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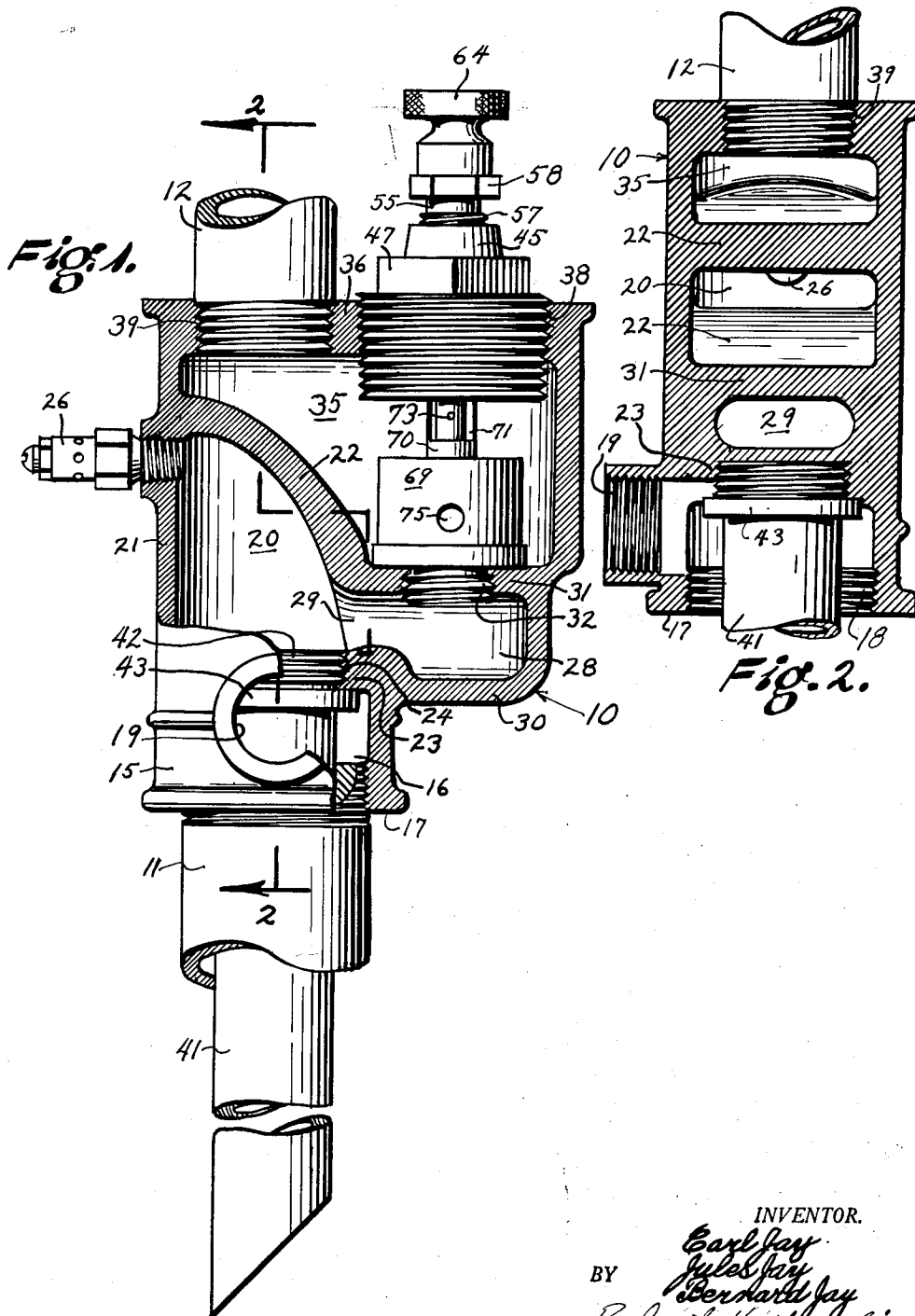
C. JAY ET AL

2,764,356

VALVE

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2 Sheets-Sheet 1



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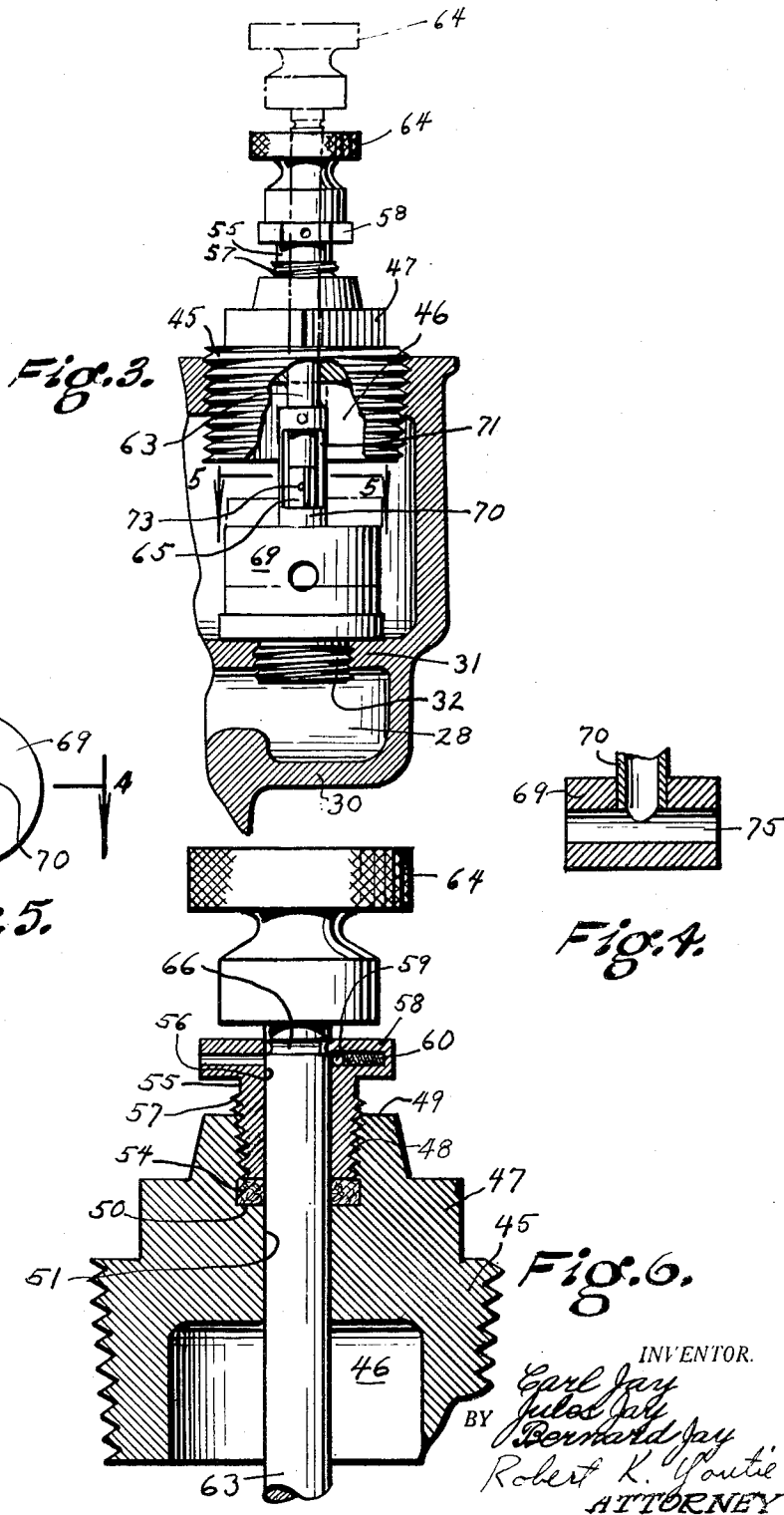
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2,764,356

VALVE

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7 Claims. (Cl. 237—56)

This invention relates generally to valves, and is particularly directed to a highly improved valve construction adapted for use in hot water heating systems.

It is the one object of the present invention to provide a valve construction for hot water heating systems which substantially completely eliminates air from the water to prevent rust, obviate air binding, and eliminate other adverse effects of the air.

It is another object of the present invention to provide a novel valve construction in which all or substantially all of the air carried in the water is removed before the water passes through the valve port or seat, to thereby substantially completely eliminate valve chatter and considerably prolong the life of the valve. A related object is to provide a valve enabling substantially all of the removed air to be passed directly from a boiler to an expansion tank without movement of the valve closure element, which minimizes movement of the valve components, and also prevents the water mains from getting hot in warm weather.

A more particular object of the present invention is to provide a valve construction including a highly improved valve closure element and mounting means therefore, which combine to insure positive closure element seating long continued and trouble free use of the valve, which combination may be quickly and easily replaced, repaired or cleaned, and is foolproof in operation, both in gravity and forced flow systems.

It is a further object of the present invention to provide a valve construction having the advantageous characteristics mentioned in the foregoing paragraphs, which is extremely simple and durable in structure, requiring a minimum of parts, and which can be manufactured, installed, maintained at a reasonable cost.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

In the drawings:

Figure 1 is an elevational view, partly in section and partly broken away, showing the valve construction of the present invention and parts associated therewith for connecting the valve in a heating system;

Figure 2 is a sectional view taken substantially along the line 2—2 of Figure 1;

Figure 3 is a partial sectional elevational view similar to Figure 1, but showing details of the closure element and its mounting means, and illustrating an alternate position of operation in dot-and-dash outline;

Figure 4 is a partial, sectional, elevational view taken through the valve closure member, substantially along the line of 4—4 Figure 5;

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Figure 5 is a horizontal, sectional view taken substantially along the line of 5—5 of Figure 3; and

Figure 6 is a fragmentary elevational view showing in detail the valve stem holding means of the present invention.

Referring now more particularly to the drawings, and specifically to Figure 1 thereof, the embodiment of the invention illustrated therein comprises a valve body commonly designated 10, which is adapted for connection at its lower end to a hot water boiler by a conduit, pipe or nipple 11, and adapted for attachment at its upper end to the heating elements of a hot water system by a pipe or conduit 12.

The valve body 10 is of generally hollow construction and formed on its lower end with a depending angular skirt 15 which defines interiorly thereof of an inlet chamber 16 having its lower end 17 opening downwards, and provided adjacent to the lower end with internal screw threads 18. Formed in the skirt 15 is a side opening or outlet 19 adapted for fluid communication with an expansion vessel or tank (not shown).

Directly above the inlet chamber 16, the valve body 10 is formed with an air removal chamber 20 which tapers upwardly or reduces in cross section toward its upper end, being defined between the generally vertical valve body side wall 21 and an inclined interior body wall or partition 22. The upper wall 23 of the inlet chamber 16, which is also the lower wall of the air removal chamber 20, is formed with an internally threaded, generally vertically extending through hole 24 opening upwards and downwards into the air removal chamber and inlet chamber respectively.

Extending through the valve body side wall 21, for communication between the upper interior region of the air removal chamber 20 and the exterior of the valve body, is an air vent 26. The air vent per se may be of any suitable conventional construction; and, as will appear more fully hereinafter, the air vent serves to permit the escape of air from the air removal chamber 20 to the atmosphere, while preventing the escape of liquid or water through the vent.

The valve body 10 is further formed with an interior, generally horizontally disposed passageway 28 which extends laterally from a lower region of the air removal chamber 20. That is, the passageway 28 opens, as at 29, into a lower portion of the air removal chamber 22 and extends therefrom laterally outwards between a generally horizontal, lower exterior body wall 30 and an upper generally horizontal interior wall or partition 31. As best seen in Figure 1, the upper wall 31 of the passageway 28 may be considered as a generally horizontal extension of the inclined partition 22, and is provided with a generally vertically extending through opening or port 32.

Also formed interiorly of the valve body 10, located over and on one side of the air removal chamber 20 is an outlet chamber 35. It will be noted that the inclined partition wall 22 formed one wall of the outlet chamber 35, while the horizontal partition wall 31 forms a lower wall of the outlet chamber, and the valve body top wall 36 defines the upper outlet chamber wall. Further, the outlet chamber 35 is directly over the horizontal passageway 28; and, the port 32 in the lower outlet chamber wall 31 communicates between the passageway 28 and the lower region of the outlet chamber. Provided in the upper or top wall 36 of the valve body 10, directly above and preferably coaxial with the port 32 is an internally threaded through opening or hole 38. An additional through opening or hole 39 is formed in the top valve body wall 36, spaced laterally from the hole 38, and preferably over the air removal chamber 20 for economy of space and material.

The nipple or pipe 11 has its upper end portion threaded for engagement into the lower end of portion 18 of the skirt 15, and may have its lower end portion (not shown in the drawing) connected to the top wall of the hot water boiler for communication with the air space in the upper interior region of the boiler. Of course, other suitable connections of the nipple 11 may be made with a hot water boiler, say through a side wall of the latter, it being advantageous that the valve body be arranged adjacent to the top of the boiler and that the inlet chamber 16 be in communication with the upper interior region of the boiler above the water level in the latter for receiving air from the boiler.

With the inlet chamber 16 thus communicating with the air space in a boiler, a suitable conduit or pipe (not shown) is connected between the outlet 19 and an expansion tank, so that air received in the inlet chamber may be passed directly to the expansion tank.

A generally vertically disposed conduit, tube or pipe 41 has its upper end portion externally threaded, as at 42, and is formed with an external, peripheral shoulder or collar 43 adjacent to the threaded end portion. As clearly seen in Figure 1, the tube 41 is arranged generally vertically, being spacedly received within the nipple 11, and extends into and spacedly through the inlet chamber 16. Further, the threaded tube and portion 42 is arranged uppermost and threadedly engaged in the opening 24 of the inlet chamber upper wall 23. Thus, the upper end portion of the tube 41 communicates through the opening 24 with the lower interior region of the air removal chamber 20 and closes the latter opening to the interior of the inlet chamber 16. Further, the collar 43 abuts against the underface of the wall 23 to seal any communication between the inlet chamber 16 and air removal chamber 20. The lower end of the conduit or tube 41 is open and arranged, when the valve is installed in the heating system, so as to be submerged in the boiler water. Hence, the tube 41 communicates between the lower region of the air removal chamber 20 and the interior of the boiler below water level therein and serves to conduct water from the boiler to the air removal chamber.

Threadedly engaged within the top wall opening 38 of the valve body 10 is an externally threaded mounting member or plug 45, which has its under side concave or hollow, as at 46 in Figure 3, and is provided on its upper side, exteriorly of the valve body 10, with a generally polygonal head 47 to facilitate insertion and removal of the plug with a wrench. As best seen in Figure 6, the plug 45 is formed with an internally threaded recess or hole 48 extending centrally downwards through the upper plug surface 49 and terminating in an enlarged generally cylindrical lower end portion or packing chamber 50. Further, a generally vertically disposed through bore or hole 51 extends through the plug 45, opening downwards into the cavity 46 and upwards into the packing chamber 50.

Suitable packing or sealing material 54 is disposed in the chamber 50 and held therein by a retaining member 55. More specifically, the retaining member 55 is of generally tubular configuration, having a generally vertically extending through bore or hole 56, and formed on its lower portion with external screw threads 57 for engagement with the internal screw threads of hole 48. On the upper end of the retaining member 55 is provided a generally polygonal head 58 having a lateral bore therein for holding a detent ball 59 and spring 60 which biases the ball towards the through hole 56.

A generally vertically disposed rod or stem 63 extends slidably through the plug bore 51 and retainer hole 56, and has its upper and lower ends disposed respectively above the retainer 55 and below the plug 45. Further, an enlarged head or hand knob 64 is provided on the upper end of the stem 63 above the retainer 55; and, the lower end portion 65 of the stem

is of reduced diameter, for a purpose appearing more fully hereinafter. Adjacent to and spaced below the knob 64, the stem 63 is formed with an annular peripheral groove 66 adapted to receive the ball 59 when the stem is in its lowermost position of vertical shifting movement. The ball or detent 59, being biased by the spring 58 toward the stem 63, serves to releasably retain the stem in its lowermost position.

Mounted on the lower end portion of the stem 63 is a generally cylindrical float or closure member 69 which includes an upstanding tubular guide socket 70 slidably receiving the stem. The guide socket or tube 70, see Figure 4, has its lower end portion extending downwards into and fixedly secured within the closure member 69, while the upper portion of the guide socket above the closure member is provided with a pair of opposed, generally rectangular, longitudinally extending cutouts or openings 71, see Figures 3 and 5. Extending transversely through the upper region of the lower, reduced stem portion 65, and projecting outwards through the cutouts 71, is a stop or limit pin 73. Thus, vertical shifting or sliding movement of the closure member 69 on the stem 63 is limited by engagement of the pin 73 with the upper and lower bounding edges of the cutouts 71. It will be noted that the upper portion of the guide socket 70 above the stop pin 73 is freely slidable on the relatively large upper portion of the stem 63, while the lower reduced stem portion 65 is loosely received in the lower portion of guide socket 70 to allow the guide socket and closure member 69 a slight angular freedom of movement. That is, the float or closure member 69 is adapted to freely tilt or cant relative to the stem 63. This freedom to tilt or cant enables the closure member 69 to rest or seat firmly on the upper surface of the outlet chamber bottom wall 31, in positive closing relation with respect to the port 32, without high precision of parts.

It will now be understood, that in the solid line position of the Figure 3, the closure member 69 is mounted for free vertical shifting upwards away from the port 32 to open the latter, and free angular tilting or canting so as to return downward to a firmly seated, port closing position on the upper surface of the wall 31. However, upon upward shifting of the stem 63, as by manual raising of the knob 64 to disengage the detent 59 from the stem groove 66, the pin 73 will engage with the upper bounding edges of the cutouts 71 to raise the guide socket 70 and closure member 69 away from the wall 31. The extreme upward position of vertical stem shifting is shown in dot-and-dash outline in Figure 3, wherein the upper end of the guide socket 70 enters the plug cavity 46 and abuts against the under surface of the plug 45, and the closure member 69 is positively maintained in the dot-and-dash outline position away from and in open relation with respect to the port 32.

In Figure 4, the internal construction of the closure member 69 is best seen as including a generally horizontal through bore or hole 75 which communicates with the lower end of the guide socket 70. As will appear more fully hereinafter, the bore 75 serves to collect dirt particles and the like from the guide socket 70, insuring free movement of the guide socket and closure member on the stem 63, and facilitates rapid removal of the collected dirt.

In operation, as in a forced flow hot water heating system having a circulator or pump, the knob 64 is pressed down to shift the stem 63 to its lowermost position, wherein it is releasably retained by the spring pressed ball or detent 59. In this condition, the closure member 69 is freely shiftable vertically between a lower position closing the port 32 at an upper position opening the port.

As noted hereinbefore, the air from the upper region of the boiler above the water level therein passes upwards through the nipple 11, exteriorly of the tube 41, and out through the outlet port 19 to an expansion vessel or tank. As the lower end of the tube 41 extends into the boiler

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below the water level thereof, to be submerged in the boiler water, it will conduct water upwards and into the lower region of the air removal chamber 20. While substantially all of the air from the boiler is passed directly to the expansion vessel, through the inlet chamber 16 of the valve body 10, some air will become entrained in the boiler water, as by turbulence or for other reasons, and will be conducted with the water into the air removal chamber 20. Obviously, entrained air conducted with the boiler water into the chamber 20 will rise to the upper region of the latter chamber, and from there escape to the atmosphere through the air vent 26. That is, the air vent 26 will permit the passage therethrough of air rising to the upper region of the air removal chamber 20, while preventing the escape of water from the air removal chamber.

As all of the air carried by the water conducted through the tube 41 into the air removal chamber 20 will rise to the top of the latter chamber, only water substantially completely free of air will pass laterally or horizontally into the passageway 28. Further, the entrained air will tend to move upward and to the left, as seen in Figure 1, toward the air vent 26, to further insure the movement of only air-free water into the passageway 28. The pressure of the air-free water in the passageway 28, as created by the circulator or pump, will be transmitted upwards through the port 32 to effect elevation of the closure member 69 and opening of the port 32. Hence, the port 32 will be open whenever the circulator or pump is operating. However, when the circulator or pump is not operating, and the upward force of the relatively hot water, as by convection current or gravity flow, is insufficient to raise the closure member 69, the port will be closed and thereby prevent the downward movement of water through the port 32 from the outlet chamber 35 to the passageway 28.

In a gravity flow or convection current type hot water heating system, the knob 64 and stem 63 may be elevated to their dot-and-dash line position of Figure 3 to positively maintain the port 32 open. In either the force or gravity flow type of system, substantially completely air-free hot water will pass upwards through the port 32 into the outlet chamber 35, and thence upwards through the conduit 12 to radiators or other radiating elements of the heating system.

If any dirt particles should enter the guide socket 70, say through the cutouts 71 or through the upper socket end, the particles will fall through the lower socket end into the closure member bore 75, and thus leave the guide socket freely slidable on the stem 63. Occasional cleaning may be effected by merely removing the plug 45 from the hole 38, which serves to remove the stem 63 and closure member 69, and then flushing, blowing out or otherwise cleaning the hole 75 to clear the latter of accumulated dirt. The plug 45, and the elements assembled therewith, may then be replaced in valve body 10 and operation resumed.

From the foregoing, it is seen that the present invention provides a valve construction for venting the air from and controlling the flow of water in a hot water heating system, which fully accomplishes its intended objects, and is well adapted to meet practical conditions of manufacture, installation, maintenance and use.

Although the present invention has been described in some detail by illustration and example for purpose of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention and scope of the appended claims.

What is claimed is:

1. A valve construction for controlling the flow of water in and venting the air from a hot water heating system, said valve construction comprising a valve body having a lower inlet chamber and adapted to be arranged adjacent to the top of a boiler with said inlet chamber communicating with the upper interior region of said

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boiler above the water level thereof for receiving air from said boiler, said body being provided with an air outlet communicating with said inlet chamber for passing air from the latter to an expansion vessel, said body being formed with an air removal chamber above said inlet chamber, an air vent communicating between an upper interior region of said air removal chamber and the exterior of said body, said body being formed with an outlet chamber on one side of said air removal chamber and adapted for fluid communication with heat radiating elements of said system, said body being provided with a passageway extending generally laterally from a lower region of said air removal chamber and opening upwards into said outlet chamber, a conduit communicating between a lower region of said air removal chamber and the interior of said boiler below the water level therein for conducting water to said air removal chamber, and a check valve located in said outlet chamber to permit the flow of water from said passageway into said outlet chamber and prevent the return of water from said outlet chamber to said passageway, whereby air carried in said conducted water rises to the upper regions of said air removal chamber for escape through said air vent and air-free water moves laterally through said passageway to said outlet chamber.

2. A valve construction according to claim 1, said check valve comprising a generally vertically disposed stem carried in said valve body depending toward the opening of said passageway into said outlet chamber, and a closure member having an upwardly opening guide socket loosely and slidably receiving the lower end portion of said stem to permit vertical shifting of said closure member into and out of closing relation with respect to the opening of said passageway into said outlet chamber, said closure member being provided with a laterally extending through bore communicating with the lower end portion of said guide socket to facilitate removal of dirt from said guide socket.

3. In a valve construction for controlling the flow of water in and venting the air from a hot water heating system, a valve body having a downwardly opening air removal chamber and adapted to be arranged adjacent to the top of a boiler with the air removal chamber in fluid communication with the interior of said boiler below the water level therein for receiving water from said boiler, an air vent mounted in said body in communication between an upper interior region of said air removal chamber and the exterior of said body, said body being formed with an outlet chamber on one side of and above said air removal chamber and adapted for fluid communication from its upper region with heat radiating elements of said system, said body being provided with a passageway extending generally laterally from a lower region of said air removal chamber and opening upwards into said outlet chamber, and a check valve located in said outlet chamber and operable to permit the flow of water from said passageway into said outlet chamber and prevent the return of water from said outlet chamber to said passageway, whereby air entrained in the water from said boiler rises to the upper region of said air removal chamber for egress through said air vent and substantially air-free water passes laterally through said passageway and into said outlet chamber for circulation through said heating system.

4. A valve construction according to claim 3, said check valve comprising a generally vertically disposed stem carried in said valve body depending toward the opening of said passageway into said outlet chamber, and a closure member having an upwardly opening guide socket loosely and slidably receiving the lower end portion of said stem to permit vertical shifting of said closure member into and out of closing relation with respect to the opening of said passageway into said outlet chamber, said closure member being provided with a laterally extending through bore communicating with the lower end

portion of said guide socket to facilitate removal of dirt from said guide socket.

5. A valve construction for controlling the flow of water in and venting the air from a hot water heating system, said valve construction comprising a valve body having a downwardly opening lower inlet chamber and adapted to be arranged adjacent to the top of a boiler with the inlet chamber in fluid communication with the upper interior region of said boiler above the water level thereof for receiving air from said boiler, said body being provided in a side wall portion with an air outlet communicating with said inlet chamber for passing air from the latter to an expansion vessel, said body being formed with an air removal chamber above said inlet chamber, an air vent mounted in said body in communication between an upper interior region of said air removal chamber and the exterior of said body, said body being formed with an outlet chamber on one side of and above said air removal chamber and adapted for fluid communication from its upper region with heat radiating elements of said system, said body being provided with a passageway extending generally laterally from the lower region of said air-removal chamber and communicating with said outlet chamber, and a tube having its upper end extending spacedly through said inlet chamber and opening upwards through a lower wall portion of said air removal chamber, the lower end of said tube extending downwards for communication with the interior of said boiler below the water level therein for conducting water to said air removal chamber, whereby air carried

in said conducted water rises to the upper region of said air removal chamber for escape through said air vent and air-free water moves laterally through said passageway to said outlet chamber.

6. A valve construction according to claim 5, said outlet chamber being located above said passageway and formed in a lower wall portion with a port opening downwards into said passageway, and valve means in said outlet chamber to prevent the return of water from said outlet chamber to said passageway.

7. A valve construction according to claim 6, said valve means comprising a closure member disposed over said port, and means mounting said closure member for free up and down movement between a lower position resting on the lower wall portion of said outlet chamber in closing relation with respect to said port and an upper position spaced above said lower wall portion to open said port, whereby said closure member permits the upward movement of air-free water from said passageway to said outlet chamber and prevents the downward return of air-free water from said outlet chamber to said passageway.

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