E. C. WILEY.

CALIBRATING RADIATOR VALVE.

APPLICATION FILED OCT. 31, 1914.

1,168,359. Patented Jan. 18, 1916.

Fig. 1.

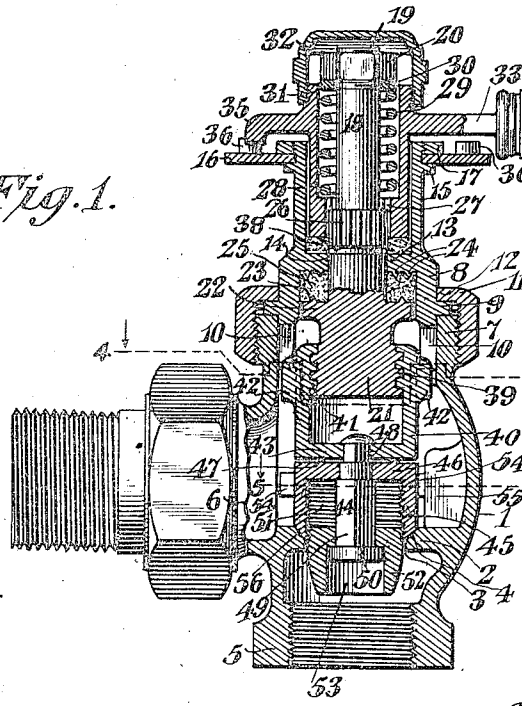


Fig. 4.

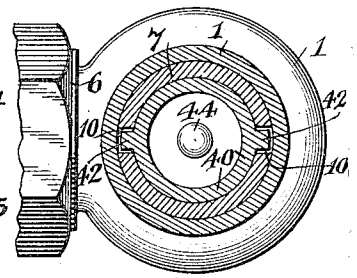


Fig. 2.

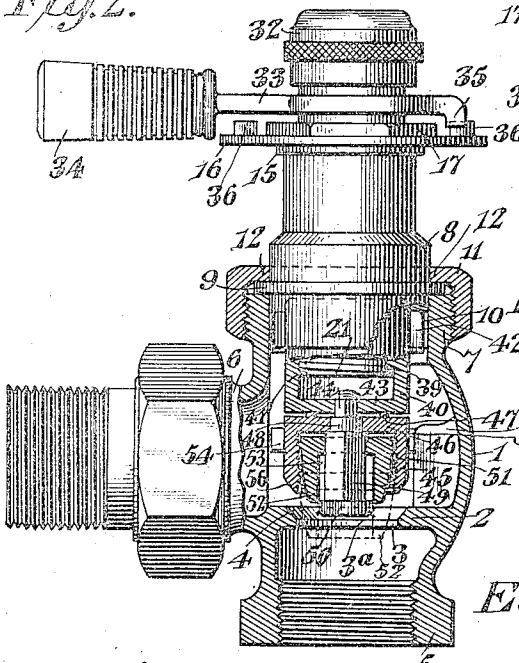


Fig. 3.

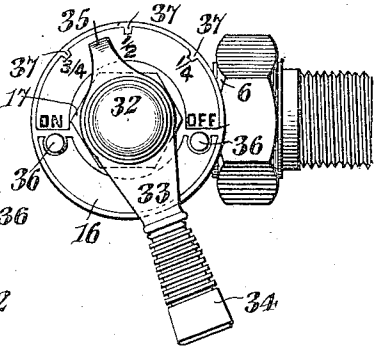
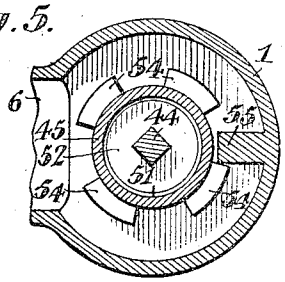


Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

EDGAR C. WILEY, OF LYNCHBURG, VIRGINIA, ASSIGNOR TO THE SIMPLEX HEATING SPECIALTY COMPANY, OF LYNCHBURG, VIRGINIA, A CORPORATION OF VIRGINIA.

CALIBRATING RADIATOR-VALVE.

1,168,359. Specification of Letters Patent. Patented Jan. 18, 1916.

Application filed October 31, 1914. Serial No. 869,684.

To all whom it may concern:

Be it known that I, EDGAR C. WILEY, a citizen of the United States, residing at Lynchburg, in the county of Campbell and State of Virginia, have invented a new and useful Calibrating Radiator-Valve, of which the following is a specification.

This invention has reference to radiator valves and its object is to provide a valve for the purpose which may be readily adapted to radiators of different sizes through a relatively wide range, whereby but one size of valve will answer for many different sizes of radiators.

It is customary in installing steam or hot water heating systems to provide a large valve for large radiators and a small valve for small radiators and also to provide various intermediate sizes, all of which means that a relatively large stock of various sizes of valves must be kept on hand or must be obtained. This means the production of many patterns by the manufacturer and the investment of a considerable amount of money which may prove to be a dead investment or a very slowly moving one.

With the present invention but one set of patterns is needed, and the necessity of providing a large stock of seldom used sizes of valves is obviated.

With the present invention the valve is made to have a maximum opening capable of supplying the largest radiators for which the valve is adapted and the opening and closing movements of the valve are constant in extent irrespective of the size of radiator to which the valve may be applied. To compensate for the difference in sizes in radiators the movable member of the valve structure is provided with an adjustable calibrating plug having a movement of adjustment lengthwise of the movable valve member so as to reduce or throttle the passage through the valve to the proper extent to adapt the valve structure to radiators of different sizes. In order to bring this about the adjustable calibrating plug is made conoidal or approximately parabolic, while the steam or hot water port or passage in which the movable valve member seats is made cylindrical, although the length of the cylinder may be very short. Theoretically the length of the cylindrical passage might be zero, but practically it has some length, wherefore it may be described as cylindrical with the understanding that the term may include as near an approach to a zero length of cylindrical port as is feasible in practice.

The idea of the conoidal calibrating plug constitutes a feature of another application filed by me on January 14, 1914, for a radiator valve under Serial No. 812,102, wherein claims are made to the calibrating plug, for which reason no claims are made herein to such plug *per se*. The present invention is in the nature of an improvement on the valve disclosed in the aforesaid application whereby adjustments of the calibrating plug to adapt the radiator valve structure to radiators of different sizes can only be made by removing the major portion of the valve structure from the valve casing or by a manipulation ordinarily unknown to the owner or occupant of the building in which the heating system is installed. This is important since for economical operation the valves should be properly adjusted when installed and thereafter left alone. With the radiator valve structure of the aforesaid application the calibrating plug is readily accessible by the simple expedient of removing a cap, which operation might be easily discovered by the occupant of the building or some other person unappreciative of the value of the close adjustment and the proper adjustment of the valve interfered with. With the present invention the calibrating plug is accessible for adjustment only by the removal of the valve stem, valve stem carrying bonnet and movable valve member with the plug all from the valve casing, whereupon the calibrating member may be adjusted and the parts be then returned to the valve casing. This is an operation which one unfamiliar with the proper adjustments of the valve is not at all likely to attempt. The valve is also susceptible of the adjustment of the calibrating plug by another manipulation which will be hereinafter described, but which is not liable to be attempted by an unskilled operator.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming a part of this specification, with the further understanding that while the drawings show a practical form of the invention, the latter is not confined to any strict conformity with the showing of the drawings but may be

changed and modified so long as such changes and modifications mark no material departure from the salient features of the invention.

In the drawings:—Figure 1 is a longitudinal central section of a valve embodying the present invention, with some parts shown in elevation, and the movable valve member being shown in the closed position. Fig. 2 is a view similar to that of Fig. 1 but with more parts shown in elevation and the valve indicated in the open position and adjusted for the largest capacity. Fig. 3 is a plan view of the valve on a somewhat smaller scale than the other figures and showing the handle in an intermediate position. Fig. 4 is a section on the line 4—4 of Fig. 1. Fig. 5 is a section on the line 5—5 of Fig. 1.

Referring to the drawings there is shown a valve casing 1 having an interior web 2 provided with a port or passage 3 at one end of which there is formed a valve seat 4 and the casing has an axially interiorly threaded neck 5 and a side exteriorly threaded neck 6 for the attachment of the valve to the steam pipe and radiator, respectively. That end of the casing 1 remote from the neck 5 is formed with an exteriorly threaded neck 7. The parts so far described may follow the general arrangement of radiator valves of the globe type with the port 3 of cylindrical shape and of short axial extent. The port 3 so far as certain features of the present invention are concerned might be otherwise shaped so long as the edge 3^a of the port where it joins the valve seat 4 is circular. Since it is the edge 3^a which is of importance, the remainder of the length of the port 3 may be actually expanded in a direction away from the valve seat 4, but customarily the port 3 is made cylindrical throughout. It will be understood, however, that whether the axial length of the port 3 be zero so far as its cylindrical form is concerned, or whether the entire length of the port 3 be cylindrical, the term cylinder as applied to the port is to include either arrangement.

Entering the casing 1 through the neck 7 is a bonnet 8 having an intermediately located exterior circumferential and laterally extended flange 9 adapted to rest on the outer end of the neck 7. Since in the usual installed position of the valve the neck 7 is uppermost, the flange 9 may be described as resting upon the upper edge of the neck 7 and further definitions of position occurring hereinafter will be with respect to the installed position of the valve structure. The bonnet 8 below the flange 9 enters the neck 7 and there is interiorly cylindrical and on diametrically opposite sides is formed with longitudinally disposed slots 10 entering the bonnet from the lower edge. The bonnet 8 is held to the neck 7 by a thimble nut 11 which may have the usual external hexagonal form for the application of a wrench and is applied to the exterior threaded portion of the neck 7. The nut 11 is provided at one end with an inwardly directed radial flange 12, as is customary, to engage the flange 9 and so lock the bonnet 8 to the neck 7 and through it to the casing 1. By loosening the nut 11 the bonnet may be readily turned about its longitudinal axis which coincides with the longitudinal axis of the casing 1 for a purpose which will hereinafter appear.

The bonnet 8 at an intermediate point has an interior web 13 with a central passage 14 therethrough, while near the upper end of the bonnet is an exterior circular flange 15 forming a seat for a dial plate 16 held to the bonnet against the flange 15 by a nut 17, the corresponding upper end of the bonnet being threaded for the application of the nut 17. Extending lengthwise through the bonnet is a valve stem 18 having its upper end projecting above the upper end of the bonnet and there threaded as indicated at 19 and provided with a nut 20 for a purpose to be described. The valve stem extends through the passage 14 and below this passage is expanded into a head 21 with the end adjacent to the web 13 formed into an outstanding circular flange 22 having on the face toward the web 13 a circular rib 23 matching the space between two concentric circular ribs 24 on the under face of the web 13. Lodged within the bonnet 8 between the web 13 and flange 22 is a packing ring 25 entered by the ribs 23 and 24, which latter serve to increase the packing surfaces without interference with turning movements since the ribs 23 and 24 may be beveled and terminate in relatively sharp edges where facing each other. At a point above the web 13 the valve stem 18 is laterally expanded and there formed with a circular series of longitudinally disposed ribs 26 to which is applied an interiorly grooved end 27 of a sleeve 28 surrounding the valve stem 18 within that portion of the bonnet 8 above the web 13. The interior of the sleeve 28 is sufficiently spaced from the valve stem 18 to provide room for a compression spring 29 held with one end against the end 27 on the sleeve 28 by the nut 20 between which nut and the spring there is interposed a washer 30. The sleeve 28 is long enough to project through the upper open end of the bonnet and terminates in an exteriorly threaded portion 31 for the reception of a cap nut 32 inclosing the nut 20. The sleeve 28 between the upper end of the bonnet and the cap nut is formed into a laterally projecting handle 33 to which is applied a handhold member 34 which may be made of some material other than metal both for protection of the hand of the operator against the

effects of transmitted heat and for ornament. On the side of the sleeve 28 remote from the handle 33 is an index or pointer member 35 in overriding relation to the dial plate 16, which latter carries upstanding studs 36 in the path of the index member 35 and serving as stops for movements of the handle about the longitudinal axis of the valve. The dial plate is provided adjacent to the studs 36 with suitable indicia which in the present instance consists of the words "On" and "Off", while between these words in position to be transversed by the pointer 35 are position indicia indicative of fractional portions of the movement between the two extremes represented by the words "On" and "Off". In the present instance the dial has markings 37 and the fractional indications 1/4, 1/2 and 3/4. Of course, any other indicating means may be employed, but it is usually sufficient that the operator be apprised of the particular fractional position indicated and the two extremes showing that the fluid passage through the valve is either fully open or fully closed. To further seal the valve stem a packing gasket 38 is introduced between the web 13 and the lower end of the sleeve 28.

The head 21 of the valve stem 18 is exteriorly screw threaded, as indicated at 39, and enters a cup-shaped member or nut 40 which in turn is interiorly screw-threaded as indicated at 41. The exterior of the nut 40 at the screw threaded end is formed with outstanding lugs 42 entering the recesses 10. Fixed to the closed end of the nut 40, which closed end is indicated at 43, is one end of a stem 44 in turn carrying a socket member or valve plug 45 having a closed end 46 adjacent to the closed end 43 of the nut 40 but spaced therefrom by a circular rib 47 serving to provide a packing means between the two members, one of which, as will hereinafter appear, may be turned axially with relation to the other. Where the stem 44 extends through the closed end or base of the plug 45 it is rounded or cylindrical as indicated at 48, while beyond this cylindrical portion the stem 44 is made noncircular and usually square, as indicated at 49, while that end of the square portion of the stem 49 remote from the cylindrical portion 48 is formed into a laterally expanded head 50. The interior of the plug 45 is screw-threaded, as shown at 51, and fitted to this screw-threaded portion of the plug is a correspondingly screw-threaded end of another plug 52 having the end remote from that entering the plug 45 counterbored, as shown at 53. The end of the plug 52 remote from the counterbore end is formed with a square passage traversed by the square portion 49 of the stem 44, while the head 50 is lodged in the counterbore or cavity 53. The exterior of the plug 52 is conoidal or approximately parabolic for a purpose which will presently appear.

The cup or plug 45 is formed with a circular exterior series of spaced lugs 54, any one of which may engage against a radial wing 55 formed on the interior of the casing 1 and projecting toward the longitudinal center line thereof. This wing 55 is somewhat extended lengthwise of the casing for a purpose which will presently appear. The calibrating plug 52 has an extent of longitudinal movement along the squared portion 49 of the stem 44 permitting it to be housed within the socket in the plug 45 or projected for the greater portion of its length beyond said plug, the adjustments of the calibrating plug being by screwing it into or out of the cup or socket carrying it. When the parts are all assembled the plug 45 is held against rotation by the wing 55, but under certain circumstances either the plug 45 or the stem 44 may be rotated with respect to the other. Since the stem 44 is held against rotation with respect to the calibrating plug or the squared portion 49 of said stem while the plug 45 is free to rotate with respect to the stem because of the round or circular part 48 where the stem traverses the plug, the rotative movement of either causes the calibrating plug to be screwed into or out of the plug 45. Furthermore, the plug 45 constitutes the movable member of the valve structure, and that end receiving the calibrating plug is shaped as shown at 56 into conformity with the valve seat 4, so as to engage the valve seat 4 in a manner to close the port 3, or when withdrawn from the valve seat to open the port 3. The extent of travel of the movable valve member 45 is always the same and is brought about by a half turn of the handle 33 actuating the valve stem 18 to a like extent, while the screw threads 39 and 41 have such a pitch that the half turn revolution of the valve stem 18 is sufficient to actuate the movable valve member from the fully closed positions to the fully open position, or vice versa. In practice this movement is about three-sixteenths of an inch more or less, and is participated in by the calibrating plug 52.

If the plug 52 be in the fully projected position it is so related to the port 3 that when the movable valve member 45 is fully lifted or in the fully open position, the wider end of the calibrating plug is still so related to the port 3 that the effective opening of the port is such as to supply the proper amount of steam or other fluid to the smaller size of radiator to which the valve is adapted. When the calibrating plug is fully housed in the valve member or socket 45 to the extent permitted by the size of the parts, the effective opening through the port 3 when the movable valve member 45

is in the fully open position is that permitting a flow of steam or other fluid to the radiator required for a radiator of the largest size for which the valve structure is adapted.

In practice a valve with three-quarter inch pipe connections will supply steam to all radiators from five feet to one hundred and fifty feet radiating surface. If the valve be applied to, say, a five foot radiator and has an effective opening adapted to a ten foot radiator the excess of steam supplied, considering the system as a steam heating system, is simply wasted and the valve is therefore uneconomical at the full open position. The same is true for other sizes of radiators where the valve is not properly adjusted to them, since when the valve supplies too much steam there is a lack of economy and when an insufficient supply of steam is provided the efficiency of the radiator is correspondingly cut down.

By the employment of the calibrating valve plug the same movement of the main valve member 45 from closed to open position will cause only the proportionate amount of steam to pass for which the calibrating plug may be adjusted. The close approach to a conoidal or parabolic form provides for the range of adjustment throughout the great difference in sizes of radiators between the minimum and maximum by corresponding movements of the calibrating plug. For instance, the parts are so adjusted that a certain number of turns of the calibrating plug is required to cause the adjustment of the plug from one extreme to the other and the shape of the calibrating plug with reference to the port 3 is such that each full turn of the calibrating plug about its longitudinal axis means a certain definite difference in the supply of steam. Suppose that the calibrating plug when fully projected is in proper relation to the main valve member 45 to cause an effective opening of the port 3 on the full open position of the valve to supply a radiator of five foot surface. This will mean that a single turn of the calibrating plug about its longitudinal axis will adjust the valve for the next size of radiator, two turns will adjust the radiator valve for the second larger size, and so on throughout the range of sizes up to the full size radiator for which the valve is designed, this being under the assumption that radiators differ in size by definite steps. Another manner of adjustment is that for a radiator of fifty or one hundred feet capacity the valve is set by first moving the calibrating plug to the fully projected position and then turning it a certain definite number of revolutions to cause it to move into the plug carrying it, when the person installing the system knows that the valve is set to about the proper position for the radiator to which it is applied.

Ordinarily in installing a system the valves are merely approximated to the proper size and then when the completed system is tested out each valve is more delicately adjusted. This may be accomplished by any one aware of the construction of the valve, but such construction is usually known only to the people employed in installing the system and is customarily unknown to the occupant or owner of the premises. For the more delicate adjustment of the valve the nut 11 is loosened and this permits a turning movement of the bonnet 8 and all those parts carried by it, except the valve plug 45 constituting the main valve member, since this member cannot turn because of the engagement of some one of the lugs 54 with the wing 55. The calibrating plug, however, participates in any turning movement of the bonnet 8 so that the plug or socket member 45 being held against rotation the calibrating plug 52 is screwed into or out of the socket in accordance with the number of turns imparted to the bonnet 8. Now by turning the bonnet 8 until the plug 52 is fully projected and then reversing the movement of the bonnet 8 until a definite number of turns has been imparted to it the calibrating plug is quite accurately adjusted for the particular size of radiator to which the radiator valve is applied, and any further and more delicate adjustment may be brought about by partial turns of the bonnet. After the proper adjustment the nut 11 is tightened and the adjustment is maintained indefinitely. Again, the particular installation may demand that the handle 33 project from the valve at a certain angle with relation to the neck portion 6 or the longitudinal line of the radiator or pipe. Under these circumstances the nut 17 may be loosened and the index 16 be turned to the desired position, or the nut 11 may be entirely disconnected from the neck 7 permitting the lifting of the bonnet until the lugs 54 are disengaged from the wing 55, whereupon the bonnet 8 may be turned without changing the adjustment of the calibrating plug and again seated with some other one of the lugs 54 in position to engage the wing 55, after which the nut 11 is tightened as before. Another way of adjusting the calibrating plug is to remove the bonnet entirely from the casing 1 and then the socket 45 may be turned to the proper position to cause the desired projection of the calibrating plug 52 in agreement with the size of the radiator to which the radiator valve is to be or is attached.

The difficulty of access to the calibrating plug adjusting means is an effective preventive against tampering with the valve after it has once been installed, so that there

is ample assurance that the installed system will continue to operate properly and economically.

When the full capacity of the radiator is desired the handle of the valve is turned so that the indicator finger 35 points to the word "On", but if it is desired to obtain a less amount of heat from the radiator the handle is turned so that the indicator points to some intermediate position. Usually the indication of three intermediate fractional positions is sufficient, and in the drawings the three usual intermediate positions are indicated. This does not, however, preclude the indication of other positions and under some circumstances the designation of the intermediate positions by figures may be omitted. Usually however it is advantageous to have the fractional positions named upon the dial plate.

The "off" position does not actually need a stop lug 36, since the manipulating handle will be arrested at such position by the closure of the main valve member or socket 45 against the valve seat, but this stop becomes of value when it is desired to fully project the calibrating member after loosening the nut 11, for the rotation of the bonnet 8 and parts carried thereby can then be caused by grasping the handhold 34 and moving it in the same direction that is required to close the valve, whereupon the calibrating plug is projected until stopped by the engagement of the head 50 against the closed end of the counterbore 53. The frictional engagement of the parts permits the reverse rotation of the bonnet 8 by the handle without causing the handle to rotate with reference to the dial.

What is claimed is:—

1. A radiator valve comprising a valve casing, a bonnet carried by the casing, a rotatable valve stem in the bonnet, a reciprocable member threaded on the stem and guided in the bonnet, a valve plug carried by the reciprocable member in rotatable relation thereto, said valve plug and casing having connections for holding the valve plug against rotation but permitting reciprocatory movements thereof, a calibrating plug carried by the valve plug in telescoping relation thereto, and connections between the calibrating plug and the reciprocable member for holding them in nonrotatable relation one to the other.

2. A radiator valve comprising a valve casing, a bonnet carried by the casing, a rotatable valve stem in the bonnet, a reciprocable member threaded on the stem and guided in the bonnet, a valve plug carried by the reciprocable member in rotatable relation thereto, said valve plug and casing having connections for holding the valve plug against rotation but permitting reciprocatory movements thereof, a calibrating plug carried by the valve plug in telescoping relation thereto, and connections between the calibrating plug and the reciprocable member for holding them in nonrotatable relation one to the other, the calibrating plug and valve plug being provided with screw threaded connections for causing the telescoping movements of the calibrating plug into and out of the valve plug by rotative movements of the valve plug or the reciprocatory member.

3. A radiator valve comprising a valve casing, a bonnet carried by the casing, a rotatable valve stem in the bonnet, a reciprocable member threaded on the stem and guided in the bonnet, a valve plug carried by the reciprocable member in rotatable relation thereto, said valve plug and casing having connections for holding the valve plug against rotation but permitting reciprocatory movements thereof, a calibrating plug carried by the valve plug in telescoping relation thereto, and connections between the calibrating plug and the reciprocable member for holding them in nonrotatable relation one to the other, the calibrating plug and valve plug being provided with screw threaded connections for causing the telescoping movements of the calibrating plug into and out of the valve plug by rotative movements of the valve plug or reciprocatory member, and the bonnet and valve casing having connecting means permitting rotative movements of the bonnet and parts carried thereby with respect to the valve casing to cause telescoping movements of the calibrating plug into and out of the valve plug.

4. A radiator valve comprising a valve casing, a bonnet carried thereby, a valve plug carried by the bonnet in rotatable relation thereto with the valve plug and casing provided with connections for holding the valve plug against rotation when in operative position within the casing, and a calibrating plug in telescoping relation to the valve plug and provided with connections with the bonnet for causing telescoping movements of the calibrating plug into and out of the valve plug by rotative movements of either the valve plug or the bonnet.

5. A radiator valve comprising a valve casing, a bonnet carried by the casing, valve operating means carried by the bonnet, a valve plug connected to the valve operating means, and a calibrating plug carried by the valve plug in telescoping relation thereto, the valve plug being in rotatable relation to the valve operating means and connected to the calibrating plug for causing the telescoping movements of the latter by rotative movements of either the bonnet or the valve plug.

6. A radiator valve comprising a valve casing, a bonnet carried by the casing, valve

operating means carried by the bonnet, a valve plug connected to the valve operating means, and a calibrating plug carried by the valve plug in telescoping relation thereto, the valve plug being in rotatable relation to the valve operating means and connected to the calibrating plug for causing the telescoping movements of the latter by rotative movements of either the bonnet or the valve plug, the casing and valve plug being provided with coacting stop members for holding the plug against rotative movements when in operative position within the casing, and the bonnet and casing being provided with coöperating means for holding the bonnet fixedly to the casing or releasing it to rotative movements within the casing or removal from the casing, at will.

7. A radiator valve comprising a valve casing, a bonnet mounted on the casing, valve operating means carried by the bonnet, a valve plug carried by the valve operating means in relatively rotatable relation thereto, a fixed stop member within the casing, a circular series of stop members on the valve plug for coaction with the stop member in the casing to hold the valve plug against rotative movements while permitting reciprocatory movements thereof, and a calibrating plug in rotatable relation to and telescoping relation with the valve plug and connected to the valve operating means for participation in movements of the bonnet for the telescoping adjustment of the calibrating plug by rotative movements of either the valve plug or the bonnet.

8. A radiator valve comprising a casing, valve operating devices carried thereby and provided with a normally non-rotatable part, a valve plug consisting of an interiorly threaded cup-shaped member carried by the valve operating devices within and in non-rotatable relation to the casing, a calibrating plug threaded into the interiorly threaded cup-shaped plug, and connections between the calibrating member and the normally non-rotatable part of the valve operating devices for holding the calibrating member normally non-rotatable and for causing adjustment of the calibrating member in the valve plug by rotative movements of the normally non-rotatable part of the valve operating devices.

9. A valve structure provided with a valve seat, a valve plug, means for moving the valve plug toward and from the valve seat, the valve plug being swiveled to the operating means, a calibrating plug threaded into the valve plug, and connections between the valve plug operating means and the calibrating plug for holding the calibrating plug in nonrotatable relation to said operating means, whereby the telescoping movements of the calibrating plug are brought about either by rotatative movements of the valve plug operating means or of the valve plug.

10. A valve structure provided with a valve seat, a valve plug, means for moving the valve plug toward and from the valve seat, the valve plug being rotatably connected to the operating means, a calibrating plug threaded into the valve plug, and connections between the valve plug operating means and the calibrating plug for holding the calibrating plug in nonrotatable relation to said operating means, whereby the telescoping movements of the calibrating plug are brought about either by rotative movements of the valve plug operating means or of the valve plug, said valve structure being provided with means for holding that part of the operating means connected to the calibrating plug and also the valve plug from rotative movements in the normal opening and closing movements of the valve plug.

11. A radiator valve comprising a valve casing, a bonnet mounted in the valve casing for rotative movements therein, means for connecting the bonnet to the valve casing in fixed relation one to the other, a valve plug carried by the bonnet and rotatable with relation thereto, coacting means on the valve plug and casing for holding the plug against rotative movements, rotatable valve operating means carried by the bonnet and having a range of operative movement with relation to the opening and closing of the valve of approximately a half revolution with respect to the bonnet, and a calibrating plug connected to the bonnet in telescoping threaded relation to the valve plug, whereby rotative movements of either the bonnet or the valve plug cause the adjustment of the calibrating plug into and out of the valve plug and the operating means for the valve plug may be utilized for producing the rotative movements of the bonnet for effecting the adjustment of the calibrating plug.

12. A radiator valve provided with a valve seat and a valve plug therefor, operating means for the valve plug for moving it toward and from the valve seat, a calibrating plug threaded to the valve plug for telescoping movements with relation thereto, and connections between the calibrating plug and the valve plug operating means comprising a noncircular pin along which the calibrating plug is movable longitudinally and by which it is held against rotation on the pin, said pin being in fixed relation to the valve operating means and the valve plug being mounted on the pin for relative rotation thereabout as an axis.

13. A valve structure comprising a valve casing having a valve seat, an interiorly threaded cup-shaped valve plug having an exterior series of spaced lugs thereon, a stop member within the valve casing in the path of the lugs, a pin extending axially through

the valve plug and on which the plug is mounted for relative rotation with respect to the pin and said pin being of noncircular contour within the threaded portion of the valve plug and terminating in an expanded head, a calibrating plug threaded into the threaded portion of the valve plug and axially traversed by the noncircular portion of the pin, said calibrating plug having a counterbore for receiving the expanded head of the pin, and valve operating means to which the pin is fixed, said pin constituting the supporting means for both the valve plug and the calibrating plug.

14. A valve structure comprising a valve casing having a valve seat, an interiorly threaded cup-shaped valve plug having an exterior series of spaced lugs thereon, a stop member within the valve casing in the path of the lugs, a pin extending axially through the valve plug and on which the plug is mounted for relative rotation with respect to the pin and said pin being of noncircular contour within the threaded portion of the valve plug and terminating in an expanded head, a calibrating plug threaded into the threaded portion of the valve plug and axially traversed by the noncircular portion of the pin, said calibrating plug having a counterbore for receiving the expanded head of the pin, and valve operating means to which the pin is fixed, said pin constituting the supporting means for both the valve plug and the calibrating plug, and said valve structure being provided with means for holding that portion of the valve operating means carrying the pin against rotative movement and for releasing it to rotative movements.

15. A valve structure comprising a valve casing having a valve seat, an interiorly threaded cup-shaped valve plug having an exterior circumferential series of spaced lugs thereon, a stop member within the valve casing in the path of the lugs, a pin extending axially through the valve plug and on which the plug is mounted for relative rotation with respect to the pin, and said pin being of noncircular contour within the threaded portion of the valve plug and also terminating in an expanded head, a calibrating plug threaded into the threaded portion of the valve plug and axially traversed by the non-circular portion of the pin, said calibrating plug having a counterbore for receiving the expanded head of the pin and said pin constituting the supporting means for both the valve plug and the calibrating plug, a bonnet with longitudinal entering recesses, clamping connections between the bonnet and the valve casing for locking the bonnet to said casing or releasing it to rotative movement within the casing, at will, and valve operating means to which the pin is fixed, comprising a threaded member carrying the pin and plugs and provided with lugs entering the recesses in the bonnet, and a valve spindle in coactive relation to the threaded member for moving the latter together with the plugs lengthwise of the valve casing by a limited rotative movement of the valve spindle.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

EDGAR C. WILEY.

Witnesses:
CHAS. E. BURKS,
J. A. ANDERSON, Jr.

E. C. WILEY.

VAPOR HEATING SYSTEM.

APPLICATION FILED JUNE 25, 1912.

1,085,717.

Patented Feb. 3, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

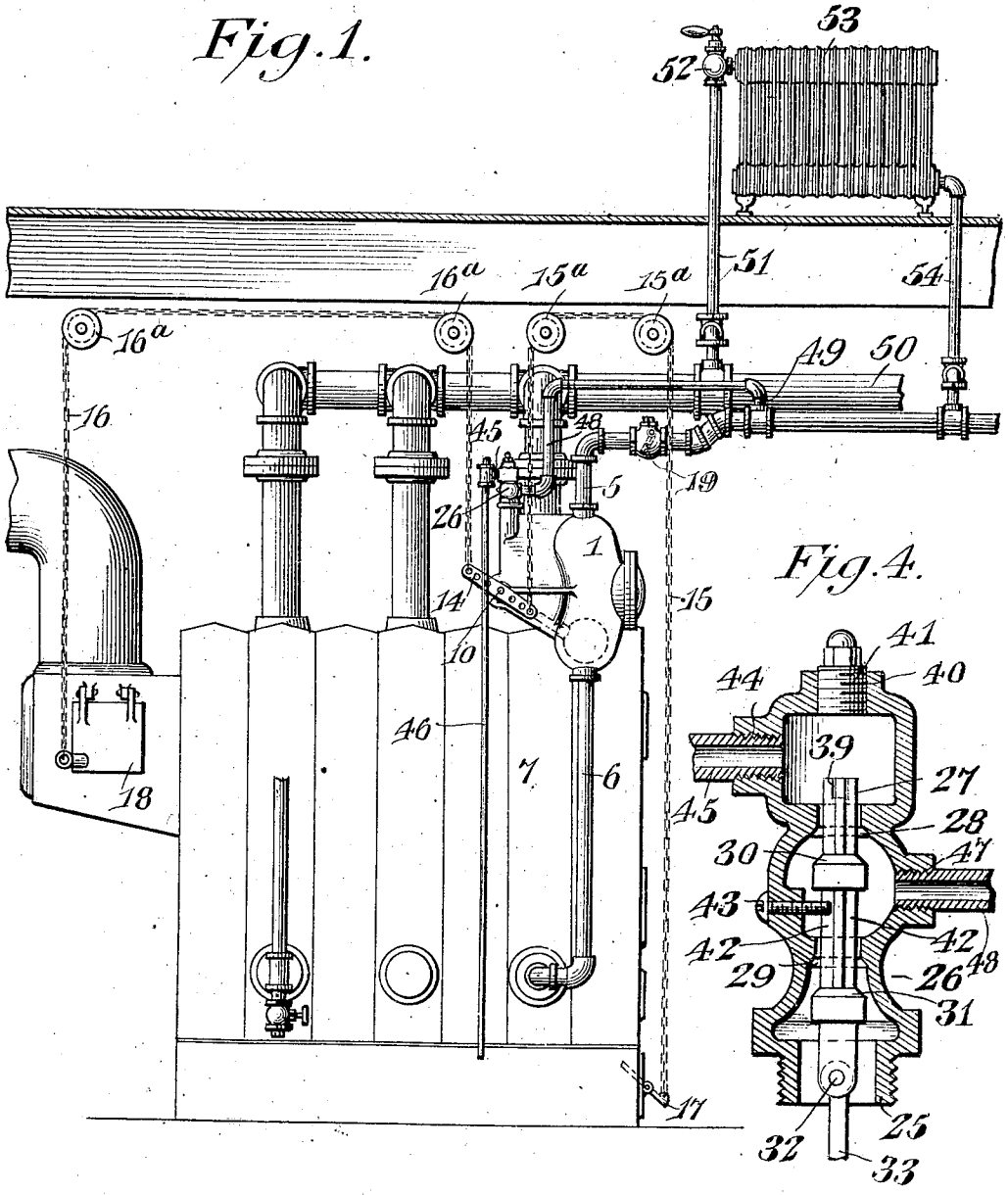

Fig. 4.

WITNESSES

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E. C. WILEY.

VAPOR HEATING SYSTEM.

APPLICATION FILED JUNE 25, 1912.

1,085,717.

Patented Feb. 3, 1914.

2 SHEETS—SHEET 2.

Fig. 2.

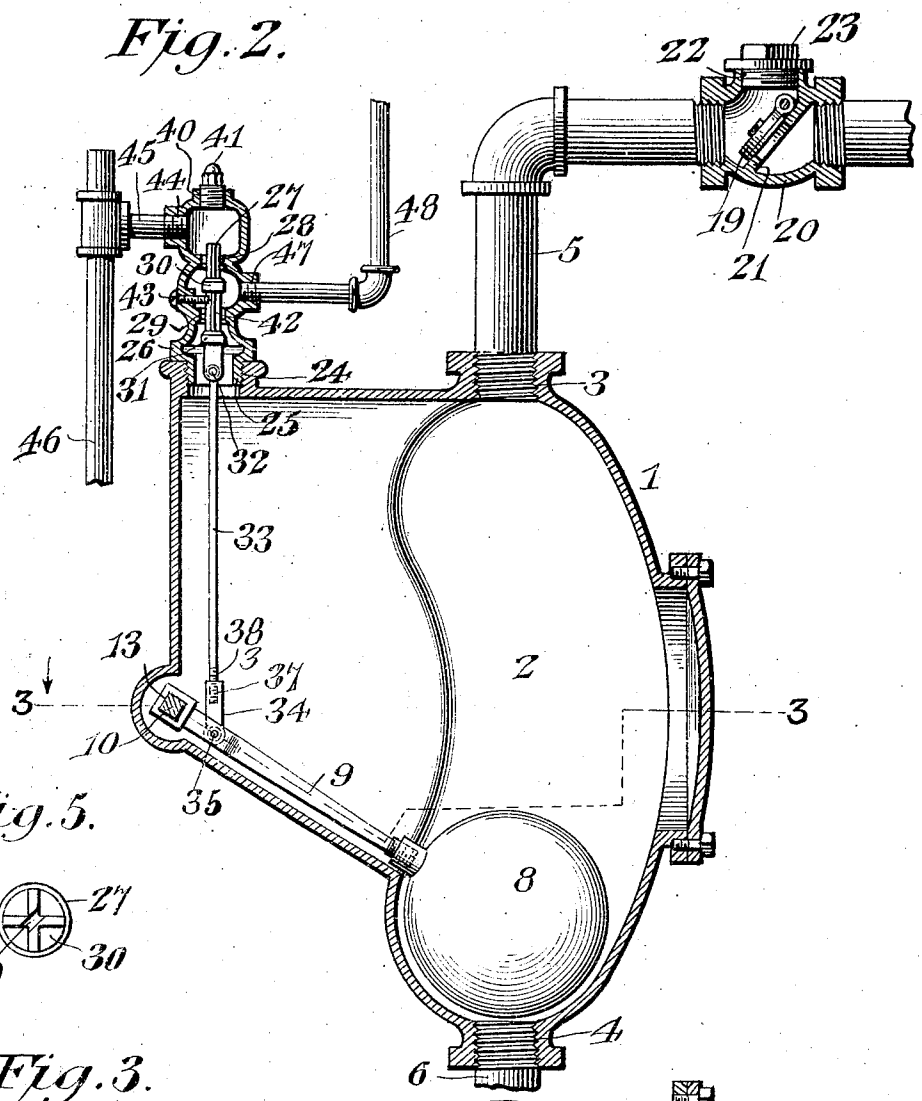
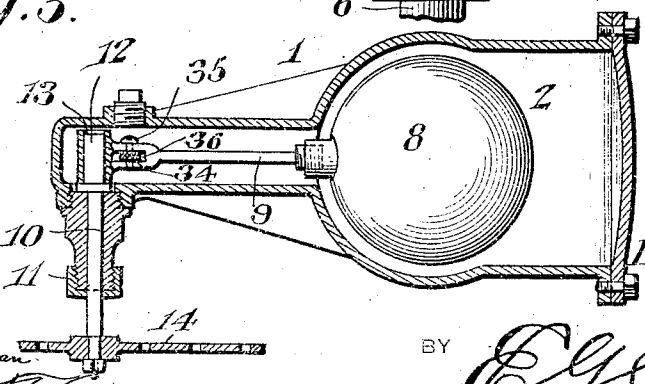


Fig. 5.

Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

EDGAR C. WILEY, OF LYNCHBURG, VIRGINIA.

VAPOR-HEATING SYSTEM.

1,085,717. Specification of Letters Patent. Patented Feb. 3, 1914.

Application filed June 25, 1912. Serial No. 705,887.

To all whom it may concern:

Be it known that I, EDGAR C. WILEY, a citizen of the United States, residing at Lynchburg, in the county of Campbell and State of Virginia, have invented a new and useful Vapor-Heating System, of which the following is a specification.

The invention relates to improvements in vapor heating systems.

The object of the present invention is to improve the construction of vapor heating systems, and to provide a simple, efficient and comparatively inexpensive automatic damper or draft regulator, designed particularly for use in residences and comparatively small buildings, and equipped with a check valve for preventing the boiler pressure from forcing water back into the return pipes, and provided with an air vent valve positively controlled by the action of the regulator to enable air to exhaust or escape from the return pipes without permitting water to be discharged through the vent opening, whereby damaging discharge of water from the boiler through either the vent or the return line is entirely eliminated, and at the same time making it possible to carry several pounds of pressure without injurious results.

The invention also has for its object to provide means for permitting air, when the steam pressure subsides, to enter the return pipes and the float chamber to prevent the vacuum resulting from the sealing of the system from drawing the water and air down through the float chamber and setting up considerable agitation.

With these and other objects in view, the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:—Figure 1 is a side elevation of an automatic damper or draft regulator, constructed in accordance with this invention, and shown applied to a vapor system. Fig. 2 is an enlarged vertical sectional view of the regulator. Fig. 3 is a horizontal sectional view on the line 3—3 of Fig. 2. Fig. 4 is an enlarged sectional view, illustrating the construction of the vent valve and its casing. Fig. 5 is a detail plan view of the vent valve.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

In the accompanying drawings in which is illustrated the preferred embodiment of the invention, 1 designates a receiver having a float chamber 2 and provided at the top and bottom thereof with threaded openings 3 and 4. The main return pipe 5 of the vapor system is threaded into the upper opening, and the lower opening 4 receives the upper threaded end of a pipe 6, which connects the receiver with the boiler 7. The receiver may be of any preferred construction and it contains a suitable float 8, secured to an arm 9 of a horizontal shaft 10, which extends outwardly through a stuffing box 11. The inner portion 12 of the shaft is squared, and the arm is provided with an opening 13 rectangular in cross section to conform to the configuration of the squared inner portion of the shaft 10. The shaft is equipped with a lever 14, secured at an intermediate point to the outer end of the said shaft and having its arms connected by chains 15 and 16 with dampers 17 and 18 of the ash door and the smoke pipe. The chains 15 and 16 are guided by pulleys 15^a and 16^a, or other suitable means, and the dampers 17 and 18 operate in the usual manner to produce a draft and to check the same. The main return pipe 5 is equipped with a hinged check valve 19, mounted in a suitable casing 20, which is provided with a valved seat 21, arranged at an inclination. The casing of the check valve is arranged in a horizontal position in a horizontal portion of the main return pipe, and it is provided at its ends with opposite threaded openings to receive sections of the pipes, and it also has a threaded opening 22 in its top normally closed by a screw plug 23, which is adapted to be removed to afford access to the valve. The valve, which is hinged at the top, is adapted to be readily opened to permit the passage of water to the boiler, and it closes automatically to prevent water from being forced into the return pipe by boiler pressure. The receiver 1 is also provided at its top with a threaded opening 24 for the re-

ception of the lower threaded end 25 of a vertical casing 26 of a double seated vent valve 27. The casing 26 is provided at a point intermediate of its ends with spaced upper and lower valve seats 28 and 29, and the valve 27 is provided with upper and lower coacting portions 30 and 31, and is movable upwardly by the float to seat the said portions 30 and 31, which seals the system and prevents water from being discharged through the vent opening. The lower end of the vent valve is connected by a suitable pivot 32 to the upper end of the connecting rod 33, which is connected at its lower end with the float actuated arm 9 by a section or coupling piece 34. The section or coupling piece 34 is pivoted at its lower end by a screw 35, or other suitable fastening device to the float actuated arm 9, which is provided adjacent to the shaft 10 with a slot 36 into which the coupling piece 34 extends. The coupling piece is provided with a threaded socket 37 and the lower end 38 of the connecting rod 33 is threaded to engage the socket. The upper end of the vent valve is provided with a groove 39, adapted to receive the blade of a screw driver, and the threaded adjustment at the lower end of the rod 33 enables the connection between the vent valve and the arm 9 to be varied in length, and permits the vent valve to be adjusted so as to properly engage the seats of the valve casing 26. In practice the valve is adjusted so as to seat itself just before the float reaches the top of the float chamber. The valve casing 26 is provided at the top with a threaded opening 40 normally closed by a screw plug 41, which is adapted to be removed to afford access to the vent valve. The vent valve is provided with longitudinal wings or flanges 42, and it is held against rotary movement by means of a horizontal screw 43, mounted in a threaded perforation of the valve casing 26 and having a pointed inner end, which extends between two of the wings or flanges of the vent valve. The screw, which prevents rotary movement of the vent valve, does not interfere with the upward and downward movement of the same through the action of the float.

The casing 26 of the vent valve is provided above the upper valve seat with a horizontal opening 44 threaded to receive an arm 45 of a vertical vent pipe 46, which extends to a point near the floor for the discharge of any water, which might leak past the vent valve. The vent pipe may be connected with a drain pipe for carrying off such water to a sewer or other suitable point. The valve casing 26 is also provided at a point between the valve seats with a threaded opening 47 to receive one end of a by-pass pipe 48, which extends adjacent the main return pipe and its other end 49 is connected to the main return pipe at a point beyond the check valve, as clearly illustrated in Fig. 1 of the drawings, in order to permit air to escape freely from the main return pipe to the vent valve casing without passing through the check valve casing. The by-pass pipe communicates with the valve casing at a point on the discharge side of the vent valve and with the return pipe on the system side of the check valve, and air and water may also pass through the check valve casing and the air will be premitted to escape from the receiver through the vent valve casing when the vent valve is open. When the vent valve and the check valve are closed, the system is sealed and water cannot escape either through the vent or through the check valve casing into the return pipes.

When the boiler is fired up and a slight steam pressure is raised, steam flows out through the main steam pipe 50 through a radiator pipe connection 51 and an adjustable controlled valve 52 into the radiator 53. The air and condensation from the radiator will be discharged through a return pipe connection 54 into the return line where the air will flow through the by-pass pipe or connection and through the vent valve casing entering at the opening 47 and discharging at the opening 44, the float at this time being at the bottom of the valve chamber 2. The water will return to the float chamber through the check valve casing and will descend to the boiler. As the pressure rises within the boiler, the water will be forced to a higher level within the float chamber than that maintained in the boiler by reason of the fact that the float chamber is open to the atmosphere through the vent valve. This elevation of water due to the pressure in the boiler will raise the float and operate the damper so as to control the draft to the boiler and thereby prevent a further rise in the pressure.

One of the principal difficulties with vapor heating plants has been that when through some accident to the dampers or failure of the dampers to properly check the fire, as is often the case when the attendant leaves the ash door, which carries the draft damper, open, water is forced through the vent openings in such quantities as to deplete the supply and cause destruction of the boiler. This is impossible with the present invention, which by sealing the system not only prevents a dangerous discharge of water but also enables the system to carry several pounds of pressure without any discharge of water or other injurious results. The check valve prevents water from being forced through the float chamber into the return pipes by a sudden rise in the pressure, which would endanger the boiler by removing too much water in a short space

of time before the pressure in the return line has had time to equalize with the pressure in the boiler, which it will do in a short time. With the check valve installed in the main return pipe, air cannot reënter the piping system from the receiver, and when the steam pressure has subsided after a rise, a vacuum would be created in the boiler and piping if the by-pass pipe were not provided to admit air to the return pipe. If this provision were not made such a vacuum in a boiler would draw the water down through the float chamber and set up considerable agitation by also drawing air through the said channel.

What is claimed is:—

1. In a heating system of the class described, the combination with a boiler, a return pipe provided with a check valve, a receiver connected with the return pipe and with the boiler and having a float chamber, an arm mounted within the float chamber and provided with a float, a vent valve casing communicating with the float chamber, a vent valve operating within the valve casing and connected with the said arm and actuated by the same, and a by-pass pipe communicating with the valve casing at a point on the discharge side of the vent valve and with the return pipe on the system side of the check valve.

2. In a heating system of the class described, the combination of a boiler, a return pipe having a check valve, a receiver connected with the return pipe and with the boiler, an arm mounted within the receiver and provided with a float, a vent valve casing communicating with the receiver, a vent valve operating within the valve casing and connected with the said arm and actuated by the same, a vent pipe connected with the valve casing at a point beyond the vent valve, and a by-pass pipe communicating with the valve casing at a point on the discharge side of the vent valve and with the return pipe on the system side of the check valve.

3. In a heating system of the class described, the combination of a boiler, a return pipe provided with a check valve, a receiver connected with the return pipe and with the boiler, a float actuated arm mounted within the receiver, a vent valve casing communicating with the receiver and provided with spaced valve seats, a vent valve operating in the casing and having spaced portions coacting with the said seats, connections between the vent valve and the said arm, and a by-pass pipe communicating with the valve casing at a point between the said valve seats and with the return pipe on the system side of the check valve.

4. In a heating system of the class described, the combination of a receiver, a float actuated arm operating within the receiver, a vent valve casing mounted upon the receiver and provided in its top with an opening and having upper and lower valve seats alined with the said opening, a vertically movable vent valve operating in the valve casing and provided with spaced upper and lower portions to coact with the valve seats and having vertical wings or flanges located between the said spaced portions, means for connecting the vent valve with the float actuated arm, said means including an adjustable connection operable by a rotary movement of the vent valve, and a screw piercing the valve casing at a point between the spaced upper and lower portions of the vent valve and engaging between the vertical flanges thereof for retaining the vent valve in its rotary adjustment.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

EDGAR C. WILEY.

Witnesses:
KATIE E. JENNINGS,
GRACE H. MAHOOD.

E. C. WILEY.

RADIATOR VALVE.

APPLICATION FILED JAN. 14, 1914.

1,200,676.

Patented Oct. 10, 1916.

Fig. 1.

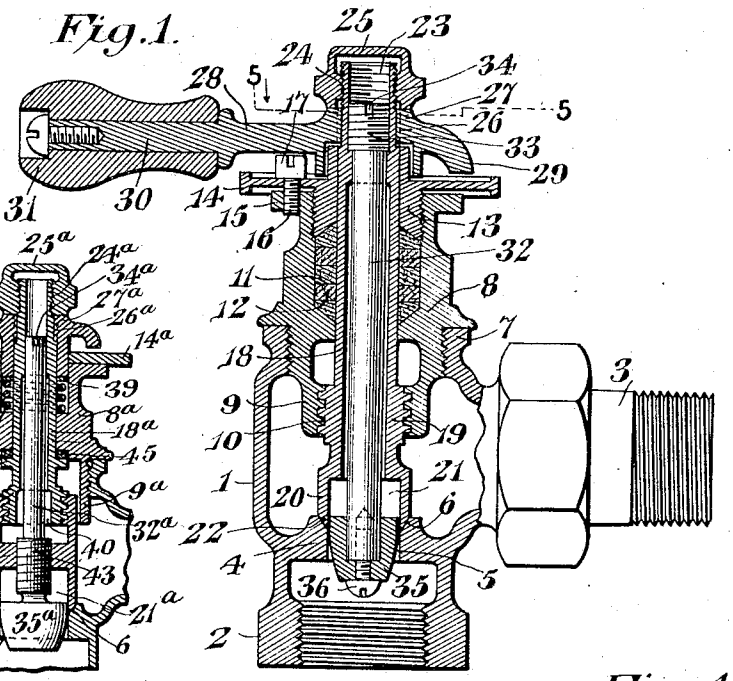


Fig. 6.

Fig. 3.

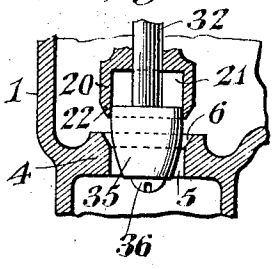


Fig. 5.

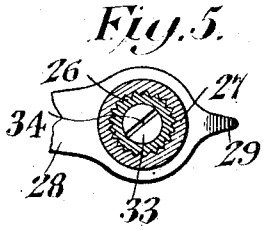


Fig. 4.

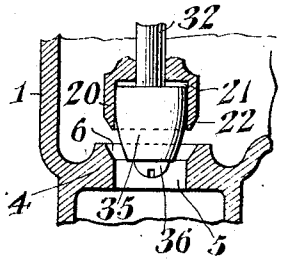
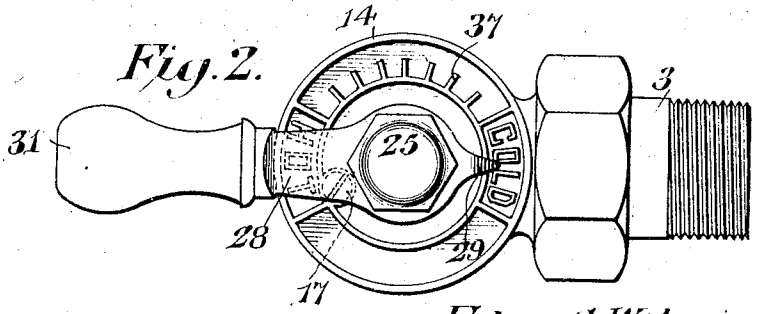


Fig. 2.



WITNESSES

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RADIATOR-VALVE.

1,200,676. Specification of Letters Patent. Patented Oct. 10, 1916.

Application filed January 14, 1914. Serial No. 812,102.

To all whom it may concern:

Be it known that I, EDGAR C. WILEY, a citizen of the United States, residing at Lynchburg, in the county of Campbell and State of Virginia, have invented a new and useful Radiator-Valve, of which the following is a specification.

This invention has reference to improvements in radiator valves, and its object is to provide a valve for the purpose which may be readily adapted to different radiator capacities, so that a single size of valve will answer for many different sizes of radiators.

In accordance with the present invention the movable member of the valve is so constructed that it may be fully opened or fully closed by a short movement of the customary handle, and it is desirable that this movement should not exceed an arc of more than about one hundred and eighty degrees, while a fractional rotation of the valve stem between the two extremes causes corresponding graduation of the supply. With such a valve steam or other heating fluid may be admitted to the radiator in large or small quantities to suit weather conditions, and this is accomplished by turning the valve stem accordingly. Where a lever handle is provided it is customary to arrange the opening and closing movement of the valve so that when the lever handle stands away from the radiator the valve is closed, and when it stands toward the radiator the valve is fully open, thus apprising the observer at a glance as to whether the steam is turned on or off, and by a suitable index fractional positions are readily indicated. In addition to this graduating function of the valve, the present invention contemplates an independent adjustment whereby the caliber of the steam port, assuming the valve to be a steam valve, may be permanently increased or diminished to adapt the valve to a large or a small radiator, this being equivalent to making the valve large or small to meet the requirements of large or small radiators, but bringing this desirable condition about with a single size of valve. This avoids the necessity of carrying the valves in a multitude of sizes. It is impossible to determine just the proper size of port to feed any given radiator, as this will vary with the pressure and other conditions, such as friction in pipes, etc., resulting from the proximity to or remoteness of the radiator from the boiler or other source of supply. In practice it is found necessary in order to get accurate results, to adjust the caliber of the valve to the radiator under practical working conditions after it is installed, and such permanent adjustment must be made in such a way that the graduating action of the valve is maintained throughout the arc of the handle movement, whether such permanent adjustment be made for a large or a small radiator, and, moreover, it is desirable that the lever movement be always the same whether the valve is applied to a large or a small radiator.

In accordance with the present invention the opening and closing movement of the valve with respect to the port it controls is constant for all sizes of radiators to which the valve is adapted, but the permanent adjustment is brought about by the employment of an auxiliary calibrating plug carried by the movable member of the valve and so related thereto that it can be adjusted with relation to the steam port to vary the same.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming a part of this specification, with the further understanding that while the drawings show a practical form of the invention, the latter is not confined to any strict conformity with the showing of the drawings, but may be changed and modified so long as such changes and modifications mark no material departure from the salient features of the invention.

In the drawings:—Figure 1 is a longitudinal diametric section of the valve with some parts shown in elevation. Fig. 2 is a plan view of the valve structure. Fig. 3 is a fragmentary section of a portion of the valve as shown in Fig. 1, but showing the movable member of the valve in the open position. Fig. 4 is a view similar to Fig. 3 but showing a different position of the calibrating plug from that shown in Fig. 3. Fig. 5 is a detail section on the line 5—5 of Fig. 1, distant parts being omitted. Fig. 6 is a view similar to Fig. 1, showing another form of valve operating mechanism.

Referring to the drawings there is shown a valve casing 1 provided with angle necks 2,

3, respectively, suitably threaded for attachment to a steam pipe and to a radiator. Adjacent to the neck 2 the casing 1 is formed with an interior web 4 having a port or passage 5 therethrough terminating at the end remote from the neck 2 in a flaring valve seat 6. The portion of the casing 1 remote from the neck 2 is formed into an interiorly threaded neck 7 for the reception of a bonnet 8 having a hollow axial extension 9 provided with interior screw threads 10 of long pitch. The bonnet 8 is provided with a cavity 11 designed for the reception of packing 12 and adapted to the bonnet so as to engage the packing 12 is a packing gland 13 on which is formed a radially extended disk-like flange 14, while the corresponding end of the bonnet 8 is formed with a radial flange 15 to which the disk-like flange or disk 14 is secured by a screw 16 passing through the disk 14 and threaded into the flange 15 and provided with a head 17 having a purpose to be described. Extended through the gland 13, packing 12, and axial extension 9 is a tubular valve stem 18 laterally enlarged and threaded, as indicated at 19, to match the screw threads 10 and terminating within the casing 1 in a valve head 20 formed with a counterbore 21 in alinement with the bore of the tubular stem, the head 20 having a terminal portion 22 shaped to fit the valve seat 6. The valve stem 18 has the end passing through the gland 13 extended beyond the latter and also counterbored and internally threaded, as indicated at 23. The terminal portion of the last-named extended part of the valve stem is exteriorly threaded, as shown at 24, to receive a cap nut 25, and adjacent to the exteriorly threaded portion 24 the extended portion of the valve stem is exteriorly serrated, as indicated at 26, to receive a similarly serrated boss 27 on a lever 28 having a short nose extension 29 on one side of the boss 27 and a stem 30 on the other side of the boss, said stem carrying a manipulating handle 31 which may be formed of wood or some suitable substance of small heat conductivity and shaped to be readily grasped by the hand of the operator. The serrated portions 26 and 27 permit the placing of the manipulating lever upon the valve stem in the desired position within very close adjustment and the nut 25 serves to hold the lever or handle to the valve stem against accidental removal.

Extending lengthwise through the hollow or tubular valve stem 18 is a rod 32 extending into the threaded portion 23 of the valve stem 18 and there screw threaded, as indicated at 33, to fit the interior threads of the portion 23, the corresponding end of the rod 32 being notched, as shown at 34, or otherwise suitably formed for the application of a tool whereby the rod 32 may be screwed along the valve stem 18 where the part 33 engages in the threaded bore 23. At the other end of the rod there is secured thereto a plug 35, a screw 36 passed axially through the plug into the corresponding end of the rod 32 forming a convenient means of fastening the plug to the rod, and the rod may be axially inset into the plug, as shown, or any other means may be provided for the purpose. The plug is of such diameter as to enter the port 5 and also enter into the counterbore or chamber 21 in the valve head 20, and the plug may be drawn into the chamber 21 to any desired extent by turning the rod 32 about its longitudinal axis, the screw threads of the end 33 and within the counterbore 23 coacting to cause the longitudinal movement of the rod 32.

The plug 35 is shown as frusto-conoidal in shape and may quite closely approach a parabolic form in longitudinal section. The greatest diameter of the plug is very nearly the same as the diameter of the port 5, which latter is of circular or cylindrical shape in the showing of the drawings.

It is advantageous from a manufacturing standpoint and economical for the installation of steam or hot water heating plants to have the controlling valves all of one size irrespective of the size of the radiators employed, and it is further highly advantageous to have the controlling valves so that a single valve may be readily adjusted to properly control the fluid supply to the radiators irrespective of their capacity.

One size of valve made in accordance with the present invention will supply a large radiator, say, one of one hundred and fifty feet radiating surface, or a small radiator, say, one of five feet radiating surface, with substantially equal efficiency throughout the range of adjustments from fully closed to full open positions, in accordance with the adjustment of the calibrating plug. This is due to the shape of the calibrating plug and its relation to the port controlled by the main valve, as well as the shape of the port. It is of importance that the port where it coacts with the calibrating plug be straight or cylindrical, while the plug itself has at its larger end a very slight taper within the range of movement of this part of the plug with respect to the end of the port it enters when the plug is in the projected position, and consequently in position to supply the smallest radiator with steam. For the remainder of the length of the plug toward the smaller end thereof the taper is progressively greater, so that the plug is substantially conoidal or parabolic in shape. The result of this is that considering the plug 35 as in its full projected position, it begins on the opening of the valve to supply steam in progressively increasing quantities as the valve moves toward the fully open position, until when

the last-named position is attained the steam supply is that suited to a five foot radiator, considering such a radiator as of the minimum size for which the valve is designed. Moreover, the slight taper of the plug as it moves through the port 5, and more particularly that end of the port where it joins the valve seat 6, regulates the supply of steam, so that such supply shall be in progressively increasing quantities as the valve opens conforming to the degree of opening of the valve. If, now, the plug 35 be drawn into the valve head 20, say, to an extent to correspond to a fifty foot radiator, then the taper of the walls of the plug 35 with relation to the outlet end of the substantially cylindrical port 5 is such as to supply steam proportionate to the opening of the valve until at fully open position the steam supplied is sufficient for a fifty foot radiator without appreciable waste. With the same valve and with the calibrating plug fully drawn into the head 20, the supply of steam is sufficient for a one hundred and fifty foot radiator, and the same positions of the valve stem lengthwise of the valve structure provide the same proportionate amount of steam to radiators of different sizes provided the plug 35 be properly located for such sizes.

To guide the user of the valve, the disk 14 has suitable indicia displayed thereon which in the particular showing of the drawings convey the information to the user by the words "Hot" and "Cold" that the valve is either fully open or fully closed, while intermediate positions are represented by intermediate marks 37. Other indication may, of course, be used for the same purpose.

It has been the custom to supply valves of different capacities for radiators of different sizes. With the present invention but one size of valve is needed for all the different sizes of radiators within very widely separated limits. The valves may be adjusted before installation to an approximation of the proper adjustment, and then after installation each valve is more accurately adjusted by removing the cap nut 25 and turning the stem 32 of the calibrating plug 35 by means of a screw driver, thus projecting the calibrating plug or withdrawing it into the head 20, as the case may be. Such operation is needful to bring the valve into proper final adjustment, but when once this adjustment is attained a half revolution of the operating handle means the full opening or the full closing of the valve irrespective of the size of the radiator, and furthermore intermediate positions of the handle mean that the radiator is receiving the proper supply of steam for the particular size of radiator to which the valve has been adjusted by the longitudinal movement of the calibrating plug 35 with reference to the valve head 20. The calibrating plug does not close the steam supply, but regulates it and the peculiar relation of the calibrating plug 35 and port 5 brings about a very close approach to accuracy in the supply of steam for the radiator to which the valve is adjusted by the same degree of turning of the valve handle for any or all sizes of radiators. This means that the movements of the valve aside from the calibrating plug are the same for all radiators, while the adjustments of the calibrating plug with respect to its position with relation to the port 5 brings about the proper supply of steam for radiators of different sizes, while the proportionate supplies irrespective of the size of the radiator for the different positions of the valve are automatically accomplished by the shaping of the calibrating plug or head with respect to the port 5 and also the shape of the latter.

Experience has shown that the port 5, or at least that portion of it coacting with the calibrating plug, must be cylindrical, that is, it shall neither taper nor diverge where in coactive relation with the plug 35, and this plug must taper very slightly at its large end and then more rapidly toward its small end, so that the conoidal or parabolic form is either attained or very closely approximated.

The screw 16 while primarily serving to hold the index disk 14 in proper relation to the body of the valve structure, has its head 17 in the path of the nose 29 so as to determine the full open position of the valve and prevent overriding of this position. While the calibrating plug 35, has been described as substantially conoidal, it will be understood that other forms of plug may be employed so that the invention is not necessarily confined to any particular shape of plug.

Instead of employing the type of valve shown in Fig. 1 and associated figures, where the stem of the main valve has the operating handle directly connected thereto, the structure may be made on the lines of the so-called packless valve, as shown in Fig. 6. In this construction there is a valve casing 1 which may be in substantially all respects similar to the structure shown in Fig. 1, and this casing carries a bonnet 8^a provided with a skirt 9^a within the casing 1 and with a chamber 11^a at that end of the bonnet remote from the skirt 9^a. The bonnet is provided with an outstanding flange 15 similar to the flange 15 of the structure of Fig. 1, and this flange carries a plain disk 14^a secured thereto by a screw 16^a having a head 17^a as in the structure of Fig. 1. A handle lever 28^a in the main similar to the lever 28 of Fig. 1 is provided and this handle has a hub portion 27^a of an axial length to extend

through the disk 14ª into the chamber 11ª where it is engaged by a spring 38 bearing at one end against the inner end of the chamber 11ª and at the other end against the hub 27ª where entering the chamber, through an interposed wear washer 39. The bonnet is traversed by a tubular stem 18ª extending into the interior of the casing 1 and terminating in an exteriorly threaded portion 19ª counterbored or enlarged, as indicated at 40. That end of the tubular stem 18ª remote from the threaded end 19ª extends through the hub 27ª and beyond the same where it is exteriorly threaded, as indicated at 24ª, to receive a cap 25ª which in the main may be similar to the cap 25 of Fig. 1 and moreover, the stem 18ª where encircled by the hub 27ª may be toothed or serrated, as indicated at 26ª, similarly to the like parts of Fig. 1. Within the casing 1 is a hollow valve head 20ª having an internal chamber 21ª and an engaging end 22ª adapted to the valve seat 6 of the casing 1 about the port 5. The valve head 20ª is provided at the end remote from the engaging portion 22ª with a hollow extension 41 interiorly threaded for the reception of a threaded end 19ª of the stem 18ª. The valve head 20ª has an intermediate interior web 42 axially threaded for the passage of a threaded portion 43 of a stem 32ª which enters the stem 18ª and extends throughout the greater portion of the length thereof, this stem having at the end remote from the threaded portion 43 a notch 34ª for the reception of a manipulating tool and rendered accessible on the removal of the cap 25ª. The stem 32ª at the end adjacent the screw-threaded portion 43 carries, or has formed thereon a plug 35ª which may be similar to the plug 35 of Fig. 1 and performs the same function. The space inclosed by the skirt 9ª may be of non-circular cross-section and the portion 41 of the valve may conform to the interior of the skirt, so that the valve may be moved lengthwise without turning by a turning movement of the stem 18ª, the meshing of the threaded portion 19ª with the threaded portion 41 bringing this movement about. Where the stem 18ª enters the skirt 9ª it is formed with an exterior flange 44 bearing against a packing ring 45 lodged in the corresponding part of the bonnet, and this flange is maintained in contact with the packing ring by the expansive action of the spring 38. The stem of the plug 35ª is maintained in any adjusted relation to the valve 20ª by the threaded connection 43 and participates in all movements of the valve, the stem 32ª sliding lengthwise with the stem 18ª, so that the same result is brought about by the structure of Fig. 6 as is accomplished by the structure of Fig. 1, the principal differences being in the packing arrangements and the variations in structure caused by the changed packing. The plug 35ª may be in one piece with the stem 32ª or may be separate therefrom and connected thereto as indicated in Fig. 1.

What is claimed is:—

1. A radiator valve having a substantially cylindrical port with a flaring valve seat at one end, and a valve movable into and out of the valve seat for closing and opening the port, and an adjustable auxiliary calibrating plug carried by and movable with the valve and of substantially conoidal form, whereby the proportional amount of steam flowing through the port for different degrees of opening of the valve is substantially the same in any and all positions of adjustment of the calibrating plug with reference to the port controlling valve.

2. A radiator valve provided with a substantially cylindrical port with a flaring seat at one end and a controlling valve therefor movable into and out of the valve seat to close and open the port, said valve being provided with a calibrating plug participating in the movements of the valve and adjustable in the direction of the movements of the valve, said plug tapering in a direction away from the valve carrying it by progressively greater degrees and proportioned to regulate the effective size of the port for like extents of movement of the valve to the same degree for all the longitudinal adjustments of the plug with respect to the valve.

3. A radiator valve provided with a substantially cylindrical port with a flaring valve seat at one end, a valve movable into and out of the valve seat to close and open the port, and a substantially conoidal calibrating plug carried by the valve in telescoping relation thereto and movable with the valve to different degrees into and out of the port in accordance with the degree of telescoping of the plug in the valve, the conoidal form of the plug being such as to coact with the cylindrical port to provide the same proportionate opening of the port for any position of the valve irrespective of the effective size of the port as provided for by the telescoping movement of the calibrating plug into or out of the valve.

4. A radiator valve provided with a substantially cylindrical port and a valve member for opening and closing the port, an auxiliary calibrating plug of substantially conoidal form in telescoping relation to the valve member, and a stem for the plug carried by the valve member in the longitudinal center line thereof and in turn carrying the plug, said stem having a screw threaded connection with the valve member, and said stem being in shouldered relation to the valve member near one end of the stem and the plug being in shouldered relation to the valve member at the other end of the stem to provide stop means limiting the telescop-

ing movements of the plug in both directions.

5. A radiator valve provided with a substantially cylindrical port, a valve member for said port, and a substantially conoidal auxiliary calibrating plug carried by the valve member in telescoping relation thereto, said plug having means for its telescoping adjustment and provided with positive stop means for both limits of its telescoping movement.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

EDGAR C. WILEY.

Witnesses:
KATIE E. JENNINGS,
GRACE H. MAHOOD.