May 13, 1924. 1,494,026

J. E. SAMUELSON

RADIATOR VENT VALVE

Filed April 7, 1923

Fig. 1

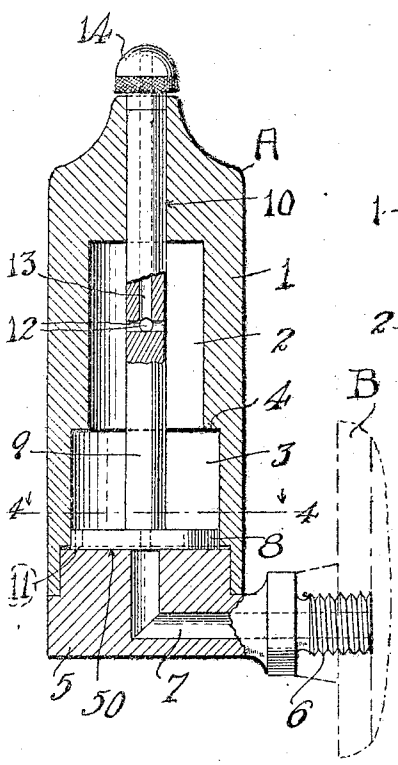


Fig. 2

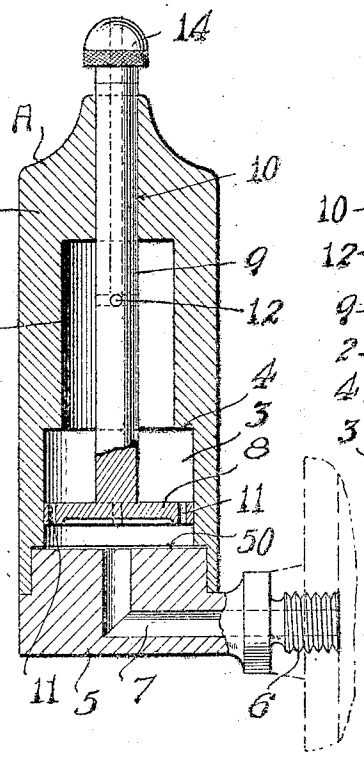


Fig. 3

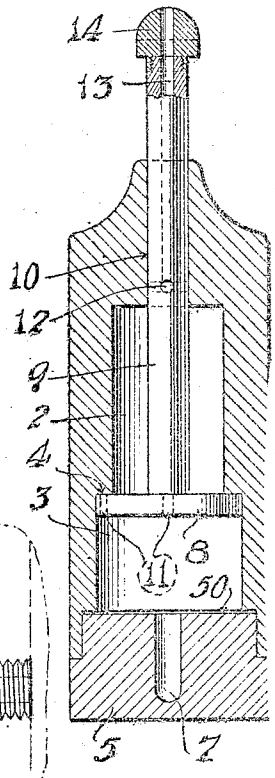
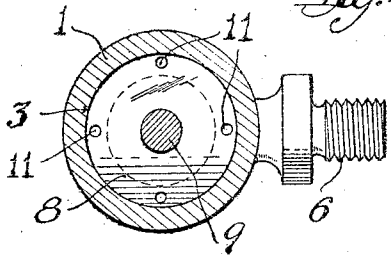


Fig. 4



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UNITED STATES PATENT OFFICE.

JOHN E. SAMUELSON, OF BLOOMFIELD, NEW JERSEY.

RADIATOR VENT VALVE.

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To all whom it may concern:

Be it known that I, JOHN E. SAMUELSON, a citizen of the United States, and a resident of Bloomfield, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Radiator Vent Valves, of which the following is a specification.

This invention relates to a valve for permitting the escape of air from a steam heating system as the pressure of the steam increases to prevent the radiator from becoming air-bound and to allow the steam to enter and thoroughly heat the radiator. Further the invention relates to such a valve which also prevents air from entering a radiator when the steam pressure falls below atmospheric pressure, for instance at night, thereby ensuring rapid circulation of the steam through the system as the pressure rises, for instance in the morning.

The primary object of my invention is to provide a valve of the character described embodying novel features of construction and operating in accordance with the varying pressures in the radiator to permit air to gradually escape from a radiator as the pressure in the radiator rises above atmospheric pressure and preventing air from entering the radiator when the pressure therein is at or below atmospheric pressure.

Another object is to provide such a valve including a cylinder or casing adapted to be connected to a radiator with one end communicating with the interior of the radiator, and a piston reciprocable in said cylinder and formed with a rod slidably mounted in and projecting from the other end of said cylinder, said piston being formed with transverse ports or openings communicating with said cylinder at opposite sides of the piston and said rod being formed with a port or opening communicating with the end of said cylinder opposite that connected to the radiator and the atmosphere, said cylinder being also formed with valve seats cooperating with said ports, said ports being so constructed and arranged as to cause movement of said piston and thereby cooperation of said ports and seats to permit the escape of air and prevent the escape of steam from the radiator and to prevent the entering of air into the radiator.

Further objects are to provide a novel and improved radiator vent valve which is simple and inexpensive in construction, which will not easily get out of repair and which is dependable in operation; and to obtain other results and advantages as may be brought out by the following description.

Referring to the accompanying drawings in which like numerals of reference indicate the same parts throughout the several views,

Figure 1 is a vertical longitudinal sectional view through a valve embodying my invention, showing the piston in position to prevent air from entering a radiator;

Figure 2 is a similar view showing the piston in position to permit the escape of air from the radiator;

Figure 3 is a vertical longitudinal sectional view showing the piston in position to prevent the escape of steam from the radiator, and

Figure 4 is a horizontal sectional view through the valve taken on the line 4—4 of Fig. 1.

In the specific embodiment of the invention shown on the drawings the reference character A designates a casing or cylinder of the valve which is preferably formed with a body portion 1 having two co-axial internal bores 2 and 3 of different diameters which provide between them an annular shoulder or seat 4. A base 5 is fitted into the outer end of the bore 3 of the casing 1 to close the same, said base being provided with a laterally projecting screw threaded nipple 6 for connecting the valve to a radiator or the like B. A passage 7 is provided through the nipple 6 and base 5 to permit the flow of air from the radiator into the bore 3 of the casing or cylinder.

A piston 8 is slidably mounted in the bore 3 and carries a piston rod 9 slidably mounted in an opening 10 in the end of the casing A opposite the base 5 and projecting outwardly from the said end of the casing. The inner end of the base 5 is preferably flat as shown, and the piston 8 is reciprocable between said end of the base and the shoulder 4. The said piston is formed with a plurality of circumferentially arranged transverse openings 11 so positioned that when the piston is in engagement with the seat 4 the said openings are closed by said seat. The piston rod 9 is provided with a plurality of transverse openings 12 which communicate with a longitudinal opening 13

which opens through the outer end of the rod into the atmosphere. The total capacity of the openings 11 is considerably smaller than the capacity of the passage 7 while the capacity of the passage 13 is considerably less than the capacity of the chamber above the piston and greater than the capacity of the openings 11. The outer end of the rod 9 has preferably threaded thereon a cap 14 for actuation of the rod and for ornamentation.

In the operation of the valve with the same in position on a radiator with the casing A substantially vertical, and assuming the pressure in the radiator below that of the atmosphere, the piston 8 is seated on the inner end 50 of the base 5 so as to close the openings 11 and prevent communication between the chambers 2 and 3 and the passage 7. As the pressure in the radiator rises, for instance due to starting the heating system, air is forced from the radiator through the passage 7 beneath the piston 8 by the incoming steam. The said air being of a higher pressure than atmospheric pressure above the piston raises the piston 8 from the seat 50 and permits the air to escape from the radiator through the openings 11 into the chamber 2 and from there through the openings 12 and passage 13 into the atmosphere. During the said operation of the valve the chamber 2 above the piston is constantly filled with air passing from the radiator through the openings 11, the pressure of which is less than the pressure below the piston due to the restricted size of said openings 11 and the outlet provided by the passage 13 so that the piston 8 is caused to slowly and gradually rise. As the pressure in the radiator increases due to a rise in pressure of the steam, the piston 8 continues to rise in the chamber 3 against the resistance of the air above the piston. the speed and extent of movement of the piston being determined by the pressure in the radiator B. The relative sizes of the openings 11, the chambers 2 and 3 and the outlet passage 13 and the weight of the piston 8 are such that when the radiator becomes filled with steam the piston 8 is forced into engagement with the seat 4, thereby closing the openings 11 and preventing steam from escaping from the radiator into the chamber 2 and the atmosphere. The openings 12 of the piston rod are preferably so positioned with relation to the piston 8 and the seat 4 that they enter the opening 10 before the piston 8 engages the seat 4 so that the air from the chamber 2 must then leak through the opening 10 around the piston rod into the opening 12, whereby movement of the piston is further retarded to ensure that all air in the radiator escapes into the atmosphere. With this construction it will be observed that the piston 8 moves toward the seat 4 gradually and in accordance with the variations in pressure in the radiator, and that all the air in the radiator regardless of the amount is permitted to escape without the escape of steam.

When the pressure in the radiator falls below atmospheric pressure, the air entering the chamber 2 through the passage 13 forces the piston 8 against the seat 50, thereby preventing air from entering the radiator and permitting a partial vacuum to be produced in the heating system whereby the distribution of steam through the system on the next rise in pressure of the steam is greatly facilitated.

While I have shown and described a valve embodying certain details of construction which are the best now known to me, it will be understood that this is mainly for the purpose of illustrating the principles of the invention and that many modifications and changes can be made in the construction of the valve without departing from the spirit or scope of the invention. Therefore, I do not desire to be understood as limiting myself except as required by the following claims when construed in the light of the prior art.

Having thus described the invention, what I claim is:

1. A valve of the character described comprising a relatively slidable piston and cylinder, said cylinder having an inlet at one side of said piston and an outlet at the other side thereof, said piston being provided with a port communicating with said cylinder at opposite sides of said piston and said cylinder being provided with a seat adapted to close said port upon engagement of said piston with said seat, said port being of less capacity than said inlet and said outlet, and said outlet being of a capacity substantially smaller than that of said cylinder at the outlet side of said piston, whereby a difference in fluid pressure may be maintained at opposite sides of said piston to cause a gradual relative movement of said piston and said cylinder in either direction in accordance with the greater pressure.

2. A valve of the character described including a casing provided with a chamber having an inlet and an outlet, a piston slidable in said chamber between said inlet and said outlet and formed with a port communicating with both said inlet and said outlet and of a capacity smaller than said inlet and said outlet, said chamber being formed intermediate said piston and said outlet with a seat adapted to close said port in the piston upon engagement of said piston with said seat, and said outlet being of a capacity substantially smaller than that of said chamber at the outlet side of said piston, whereby a difference in fluid pressure may be maintained at opposite sides

of said piston to cause the piston to gradually move in either direction in accordance with the greater pressure.

3. A valve of the character described comprising a relatively slidable piston and cylinder, said cylinder having an inlet at one side of said piston and an outlet at the other side thereof, said piston being provided with a port communicating with said cylinder at opposite sides of said piston and of less capacity than said inlet and said outlet, said outlet being of a capacity substantially smaller than that of said cylinder at the outlet side of said piston, whereby a difference in fluid pressure may be maintained at opposite sides of said piston to cause a gradual relative movement of said piston and said cylinder in either direction in accordance with the greater pressure, and means for closing said port when said cylinder and said piston reach a predetermined relative position.

4. A valve of the character described comprising a relatively slidable piston and cylinder, said cylinder having an inlet at one side of said piston and an outlet at the other side thereof, said piston being provided with a port communicating with said cylinder at opposite sides of said piston and said cylinder being provided with seats one between said piston and said inlet and the other between said piston and said outlet, said seats being adapted to close said ports upon engagement of said piston with said seats, said port being of less capacity than said inlet and said outlet, and said outlet being of a capacity substantially smaller than that of said cylinder at the outlet side of said piston, whereby a difference in fluid pressure may be maintained at opposite sides of said piston to cause a gradual relative movement of said piston and said cylinder in either direction in accordance with the greater pressure.

5. A valve of the character described comprising a casing provided with a chamber having an inlet at one end and an opening at the other end, a piston slidable in said chamber and formed with a piston rod slidable in said opening, said rod having a passage communicating with the atmosphere and with the side of said piston opposite said inlet to form an outlet, said piston being provided with a port communicating with said chamber at both sides of said piston, and said chamber being formed with a seat adapted to be engaged by said piston to close said port.

6. A valve of the character described comprising a casing provided with a chamber having an inlet at one end and an opening at the other end, a piston slidable in said chamber and formed with a piston rod slidable in said opening, said rod having a passage communicating with the atmosphere and with the side of said piston opposite said inlet to form an outlet, said piston being provided with a port communicating with said chamber at both sides of said piston, and said chamber being formed with seats one at each side of said piston adapted to be engaged by said piston to close said port.

7. A valve of the character described comprising a casing provided with a chamber having an inlet at one end and an opening at the other end, a piston slidable in said chamber and formed with a piston rod slidable in said opening, said rod having a passage communicating with the atmosphere and with the side of said piston opposite said inlet to form an outlet, said piston being provided with a port communicating with said chamber at both sides of said piston, and said chamber being formed with seats one at each side of said piston adapted to be engaged by said piston to close said port, said outlet passage in said piston rod being so positioned relative to said piston and the one of said seats opposite said inlet that said passage is restricted before engagement of said piston with said last-mentioned seat.

8. A valve of the character described comprising a casing provided with a chamber having an inlet at one end and an opening at the other end, a piston slidable in said chamber and formed with a piston rod slidable in said opening, said rod having a transverse passage adapted to communicate with said chambers at the side of said piston opposite said inlet and also having a longitudinal passage communicating with said transverse passage and the atmosphere to form an outlet, said piston being provided with a port communicating with said chamber at both sides of said piston and said chamber being formed with seats one at each side of said piston to be engaged thereby to close said port, said transverse passage of the piston rod being so positioned relative to said piston and the one of said seats at the corresponding side of said piston that said passage enters said opening in the casing before said piston engages said last-mentioned seat.

9. A valve of the character described comprising a relatively slidable piston and cylinder, said cylinder having an inlet at one side of said piston and an outlet at the other side thereof, said piston being provided with a port communicating with said cylinder at opposite sides of said piston, means for closing said port when said cylinder and said piston reach a predetermined relative position, and means for restricting said outlet before said piston and cylinder reach said predetermined relative position.

JOHN E. SAMUELSON.