(No Model.)

W. TODD.

AIR VALVE FOR STEAM RADIATORS.

No. 430,448. Patented June 17, 1890.

Fig. 1.

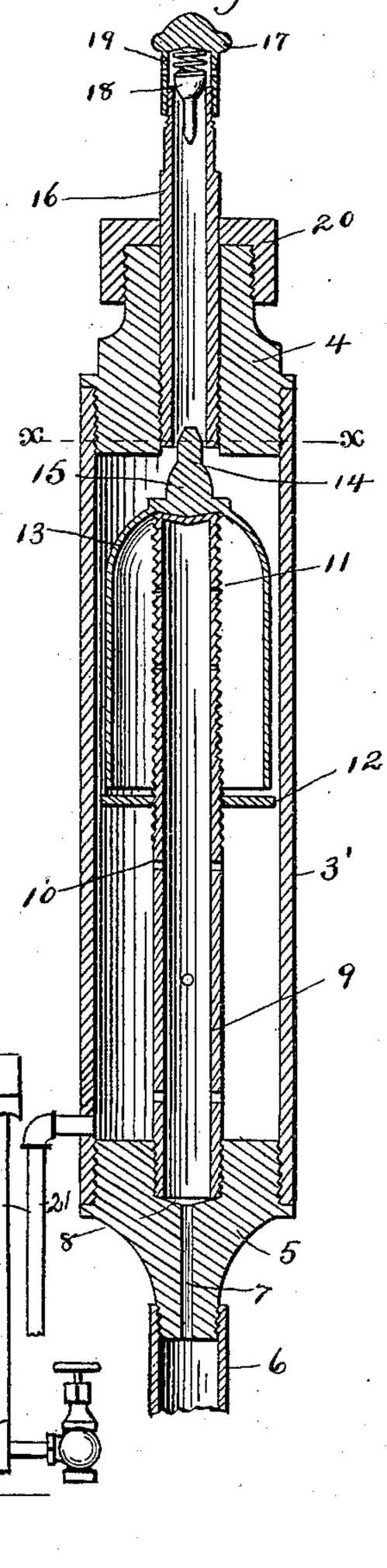

Fig. 2.

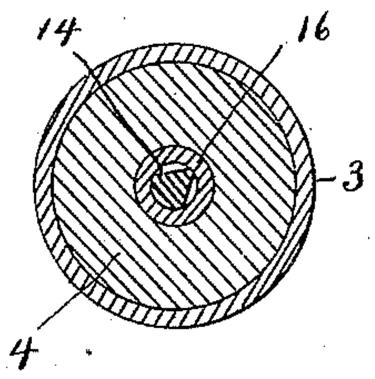

Fig. 3.

Fig. 4.

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AIR-VALVE FOR STEAM-RADIATORS.

SPECIFICATION forming part of Letters Patent No. 430,448, dated June 17, 1890.

Application filed June 1, 1889. Serial No. 312,863. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM TODD, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Air-Valves for Steam-Radiators, &c., of which the following is a specification.

My invention has reference to means whereby the air is permitted to escape from the radiators and pipes of a steam-heating system when the steam is let into the same.

The object of the invention is to devise an air-valve for attachment to radiators, for the purpose stated, which will close automatically to prevent the escape of steam or water therefrom after the air has been driven out of the pipes and radiators by the influx of steam.

My invention accordingly consists of an automatically-operating air-valve constructed as hereinafter described, which is organized to close by the admission thereto of either water or steam, the particular features of novelty for which protection by Letters Patent is desired being specified in the claims at the end of this specification.

To enable those interested in devices of this nature to make and use my improved air-valve, I will now describe its construction and operation in connection with the accompanying drawings, which form a part of this specification, and wherein like parts are indicated by like figures of reference in the several views, and wherein—

Figure 1 is a central vertical section of my air-valve. Fig. 2 is a cross-section on the line *x x* of Fig. 1. Fig. 3 is a fragmentary view showing certain modifications of the lower part of the valve-chamber. Fig. 4 is an elevation of a steam-radiator having my air-valve attached thereto.

Referring to the drawings, 3′ indicates the valve-chamber of any desirable dimensions and made, preferably, of cast-iron. The top of chamber 3′ is closed by screw-threaded plug 4, and its bottom, in the construction shown in Fig. 1, by screw-threaded plug 5. The lower end of the plug 5 is provided with screw-threads to permit the attachment of a short section of pipe 6, by means whereof the valve may be connected, for example, to a radiator, and said plug is also provided with a central passage 7 and a chamber 8 with screw-threaded walls for receiving the screw-threaded lower end of brass tube 9. The passage 7 permits the entrance of water or steam into tube 9. Brass tube 9 is provided with holes of two sizes 10 and 11, the larger holes being below the washer 12, which is adjustable within certain limits (for the purpose presently explained) on the screw-threaded portion of the tube 9, as indicated.

On the top of tube 9 is loosely supported in an inverted position the light metallic bucket 13, provided centrally on its bottom with a projection 14, as shown, which in cross-section is triangular above its seating-surface 15, (see Fig. 2,) and which serves as a valve to close the lower end of the air-discharge tube 16 when the inverted bucket 13 is raised by the pressure of water, for example, on the air-cushion within said bucket. The triangular portion of projection 14 is normally within the bore of tube 16, as shown in the drawings; but by reason of its shape the air within the radiator system readily passes into tube 16 when driven to that point by the advancing water or steam, the tube 16 remaining open for the discharge of the air until closed by the elevation of the bucket, as before stated. The projection 14 also serves as a guide for the bucket, as is obvious. The tube 16 (which is screw-threaded exteriorly at its lower end) is, as shown, screwed centrally within plug 4, and as the bore of said plug is likewise screw-threaded the distance between the lower end of said tube and the seating-surface 15 of valve 14 will be governed by the distance-tube 16 is screwed into the plug. By this means an accurate adjustment of these parts is easily effected.

At the top of tube 16 there is shown a pressure-regulating appliance consisting of perforated casing 17, valve 18, and spring 19. This appliance serves to prevent the inverted bucket 13 from rising to close the lower end of tube 16 before the air is expelled from the valve-chamber. The action of valve 18 is intermittent and maintains a sufficient compression of air to restore equillibrium of bucket 13 when disturbed in use under high pressure, thus allowing the pressure to become equalized on all sides thereof. By suit-

ably adjusting or setting the pressure-regulating appliance—the screw-threaded connection of casing 17 with the top of tube 16 permitting that to be done—the valve 14 is held in suspension by the equalization of the pressure on all sides of the same. Under ordinary low pressure the weight of the bucket would be sufficient to overcome the pressure on the radiator and use of valve 18 would not be necessary. Under high pressure, however, it is desirable to use said valve. In the operation of this feature of my air-valve the air from the steam-heating system passes by the washer or guide 12 to the top of inverted bucket 13, and if its pressure is sufficient and the pressure-regulating appliance is screwed down to weight its valve 18 sufficiently, the bucket 13 will be held in suspension and valve 14 prevented from seating (due to the air-pressure on top of said inverted bucket) until the steam affects tube 9 to lift the bucket, or the said bucket is lifted by the water accumulated in the valve-chamber. The nut 20 on the top of plug 4 is for the purpose of packing the stem or tube 16.

At the bottom of valve-chamber 3′, above plug 5, Fig. 1, there is arranged a return-pipe 21 to carry off the water from said valve-chamber. Pipe 21 may connect with the radiator pipe or tube to which the air-valve is attached, or, if preferred, said pipe 21 may be connected with the return-pipe of the radiator. Under either plan the steam will circulate directly through the valve-chamber 3′ the same as it circulates through the radiator-coils, and I entirely dispense with the drip-tube commonly employed with radiator air-valves.

In Fig. 3 the plug 5 is dispensed with, and the lower end of valve-chamber 3′ is made, as shown, with a solid bottom having a chamber 8, to receive brass tube 9, and a passage 7.

Instead of connecting the return-pipe 21 on the outside of valve-chamber 3′, as in Fig. 1, I make it, in this instance, through the bottom of said chamber, as indicated. In this construction, Fig. 3, when the air-valve is connected to the radiator, as 22, there is no need of any outside connection for the return-pipe 21 of the air-valve.

The washer 12, which is also a guide and support for tube 9, may be adjusted on tube 9, so as to regulate the extent of opening between the washer and the open mouth of the bucket 13, and thus prevent too rapid entrance of air to the bucket and the possibility of premature elevation of the latter. One of the functions of washer 12, however, is to serve as a shield to prevent the pressure beneath it from prematurely affecting the bucket 13. The influx of steam will drive the water and air before it, and as the air enters the valve-chamber through passage 7 it carries more or less of the water with it. If there be considerable water driven into the valve-chamber 3′, the influx of the steam will have a tendency to force said water upward within said chamber in contact with the washer 12, which washer will prevent the water from suddenly raising the bucket. The bucket 13 is more sensitive in its operation than a solid float would be, and, besides, it cannot become "water-logged," as it would if solid.

In the operation of my invention, when steam is turned into the system and advances toward the radiators it drives before it the air and more or less of the water that may be in the pipes and forces the same into the air-valves. The water and air enter tube 9 through passage 7 and pass into the valve-chamber 3′ through the larger holes 10 in said tube. The water, as it rises within valve-chamber 3′, comes in contact with washer 12, whose diameter is but slightly less than the internal diameter of the valve-chamber 3′. The air, however, rises within the valve-chamber between the rim of the washer and walls of the chamber, and is discharged through tube 16, as already explained. A comparatively small amount of water will be discharged within the inverted bucket 13 through the small holes 11 made in tube 9. When a sufficient quantity of water is forced into the valve-chamber to cause it to rise high enough to exert a pressure on the air-cushion within the inverted bucket, said bucket will be forced up and thus close the air-outlet tube 16, and thus effectually prevent the escape of water through said tube 16 and likewise prevent the escape of any steam therethrough. The tube 9 being of metal, easily affected by heat, it is obvious that as soon as the steam has entered valve-chamber 3′—and this it does with the driving out of the water and air from the system (and continues to circulate through the valve, as hereinbefore indicated)—said tube will expand and thereby maintain seat 15 of projection 14 of said bucket against its seat at the lower end of air-tube 16. It is plain, of course, that if the amount of water within the pipes and radiator-coils should not be sufficient to raise the bucket, as explained, the influx of steam within the valve-chamber 3′ would produce an expansion of tube 9, and consequently close air-tube 16, so as to prevent the discharge of steam through tube 16 after the expulsion of the air. It is understood that when the steam is turned off from the system the tube 9 will contract and the parts will be restored to their normal condition, as shown in the drawings.

In Fig. 4 I show a steam-radiator having my air-valve attached thereto. The valve is secured to the radiator-tube and the return-pipe 21 is shown in full lines passing from the bottom of the valve-chamber (see Fig. 1) and entering the same radiator-tube below the point of connection of the air-valve to said tube. In dotted lines I have shown said return-pipe 21 connected to the return-pipe of the radiator.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an air-valve for steam-radiators, &c., the combination, with a valve-chamber provided with an inlet-passage and a water-outlet passage and with air-discharge tube, of a perforated tube arranged vertically within the valve-chamber and in communication with said inlet-passage, and an inverted bucket supported loosely on the upper end of said perforated tube and provided with a projection on its bottom serving to close the air-discharge tube when the bucket is lifted by the rising of the water in the valve-chamber or by the expansion of the perforated tube upon the admission of steam thereto, substantially as set forth.

2. In an air-valve, the combination, with a valve-chamber provided with inlet, water-discharge, and air-discharge passages, and a tube arranged vertically within said valve-chamber and provided with perforations of two sizes, and with a washer adjustable on said tube between the two sets of perforations, of a bucket supported loosely in an inverted position on the top of said vertical tube and serving to close the air-discharge tube, substantially as set forth.

3. In an air-valve, the combination, with a valve-chamber provided with inlet and water-discharge passages at one end and with a plug at the opposite end having a screw-threaded passage, of a perforated tube arranged vertically within the valve-chamber, a bucket supported loosely in an inverted position on the top of said tube and provided on its bottom with a valve, and an air-discharge tube screw-threaded exteriorly and arranged and adjustable within the screw-threaded passage of the above-mentioned plug, substantially as and for the purpose set forth.

4. In an air-valve, the combination, with valve-chamber 3′, provided with inlet and water-discharge passages at one end and with a perforated plug 4 at the opposite end, of a tube 9, readily expansible under the influence of heat, arranged vertically within the valve-chamber, and provided with perforations of two sizes 10 and 11, and with an adjustable washer 12, an air-discharge tube 16, adjustable within the perforated plug 4, and provided with a pressure-regulating device at its outer end, and a bucket loosely supported in an inverted position on the top of tube 9, and provided with valve 15 and projection 14 on its bottom, the latter triangular in cross-section and normally extending into the air-discharge tube 16, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 17th day of April, A. D. 1889.

WILLIAM TODD.

Witnesses:
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J. E. M. BOWEN.