C. A. DUNHAM.

AIR VALVE.

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1,048,508. Patented Dec. 31, 1912.

Fig. 1.

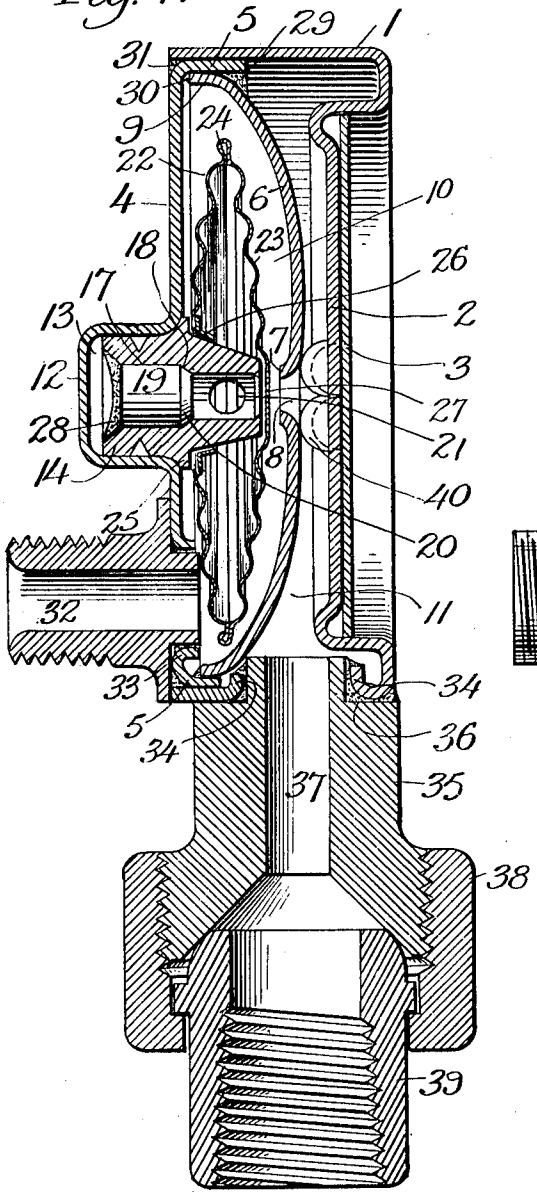
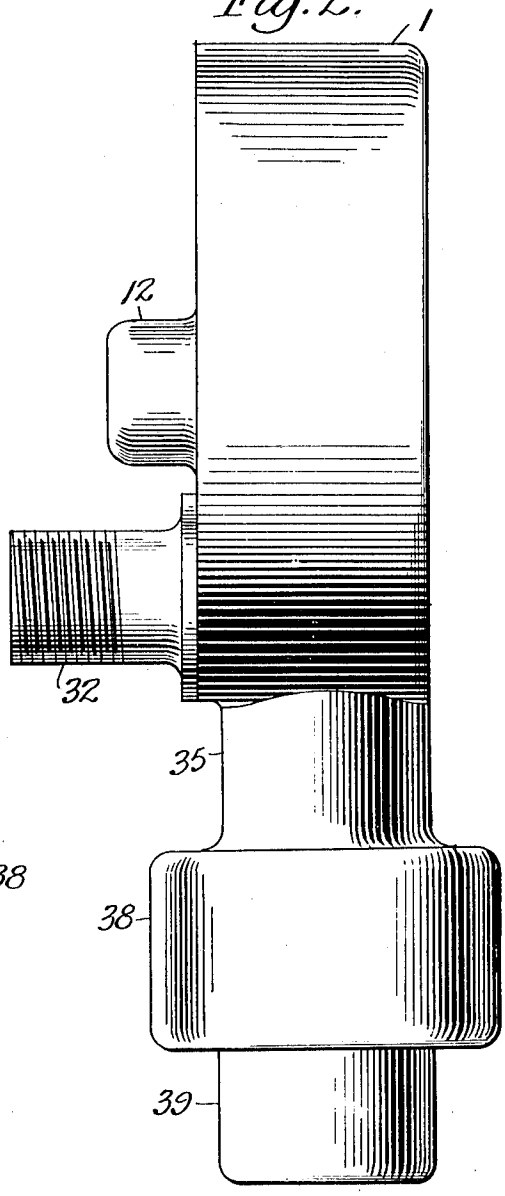


Fig. 2.



WITNESSES

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AIR-VALVE.

1,048,508. Specification of Letters Patent. Patented Dec. 31, 1912.

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To all whom it may concern:

Be it known that I, CLAYTON AUBRA DUNHAM, a citizen of the United States, residing at Marshalltown, in the county of Marshall and State of Iowa, have invented a new and Improved Air-Valve, of which the following is a specification.

My invention is designed to be used in connection with systems of steam heating having an independent air line to permit the escape of air from a radiator, and at the same time prevent the escape of steam.

In the valves heretofore used in connection with the air vents of air line heating systems, considerable difficulty has been found because of the fact that the valves were so constructed as to provide but small openings, which became clogged with foreign matter floating into the air valve with the steam, thereby choking the valve and rendering it inoperative. In such prior constructions, moreover, various means have been employed to adjust the valve to its valve seat, and adjustable means have been exposed either directly on the outer surface of the casing, or under a detachable cover, in both of which constructions the valve is liable to be tampered with by inexperienced persons, and thereby rendered partially or wholly inoperative.

My invention has for its main object, to provide an air valve for use in systems of the character described, so constructed as to provide a very large open area for the discharge of air, and adapted to be closed tightly and quickly against the discharge of steam, thereby providing the quickest circulation possible, and the highest efficiency that can be produced on air line heating systems.

A further object of my invention is to provide a casing so constructed that no movable or detachable parts shall be exposed, thereby preventing the parts from being tampered with, and also to provide a construction wherein the valve may be readily adjusted and fixed in its position relative to its seat, without the use of any regulating or adjustable means.

My invention is also designed to enable the several parts composing the valve to be secured together without the use of any screws or bolts having their heads exposed on the outer surface of the casing. The valve is thereby protected against being readily interfered with, and a casing is provided having a smooth surface and free from any unsightly features.

These and other objects of my invention hereinafter stated are accomplished by the means illustrated in the accompanying drawing in which similar characters of reference refer to similar parts throughout the several views; and in which:

Figure 1 is a vertical central section of an air valve embodying my invention, having inlet and outlet pipes connected therewith, and Fig. 2 is a side elevation of the valve shown in Fig. 1.

As illustrated in the drawings, the body of the valve casing consists of a side wall 1 and back 2, set in from the adjacent terminal of the side wall and provided with an auxiliary back plate 3 adapted to reinforce the casing, and also to serve as a name plate. The side wall and back of the outer casing are preferably formed integral with each other, stamped or drawn out of one piece of metal. The outer casing is provided with a closure or cap 4 having an annular flange 5 extending into the body of the casing, and bearing against the inner surface of the side wall 1 of the outer casing. The inner flange 5 of the cap 4 receives the outer portion of an interior disk or valve plate 6 preferably concavo-convex in general outline, and provided on its central portion with a valve seat 7 having a valve or discharge opening 8 formed by projecting inward the central portion of said plate, and forming an even bearing surface thereon to serve as a valve seat. The marginal portion of the plate 6 is preferably provided with a flange 9 that bears against the inner surface of the flange 5 of the cap 4. By means of such construction, the plate 6 forms within the outer casing a valve chamber 10 and a discharge chamber 11. The cap 4 of the outer casing is provided with a hollow offset 12, preferably formed integral with said cap forming an interior recess 13, permanently closed from the outside, and adapted to receive and hold a nozzle 14. This nozzle is preferably held within the recess 13 by means of frictional contact with the inner wall of said recess. The nozzle 14 is provided with a central aperture 17, preferably having a shoulder 18 adapted to receive a plug 19 provided with a beveled edge 20, which bears against the shoulder 18 of the nozzle.

The nozzle 14 is also provided with an

aperture 21 communicating with the central aperture 17 of the nozzle. The inner end of said nozzle projects into the interior of an expansion disk, and the purpose of said apertures 17 and 21 is to permit the air to be withdrawn from the interior of said disk, and also to permit a suitable filling material, such as a volatile liquid, to be placed within the interior of the disk. After the disk has been filled, the plug 19 is inserted in its place, and the joint between said plug and nozzle is then sealed with any suitable matter 28, such as solder, to make a closed joint. The expansion disk consists of oppositely disposed corrugated plates 22 and 23 joined tightly together at their outer terminals 24. The plate 22 is secured to the nozzle 14 in any suitable manner, such as by the construction illustrated in the drawings, wherein the inner margin of the plate 22 bears against an annular shoulder 25 formed on the nozzle 14, and is held in position by means of a collar 26 angular in cross section, which may be clamped or soldered to the inner disk 22 and the nozzle 14, so as to make a tight and secure joint between said disk 22 and the nozzle 14. The plate 23 is provided with a wide flat central portion 27, which serves as a valve and is adapted to bear evenly on the valve seat 7 formed on the interior plate 6 when the valve is in operation. The flange 9 of the inner plate 6 is sealed to the flange 5 of the cap 4 by rows of soldering 29 and 30, and the cap 4 is preferably sealed to the outer margin of the outer casing by means of a row of solder 31.

When in use the valve is secured to a radiator above the line of the water of condensation by means of a nipple 32, and the nipple is secured preferably to the cap 4 of the valve by forming on said cap an inwardly projecting shoulder 33, adapted to receive a reduced end of said nipple, and to be sealed thereto by means of solder or other suitable means. An annular inwardly extending flange 34 is formed in the side wall 1 of the outer casing, adapted to receive a nipple 35, and be secured thereto by means of solder 36. The nipple 35 is provided with a central aperture 37 which leads into the interior discharge chamber 11 of the valve. A coupling 38 connects the nipple 35 with a discharge or return pipe 39, which may lead to the atmosphere or to a pump or other means for producing a partial vacuum in the air line.

By means of the construction shown and described herein, the outer casing of the valve may be made of sheet metal drawn or pressed, and all of the parts assembled when the several parts are in a condition best adapted for so doing, without any inconvenience, or interference with each other, thereby enabling all of the joints connecting the different parts to be readily and securely formed, and the entire valve construction in such a manner that none of the parts are liable to become inoperative or their efficiency in any way impaired. By means of such construction, moreover, a valve is produced that is cheaper in construction, lighter, and more sightly in appearance than a valve construction of cast metal.

In assembling the parts of the valve, the corrugated plate 22 may be securely attached to the nozzle 14, and the plate 23 secured to the plate 22 before being attached to the other parts of the valve. When the expansion disk is completed and attached to the nozzle 14, the nozzle and disk may be attached to the cap 4, and the inner plate 6 may be connected with the cap 4 and the joint between said plate and cap soldered, before those parts are connected with the outer casing of the valve. By said means the valve seat 7 may be fixed in its proper position relative to the bearing surface of its oppositely disposed valve without the use of any screw threaded adjusting devices, and the parts being so fixed can not be readily interfered with or get out of order. Similarly the offset 12 of the cover being closed on the outside, the nozzle and valve may be fixed in position without the use of any screw threaded adjusting devices, and without any liability of the valve being displaced from its proper position relatively to its seat. When the said parts are completed, they may be collectively placed within the outer casing and the soldered joint 31 made to secure all of said parts within the outer casing of the valve. If desired, the back plate 2 may be pressed inward to form bosses or knobs 40, to serve as guides for placing the inner disk or plate 6, and its connecting parts within the outer casing of the valve. But such means however, are not essential to the general construction or operation of the valve.

When the valve is in use and is connected by means of the nipple 32 with a radiator above the line of water of condensation, the air escaping from the radiator passes through said nipple and into the valve chamber 10, and from thence through the aperture 8 of said chamber into a discharge chamber 11, and from thence out of the trap. The discharge of air from the radiator is followed by a discharge of steam which enters the valve chamber 10, and heats the expansion disk formed of the plates 22 and 23. The disk, being filled with a highly volatile liquid, expands, and the central flat or valve portion thereof 27 comes in contact with the valve seat 7, and shuts off the escape of steam through the valve. The valve 27 is held on its seat as long as the walls of the expansion chamber are affected by the heat. But the air liberated from the water of condensation then

accumulates in the radiator and passes into the valve chamber 10, and reduces the temperature of the expansion disk, contracting the disk and drawing the valve 27 away from the seat 7, thereby opening the discharge aperture 8 and permitting the air to escape through the valve again.

The inner end of the nozzle 14 extends nearly or quite to the central flat portion 27 of the valve when the valve is contracted, and serves as a stop to prevent any undue contraction or collapse of the walls of the expansion chamber.

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

1. The combination with an outer casing having a discharge aperture formed therein and an annular inturned shoulder surrounding said discharge aperture, a nipple having a soldered connection with said shoulder, a cover having a flange extending into said casing and secured to the inner wall thereof, and an inlet aperture having an inwardly extending annular shoulder surrounding said aperture, a nipple having a soldered engagement with the shoulder of said inlet aperture, a valve plate provided with a discharge aperture and a valve seat, and having its outer margin flanged and fastened to the flange of said cover, a nozzle mounted on said cover and provided with a filling aperture, means for closing said aperture, and an expansion chamber between said cover and valve plate secured to said nozzle, and inclosing the inner end thereof.

2. The combination with an outer casing having a discharge aperture and provided with an inwardly extending annular shoulder, a discharge nipple engaging said shoulder, a cover for said casing having a flange secured to the inner wall of said casing and provided with an inlet aperture, and an inwardly extending annular shoulder, an inlet nipple engaging said shoulder, a valve plate having a flange secured to the flange of said cover, forming within said casing a valve chamber and a discharge chamber, and provided with a discharge aperture and an inwardly extending shoulder forming a valve seat, and an expansion disk mounted within said valve chamber and provided with a surface adapted to bear against said valve seat and serve as a valve.

3. In an air valve, the combination of an outer casing having an annular inturned shoulder surrounding an outlet aperture, a nipple having a soldered connection with said shoulder, a cover provided with an off-set forming an interior recess and with an outer flange soldered to the wall of said casing, and provided also with an annular inturned shoulder surrounding an inlet aperture, a nipple having a soldered connection with said shoulder, a valve plate provided with a valve seat and opening, and a flange soldered to the flange of said cover, a nozzle secured in the recess of the off-set of said cover, and an expansion disk secured to said nozzle and provided with a bearing surface adjacent to the inner end of said nozzle and to the valve seat of said valve plate.

4. A valve comprising an outer plate having a marginal flange, a hollow off-set formed in said plate, and an inlet aperture, a hollow nozzle secured within the off-set of said plate, means for closing one end of said nozzle, an expansion disk mounted on and inclosing the opposite end of said nozzle, a valve plate having its outer margin secured to the flange of said outer plate and having a discharge aperture and a valve seat arranged in close proximity to said expansion disk, and an outer casing provided with a discharge aperture, and with side walls engaging the flange of said outer plate and containing said valve plate and disk.

5. A valve comprising an outer plate having an inlet aperture and a hollow off-set formed in said plate, a hollow nozzle secured within said off-set, means for closing one end of said nozzle within said offset, an expansion disk inclosing the opposite end of said nozzle, a valve plate connected with said outer plate and provided with a discharge aperture and a valve seat in close proximity to said expansion disk, and an outer casing provided with a discharge aperture and adapted to inclose said valve plate and expansion disk.

6. A valve comprising an outer plate provided with an inlet aperture, a hollow off-set formed in said plate, and a marginal flange, a hollow nozzle secured within said off-set, means for closing one end of said nozzle, an expansion disk inclosing the opposite end of said nozzle, a valve plate having its outer margin secured to the flange of said outer plate and having a discharge aperture and a valve seat in close proximity to said expansion disk, and an outer casing provided with a discharge aperture and attached to the flange of said outer plate independently of any direct attachment to said valve plate.

7. A valve comprising an outer casing having a substantially flat circular back, and a cylindrical side wall extending at a right angle to said back, narrower in width than the diameter of said back, an outer plate or cover secured to said casing, provided with a hollow off-set, and having an inlet aperture, a valve plate secured to said outer plate or cover independently of the means for securing said cover to said outer casing, and provided with a discharge aperture and a valve seat, a hollow nozzle secured within the off-set of said cover, means for closing one end of said nozzle, and an expansion disk inclosing one end of said nozzle provided with a bearing surface in close prox-

imity to said valve seat, said expansion disk extending outward to and having one of its faces opposite said inlet opening.

8. A valve having an outer casing provided with a discharge orifice, a cap provided with an inlet aperture and a hollow off-set, a hollow nozzle fixed within said off-set and inaccessible from the outer side of said cap, an expansion disk secured to said nozzle, and a valve plate fixedly secured to said cap and provided with a valve seat and discharge aperture adjacent to said expansion disk, so constructed and arranged that said valve seat and expansion disk are held in fixed and non-adjustable relation to each other.

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Witnesses:
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A. RAY WELKER.