A. O'BRIEN.

RADIATOR AIR VALVE.

APPLICATION FILED JUNE 14, 1909.

992,039. **Patented May 9, 1911.**

Fig. 1

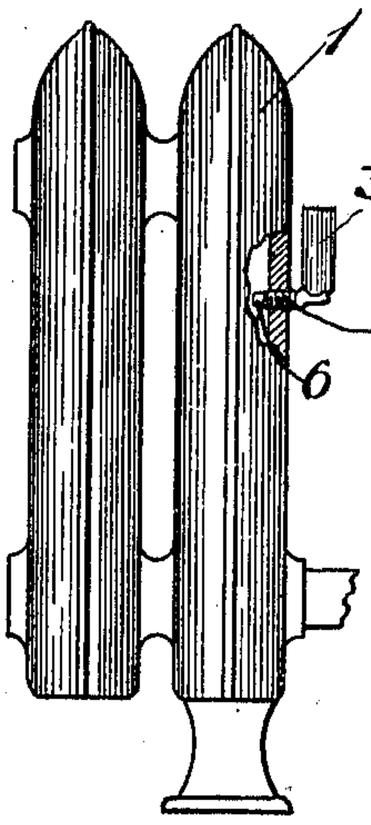


Fig. 2

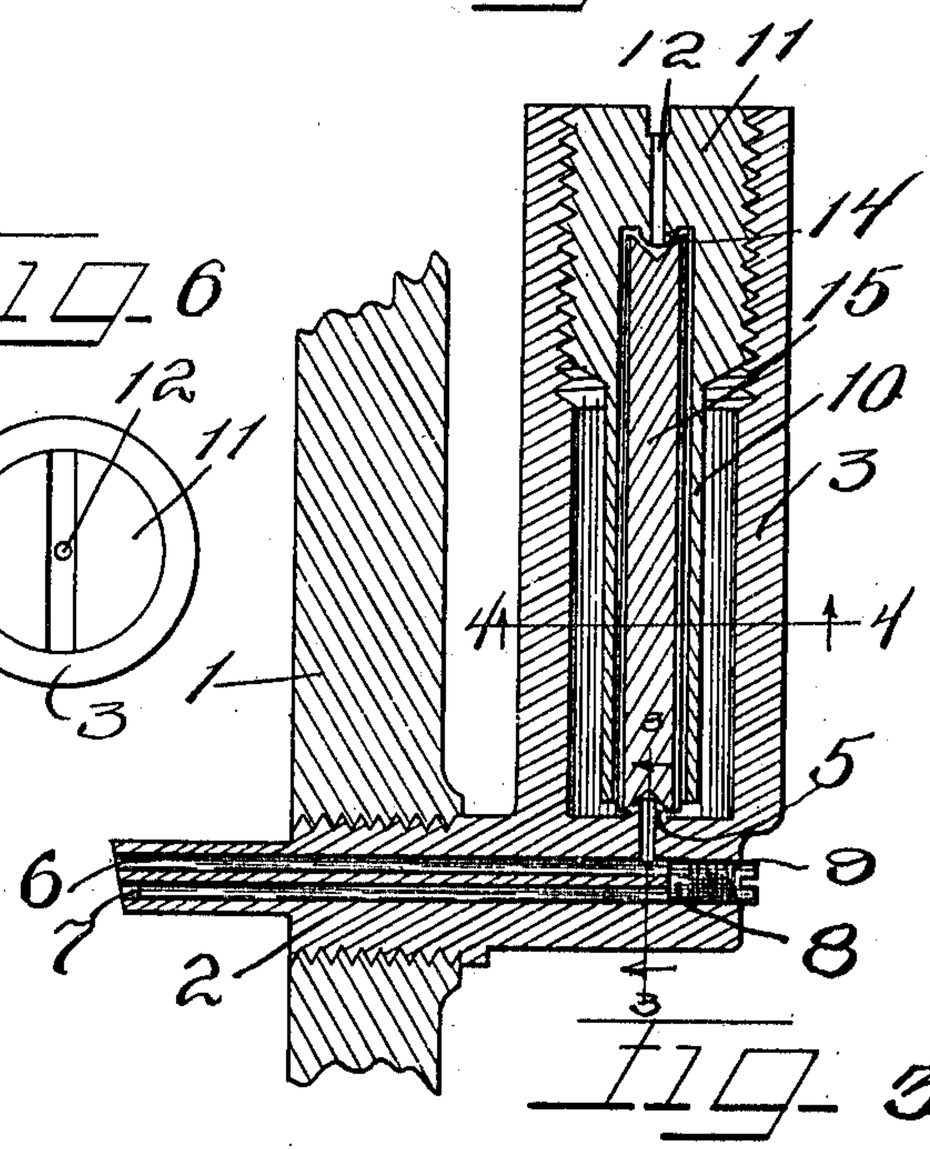


Fig. 6

Fig. 5

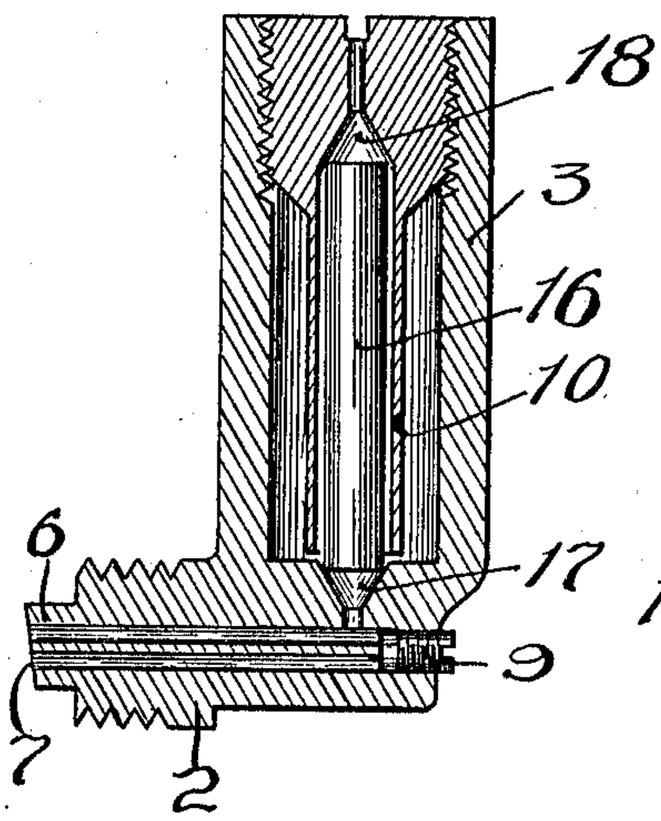


Fig. 4

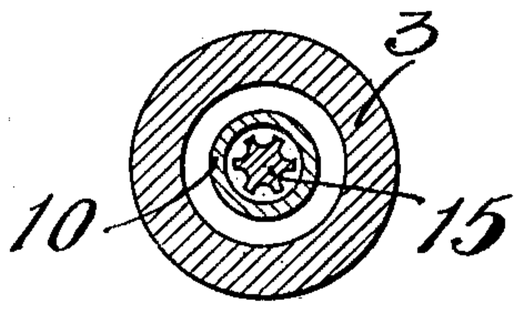
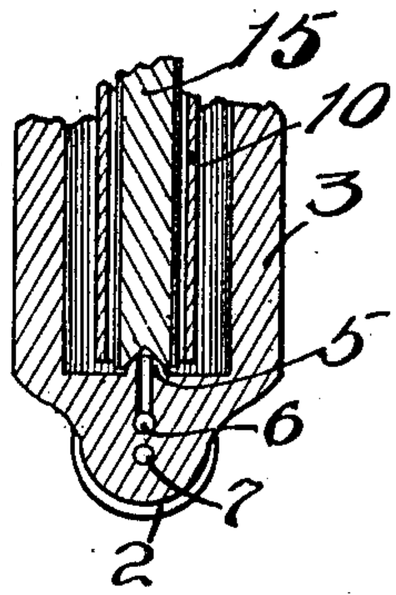


Fig. 3



Witnesses

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UNITED STATES PATENT OFFICE.

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RADIATOR AIR-VALVE.

992,039. Specification of Letters Patent. Patented May 9, 1911.

Application filed June 14, 1909. Serial No. 501,954.

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 Silver-bow and State of Montana, have invented certain new and useful Improvements in Radiator 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.

Many different types of air valves have been placed upon the market in the endeavor to permit the escape of air from the radiator automatically. While some of these permit the escape of air to a greater or less extent, the danger of the discharge of the water of condensation therethrough is great and with most of the devices intended for the purpose, it is a frequent occurrence, causing injury to carpets, floors and ceilings, owing to the drip of water therefrom. In many such constructions bells or floats are provided, which may, when the device is in perfect operation, serve to close the vent under pressure from water but which frequently become out of order through wear or held from operation by small accumulations of sediment or scale with the result before mentioned.

The object of this invention is to afford a valve for the purpose specified adapted to operate through (and wholly through) the contraction and expansion of metals so that with the fall of temperature in the radiator below a certain point the air valve will open automatically and will remain open until expanded by the rise of temperature in the radiator with the return of steam pressure, in this way insuring a free vent for the air from the radiator with very slight pressure holding the valve closed from inflowing air and acting automatically, when warm to wholly close the valve against whatsoever pressure.

It is also an object of the invention to afford a valve of the class described which positively seats through atmospheric pressure and remains seated under all conditions even independent of its expansion until raised by positive pressure from the radiator.

It is further an object of this invention to provide a valve in which the water of condensation automatically returns from the valve into the radiator and in which the water can under no circumstance be discharged outside of the valve upon the floor or carpet.

It is also an object of the invention to afford a construction affording the utmost ease and precision of adjustment, permitting the valve to be set to close at practically any desired temperature.

The invention embraces many novel features and 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 partly in section of a radiator equipped with an air valve embodying my invention. Fig. 2 is an enlarged vertical section of the air valve and a part of the radiator. Fig. 3 is a fragmentary section taken on line 3—3 of Fig. 2. Fig. 4 is a section on line 4—4 of Fig. 2. Fig. 5 is a section similar to Fig. 2, but illustrating a slightly modified construction. Fig. 6 is a top plan view of the air valve, with parts omitted.

As shown in the drawings: 1, indicates the radiator provided with a vent aperture as is usual, in which is threaded the stem 2, of the air valve, and which, as shown, is constructed of cast metal or any suitable material. Said stem extends horizontally from the radiator section, as shown in Figs. 1 and 2, and extends inwardly into the radiator coil, the inner end thereof being arranged obliquely downward and outwardly, as shown in Fig. 2. Integrally connected with said stem is the upwardly extending tubular barrel or shell 3, internally threaded near its upper end, preferably, the pitch of the thread being such as to afford a large number to the inch (even as high as twenty five threads to the inch) for precision of adjustment. In the bottom of said barrel or shell, as shown in Figs. 2 and 3, is a rounded or spherical convex boss 5, through which extends an aperture communicating with a passage 6, extending longitudinally the stem and into the radiator. Below said passage, as shown, is a corresponding passage 7, parallel therewith, and as shown, said passages communicate at the outer end of the stem in a chamber 8, in which is threaded a screw 9, which acts to regulate the size of said chamber thereby enabling the vent to be effected wholly through the upper passage 6, or partly through both

passages, and which admits of regulating the amount of vent permitted through the lower passage.

Threaded in the top of the barrel or shell is a sleeve 10, which extends to near the bottom of said barrel as shown in Figs. 2 and 5, and which is of much smaller diameter than the interior diameter of said barrel. At its upper end said sleeve is connected in an integral head 11, threaded complementally with the threads in said barrel and provided with a central vent aperture 12, the bottom of said sleeve terminating in the upper end thereof in a boss 14, corresponding with the boss 5, before described and through the center of which the bore 12, opens. Loosely held in said sleeve 10, is an expansion rod 15, the ends of which are concave with a smaller radius than the curvature of the boss 5, or 14, so that said rod seats on said bosses at its ends with its comparatively sharp periphery only.

The operation is as follows: In assembling the device the stem is threaded into the vent aperture in the radiator as is usual, with the barrel directed upwardly. The sleeve with the expansion rod 15, therein is then inserted in the barrel and threaded inwardly to nearly close upon the expansion rod, but to afford sufficient space dependent upon the character of the metal used in said rod to permit said rod lifting with pressure from within the radiator sufficiently to permit the escape of air from the radiator, but sufficiently closed so that warm water or steam will cause sufficient expansion for the rod to seat on both bosses simultaneously thus entirely closing the vent. Of course, the rate of flow from the vent may be regulated by the adjustment of the sleeve inwardly, the end thereof being provided with a slot to permit of engagement by a screw driver and also by the adjustment of the screw 9, which, if adjusted to its inward limit, necessitates the entire venting of the radiator through the passage 6. The adjustment outwardly of said screw, however, permits an increasingly greater vent through the passage 7, so that with the adjustment shown in Fig. 2, the vent is effected in part through both passages. As shown, the inner end of the stem is cut obliquely downwardly and outwardly. This tends to prevent water of condensation flowing over the end of the stem to be carried into the passages by the flow of air thereinto. Of course, it is evident that instead of the bosses shown in the sleeve and in the bottom of the barrel concentric with the vent passages, the construction may be substantially reversed and for this purpose a concave or tapered seat may be provided for the expansion rod 16, both in the barrel, as shown at 17, and in the sleeve as shown at 18, and the ends of the expansion rod may be shaped in any suitable manner to afford a comparatively sharp edge or periphery to close therein.

The operation, of course, with either construction is the same. Of course, the expansion rod may be a plain, cylindric rod, if desired, though preferably to afford the utmost freedom in venting said expansion rod is fluted longitudinally. This also serves an exceedingly important purpose, inasmuch as it enormously increases the surface of said rod exposed to the action of heat and in consequence insures said rod heating through and through almost instantly to the temperature of the passing fluid thus positively insuring the quick seating of the expansion rod to entirely close the vent with the rise of temperature. In either construction upon the accumulation of water of condensation in the valve said water returns through the passage into the passage in the stem and is adapted to flow through either passage in the stem back into the radiator and under no circumstances can the water be forced by the pressure out of passage 12, in the plug as this passage is either closed by expansion of the stem 15 or 16 or else if the pressure is sufficient to force the water out of said passage said pressure forces the stem against the upper seat and thereby prevents the water being discharged into the room.

Of course, details of the construction may be varied, and I have not attempted to show more than one simple embodiment of my invention. I am aware that the invention is capable of embodiment in many different ways without departing from the principles thereof, and may be useful for many different purposes other than for the purpose herein set forth. I therefore do not purpose limiting this application for patent otherwise than necessitated by the prior art.

I claim as my invention:

1. A thermally operated valve embracing a stem having a chamber at one end and a plurality of passages extending from the opposite end of the stem to the chamber, means for varying the size of the chamber, a barrel integral with said stem and having an inlet aperture from one of the passages, an adjustable head or plug in the barrel having an outlet aperture, a seat provided at the inner end of each aperture, an expansion rod loosely supported between said seats to close both apertures when expanded by heat, and to close the lower aperture when cold.

2. A valve of the class described embracing a stem having a chamber at one end and a plurality of passages extending from the opposite end of the stem to the chamber, means for varying the size of the chamber, a barrel integral with said stem and having

a passage opening into one of the passages in the stem, a plug or head in said barrel having a central discharge passage opening therefrom, seats surrounding each of said passages in said barrel, an expansion rod loosely supported to close on either seat when cold and to close positively on both seats when warm and means for regulating the adjustment of said seats relative to each other.

3. A radiator valve embracing a stem having a chamber at one end and a plurality of longitudinal passages opening from the chamber and extending through the stem, adjustable means in said chamber for regulating the size thereof, an integral barrel supported in upright position on said stem and having a central port opening thereinto from one end of said longitudinal passages, a plug or head threaded into the outer end of the barrel to afford a fine adjustment, an outlet passage opening centrally therethrough, spherically convex, inwardly facing bosses one on the lower end of said plug and another in the bottom of the barrel, said outlet passage opening centrally through the boss on the lower end of the plug, a thermal expansion rod having concave ends to seat on said bosses and a sleeve integral with said head and serving as a guide for the expansion rod.

4. An air valve for radiators embracing in combination with the vent valve a stem therefor adapted to be threaded into the radiator, a chamber in said stem, a plurality of passages leading to the chamber from the radiator and adjustable means for regulating the size of the chamber.

5. A vent valve embracing a stem having a chamber at one end and passages extending through the stem and communicating with the chamber, a barrel integral with the stem and extending upwardly and ported centrally to communicate with but one of said passages, a plug or head adjustably secured in the upper end of the barrel and having a central vent passage therethrough, a valve seat surrounding each of said passages in the barrel, a shell or sleeve extending downwardly from the plug to near the bottom of the barrel, and an expansion rod in said shell having its ends shaped to close on said seats and fluted longitudinally to increase surface.

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

ARTHUR O'BRIEN.

Witnesses:
ALF C. KREMER,
WILLIAM M. KIRKPATRICK.