A. O'BRIEN.

AUTOMATIC VACUUM AIR VALVE.

APPLICATION FILED MAR. 20, 1909. RENEWED OCT. 10, 1910.

998,033. **Patented July 18, 1911.**

Fig. 1

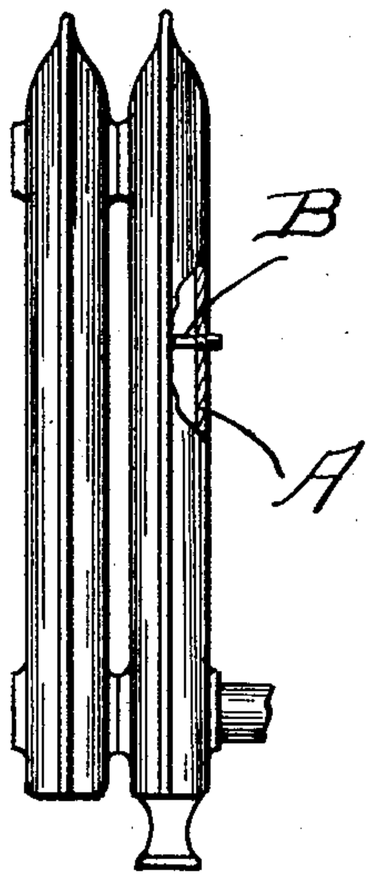


Fig. 3

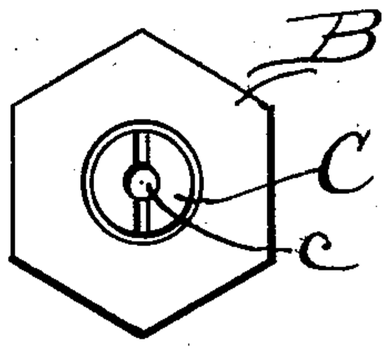


Fig. 2

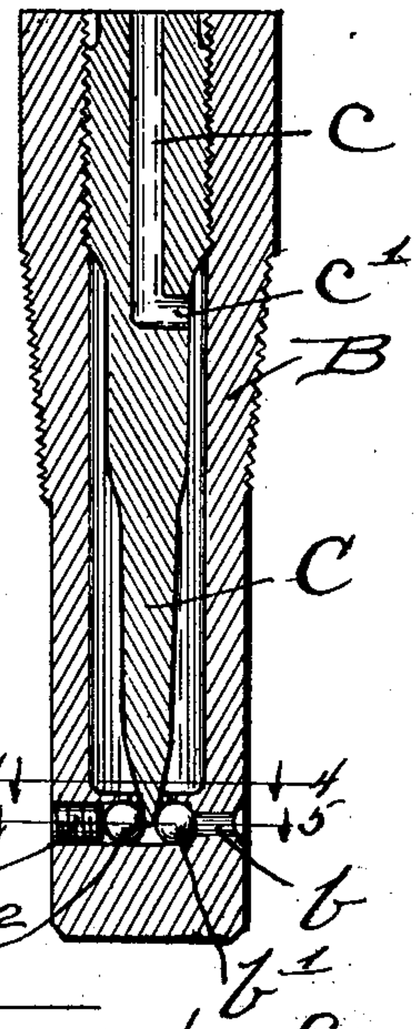


Fig. 4

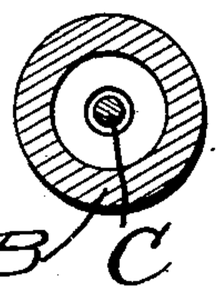


Fig. 5

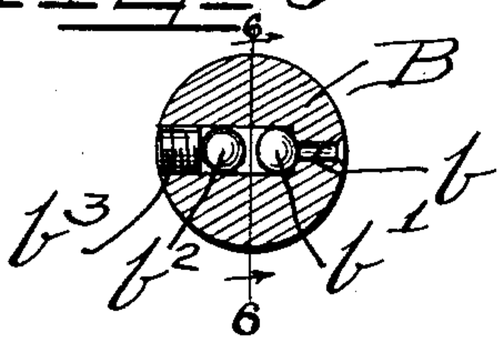


Fig. 6

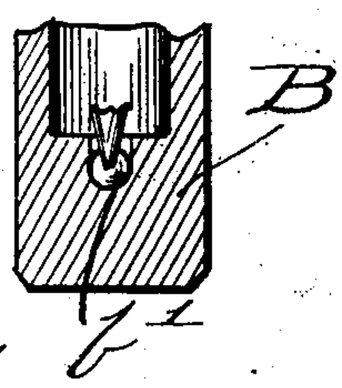


Fig. 7

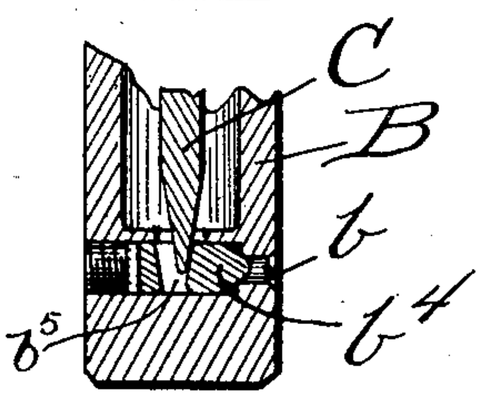
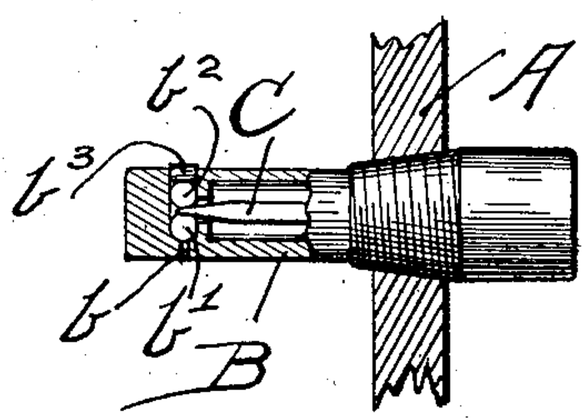


Fig. 8



Witnesses

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AUTOMATIC VACUUM AIR-VALVE.

998,033. Specification of Letters Patent. **Patented July 18, 1911.**

Application filed March 20, 1909, Serial No. 484,738. Renewed October 10, 1910. Serial No. 586,408.

To all whom it may concern:

Be it known that I, ARTHUR O'BRIEN, a citizen of the United States, and a resident of the city of Butte, in the county of Silverbow and State of Montana, have invented certain new and useful Improvements in Automatic Vacuum Air-Valves; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

In most of the steam heating plants in which radiators are employed a valve is used to permit the escape of air from the radiator as the pressure of steam is augmented. Usually such valves have been somewhat complicated and frequently afford an unbalanced construction comprising one or more vents in which the pressure of the steam itself is relied upon to close the valve after the escape of the air from the radiator. Such valves are expensive and usually short lived.

It is an object of this invention to afford a vacuum air valve adapted to maintain the vacuum in the system when the steam pressure falls and adapted to permit the ready escape of any chilled air or vapor from the system with increase of pressure and also adapted to seal the radiator to prevent the escape of steam when the steam pressure in the radiator has approximated normal.

It is a very important object of this invention to provide a valve of the class described in which the valve projects into the radiator so that any water which condenses in the valve will be evaporated or dissipated by the heat from the steam surrounding the valve.

It is further an important object of the invention to provide a device of the class described in which the valve seats by gravity as the pressure in the system falls to prevent admission of external air into the system.

It is also an object of the invention to afford an exceedingly cheap, simple and durable valve adapted to operate by the expansion of one or more of the parts thereof to entirely seal the radiator to prevent the escape of the steam when the radiator is hot, yet to freely permit the escape of air or vapor until approximately the normal heating condition of the radiator has been reached.

The invention consists in the matters hereinafter described and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 is a side elevation of a radiator broken away, showing a valve embodying my invention, installed. Fig. 2 is an enlarged central longitudinal section of the valve. Fig. 3 is an enlarged view in elevation of the outer end of the valve. Fig. 4 is a section taken on line 4—4 of Fig. 2. Fig. 5 is a section on line 5—5 of Fig. 2. Fig. 6 is a section on line 6—6 of Fig. 5. Fig. 7 is a section similar to Fig. 6, showing a slightly modified form of closure. Fig. 8 is an enlarged detail illustrating the position of the valve when engaged in place.

As shown in the drawings: A, indicates a steam radiator of the usual or any desired type in which is inserted the valve casing B, which at its inner end is of relatively small diameter and at its outer end is of larger size and is shaped to be engaged by a wrench or tool. Intermediate its ends the casing is threaded, as shown in Figs. 1 and 2, to permit of threaded engagement with the radiator, and as shown in Figs. 1 and 8, the casing projects for the greater part of its length within the radiator exposing the same directly to the steam. Said casing is bored from its outer end inwardly to afford a cylindric chamber and near its inner end said casing is transversely bored, as shown in Figs. 2 and 7, to afford a passage b, opening through said casing and in which is inserted the closure which, as shown in Fig. 2, comprises balls b'—b^2, desirably of metal that will not corrode or rust under the action of steam or water.

Threaded into the enlarged outer end of said transverse passage is a screw plug b^3 which serves as an adjustable limit for the upward movement of the ball b^2. Threaded into the interior passage or chamber in the casing B, is a tapered and pointed stem C, the point of which extends between the balls b'—b^2, and the outer end of which fits within the enlarged outer end of said casing to afford a relatively long thread therein. At its outer end said stem C, is shaped for engagement with a screw driver, wrench, or

other tool for adjusting the same in the casing. From its outer end inwardly said stem is provided with a vent passage c, which extends inwardly beyond the threaded portion of said stem and opens through the side thereof at c', as shown in Fig. 2. Said stem is preferably constructed of some metal such as copper, brass, or bronze or any material having a relatively high co-efficient of expansion and preferably a higher co-efficient of expansion than the casing B, though not necessarily so.

The operation is as follows: The valve casing is threaded in place in the radiator with the passage opening downwardly as shown in detail in Fig. 8. In adjusting the valve the stem C, is threaded inwardly when the radiator is under the normal degree of steam pressure until a very small quantity of steam or vapor first escapes through the passage in the stem. Owing to said stem being surrounded on all sides for nearly its entire length with steam, expansion occurs and a slight elongation of the stem is sufficient to force said point between the balls b'—b^2, jamming the lower ball into the passage b, and thus firmly holding the same against the pressure of the steam in the radiator. As long as the radiator remains hot the valve is maintained in closed position. When the temperature falls contraction of the stem takes place, thus readily permitting the escape of the cooled vapor or air from the radiator. When heat again begins to rise the stem expands again closing the valve when steam at the proper temperature reaches the stem.

Inasmuch as the passage b, is turned downwardly in the radiator, the ball b', seats by gravity to prevent the inflow of the air even though the stem had retracted by contraction. Inasmuch as the valve projects into the radiator and the steam surrounds the same, the valve being heated evaporates any water which may be in the valve.

Owing to the ball construction the pointed end of the stem can never be injured owing to the tendency of the balls to rotate under the pressure exerted between the same by the stem—in consequence said stem always exerts a rolling (but not deforming) pressure upon the balls. Consequently, a valve such as described is automatic and is practically indestructible.

The construction shown in Fig. 7 is substantially that before described with the exception that instead of balls being employed in the transverse passage in the inner end of the casing, a conical plug closure b^4, is used, the tapered end of which fits into the passage b, to close the same under the pressure of the stem C, when the latter elongates or expands from heating. As shown, a tapered aperture b^5 is provided in the plug b^4, to receive the tapered end of the stem, said aperture being sufficiently large as to prevent jamming the stem therein and being so positioned that the stem engages only on the side thereof adjacent the closure end of the plug.

Of course, various other modifications may be made in a valve such as described without departing from the principles of this invention. I have shown but one of several forms of an expansively acting vacuum valve for radiators, and therefore do not purpose limiting this application for patent otherwise than necessitated by the prior art.

I claim as my invention:

1. A casing adapted to be threaded into a radiator and having an interior central bore or passage opening outwardly and a transverse inner bore or passage communicating with the central bore, a movable closure in said transverse passage, and an expansible tapered stem threaded near its outer extremity in said casing and extending into engagement with the closure said stem having a passage opening from outside the radiator into the casing.

2. A vacuum radiator valve embracing a casing adapted to be threaded into the vent aperture in a radiator and having a cylindric axial bore at its outer end extending inwardly to near its inner end, said casing having a transverse passage extending therethrough adjacent the inner end of said bore, and opening centrally into the same, a movable closure in said transverse passage seating to close the same, a stem threaded in the outer end of the casing and extending inwardly to engage the closure wedgingly, said stem having a passage opening from outside the radiator into said casing, said stem being constructed of expansible material and acting to jam the closure into closing position when heated.

3. A casing embracing an axially bored, externally threaded shell and having a transverse aperture at the inner end thereof opening therethrough and communicating with the axial bore, two rounded or ball shaped bodies in said transverse passage, a tapered stem of expansible material threaded in the casing and extending between the balls, said stem having a passage therethrough opening from the outer end into the chamber in the casing, and a set screw engaged in one end of the transverse passage and adapted to regulate the movement of one of the balls.

4. A radiator valve embracing an axially bored casing or shell adapted to be threaded into the vent aperture in a radiator, said casing provided with a transverse passage therein communicating centrally in said axial bore, a movable closure in said transverse passage, a set screw extending into one side of the passage, and an inwardly tapering expansible stem threaded in the outer end of the casing and cored to afford a pas-

sage into the casing and acting by expansion to engage said closure and force the same into position to close the transverse passage.

5. A valve for radiators comprising a casing adapted to extend into the radiator to expose the same to heat within the radiator whereby all water of condensation in the casing is evaporated, said casing provided with a longitudinal bore and a transverse passage at the inner end thereof which communicates with the longitudinal bore, a valve in said transverse passage adapted to close the passage by air pressure from without the radiator, and an expansible stem threaded in the longitudinal bore adapted to expand and actuate the valve to close the passage when steam pressure in the radiator rises, said stem having a passage therein which affords communication between the bore of the casing and the atmosphere.

6. A vacuum valve for radiators comprising a casing having an internal bore threaded at its outer end and a passage extending transversely of the bore and communicating therewith and opening through the side of the casing, a stem threaded into the bore having a passage communicating with the bore in the casing and also communicating with the atmosphere, and the inner end of said stem extending into the transverse passage and a closure in the transverse passage adapted to automatically close the passage by atmospheric pressure when a vacuum is created in the radiator and adapted to be automatically actuated to close the passage by expansion of the stem when the steam pressure rises in the radiator.

7. A valve comprising a casing provided with an axial passage opening through one end and a transverse passage at one end opening through the side of the casing and communicating with the axial passage, a plurality of balls, one adapted by gravity to close the transverse passage and an expansible member between the balls adapted by expansion thereof to force one of the balls to seat to close the transverse passage against pressure and the other ball adapted for adjustment toward and from the stem to vary the pressure of the expansible stem on the ball that seats to close the passage.

8. A vacuum valve comprising a hollow casing open at one end, a tapered expansible member closing the end of the casing, said member having a passage opening through the end and through the side thereof into the hollow casing, said casing having a transverse passage which communicates with the passage in the expansible member and a member in the transverse passage adapted to close the last named passage by air pressure and by expansion of the member.

9. A vacuum valve comprising a casing having a transverse passage at one end opening through opposite sides, an adjustable plug screwed in one end of the passage, a valve seat in the casing around said passage, a plurality of members in the passage, one adapted to seat on said valve seat and the other acting as a stop and an expansible stem engaging between said members adapted by expansion thereof to force one of said members to seat to close the passage and said expansible member having a passage affording communication between the atmosphere and said transverse passage at all times.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

ARTHUR O'BRIEN.

Witnesses:
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