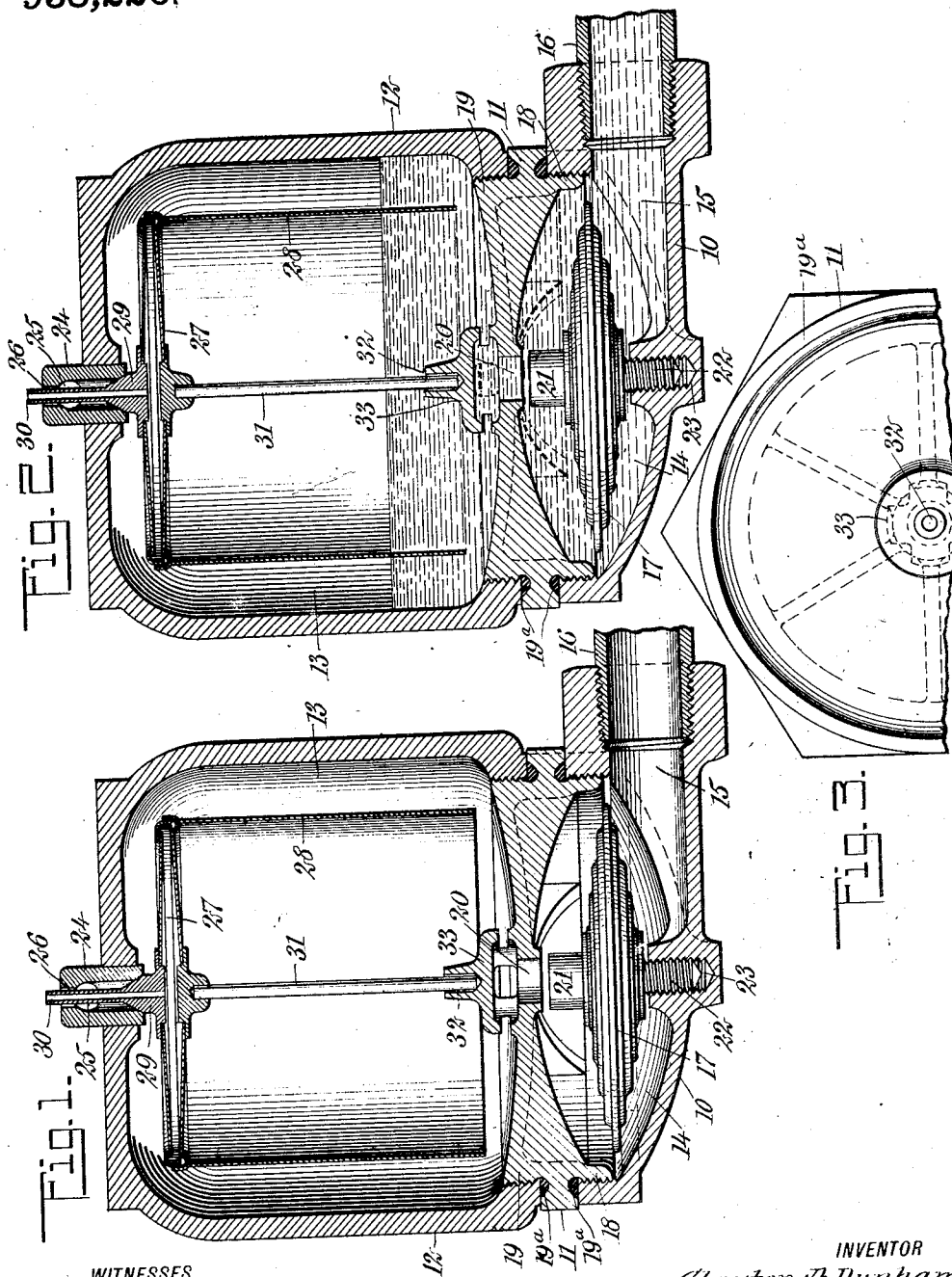


C. A. DUNHAM.
VACUUM AIR VALVE.
APPLICATION FILED FEB. 3, 1909.

Patented Oct. 26, 1909.

938,226.



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CLAYTON AUBRA DUNHAM, OF MARSHALLTOWN, IOWA.

VACUUM AIR-VALVE.

938,226.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CLAYTON A. DUNHAM, a citizen of the United States, and a resident of Marshalltown, in the county of Marshall and State of Iowa, have invented a new and Improved Vacuum Air-Valve, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in vacuum air valves intended for use in connection with vacuo-vapor heating systems, or for any class of heating work in which it is desired to vent air from the mains, returns, or other portion of the system in which low pressure steam is used.

The object of the invention is to so construct the device that air may freely escape from the system past the valve, but the valve will close to positively prevent the escape of steam or water or the reëtrance of air.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a vertical section through a device constructed in accordance with my invention, the outlet valve being closed by the difference in air pressure upon the interior and exterior of the system; Fig. 2 is a view similar to Fig. 1, but showing the outlet valve closed by the action of water; and Fig. 3 is a top plan view of the center piece of the casing.

In the specific form of device illustrated in the accompanying drawings, I employ a casing formed of three separate sections 10, 11 and 12, the middle section 11 serving to subdivide the casing into two separate chambers or compartments 13 and 14. The lower chamber 14 is formed by the casing section 10 and the lower face of the middle casing section 11. The lower casing section is provided with an inlet 15 in one side thereof, to which a pipe 16 may be connected, said pipe either leading to the system or constituting a portion thereof.

Within the chamber or compartment 14, there is mounted a thermostatic disk 17 formed of two sheet metal plates connected together at their peripheral edges and containing a fluid, the expansion of which will spread the centers of the plates apart when exposed to the temperature of steam. The casing section 11 constitutes a partition to

separate the two compartments 13 and 14, and is provided with upwardly- and downwardly-extending threaded portions 18 and 19, by means of which it is connected to both sections. Intermediate the two threaded portions 18 and 19, is a hexagonal outwardly-extending flange presenting lower and upper faces for engagement with the upper and lower faces of the sections 10 and 12. Each of these faces is provided with a groove therein to receive a ring gasket 19^a, which permits the opposed faces to be screwed up into firm engagement with each other to form tight joints. In the center of the partition or casing section 11, is an aperture 20, the lower end of which constitutes a valve seat adjacent to a valve 21 carried by the thermostatic disk upon its upper surface. The lower face of the disk is secured to the lower section in any suitable manner, as, for instance, by a threaded plug 22 fitting into a socket 23 in the center of the casing, so that the disk is anchored, but, at the same time, its elevation and its relative position in respect to the valve seat, may be varied by rotating the disk. The disk is of such a character and adjustable to such a position that when subjected to a temperature below that of low pressure steam, the valve will be spaced from its seat; in other words, the valve will be opened. When the steam comes in contact with the disk, the expansion of the fluid within the latter will bring the valve to its seat and the steam will be prevented from escaping from the compartment or chamber 14 to the compartment or chamber 13.

The casing section 12 is provided with a valve-controlled outlet in its upper wall, through which the air may escape from the compartment 13. The outlet is preferably formed through a brass tubular plug 24 set into the wall of the casing section, said tubular plug having a valve seat at its lower end, an outlet passage 25 in the side thereof, and a reduced outlet 26 in alinement with the valve seat. Within the chamber or compartment 13 is a vacuum disk 27, formed of two plates secured together at their peripheral edges. Extending downwardly from the peripheral edge is a flange 28, forming with the lower plate of the disk a float, whereby the entire disk may be raised bodily by the entrance of water to the chamber 13. The upper plate of the disk carries a valve 29, adapted to engage with the valve

seat at the lower end of the plug 24, and the valve carries a valve stem 30 extending through the plug and to the outside atmosphere through the reduced opening 26 in the plug. The reduced opening in the upper end of the plug constitutes a guide for the valve stem, and the valve stem is hollow, so that it constitutes a conduit whereby the interior of the vacuum disk 27 is at all times in communication with the outside atmosphere. The lower plate of the disk is connected to a guide rod 31, the lower end of which fits within a pocket or recess 32 in a spider 33 formed integral with the casing section 11 and directly over the opening 20. The spider serves not only to support and guide the stem or rod 31, but it also serves to deflect the air rising through the opening 20 and spread the air out into the dome chamber within the float.

With my improved device used in a vacuum-vapor heating system or any system in which the pressure is normally below atmospheric pressure, the vacuum disk 27 will normally be expanded, due to the presence of greater pressure within the disk than upon the exterior of said disk. In case air accumulates within the system so as to raise the pressure substantially to that of the atmosphere, the disk 27 will partially collapse and the valve 29 will open to permit the air to escape to the atmosphere. Should steam pass along with the air, the operation of the steam upon the thermostatic disk 17 will close the valve 21 and said steam will be prevented from escaping. Should water enter the device and rise within the chamber 13, as indicated in Fig. 2, the float will raise the vacuum disk 27 to close the valve 29, irrespective of the difference in pressure upon the interior and exterior of the disk. The valve 21 will remain open, so that upon a reduction in pressure in the system, the water may flow back through the conduit 16, and the water in leaving the compartment 13 will reduce the pressure therein to such an extent that the disk 27 will expand and the valve 29 will remain closed and prevent the admission of air to the system. The water in again rising in the compartment 13 will raise the pressure in the compartment to that of the outside atmosphere, so that the disk 27 may collapse and the air escape.

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

1. A device of the class described, including a casing having an inlet and an outlet, a valve for closing the outlet, a float for operating the valve, and a hollow expansion disk within the casing and carried by and constituting a portion of said float and having the interior thereof communicating with the outside atmosphere, the said disk operating the valve by a difference in air pres-

sure upon the interior of said expansion disk and the interior of said casing.

2. A device of the class described, including a casing having an inlet and an outlet, a valve for controlling said outlet, and a hollow expansion disk for operating the valve and disposed within said casing, said disk having a depending flange constituting therewith a float, said expansion disk having its interior communicating with the outside atmosphere.

3. An automatic trap, including a casing having an inlet, a gas outlet from the upper portion thereof, a valve for closing said outlet, and a hollow expansion disk within said casing for operating the valve, said valve having a valve stem movable therewith, and also constituting a conduit establishing communication between the interior of the disk and the outside of the casing.

4. An automatic trap, including a casing having an inlet, and a gas outlet from adjacent the upper portion thereof, a valve for closing said outlet, a hollow expansion disk within said casing and serving to operate said valve, and a valve stem extending through said outlet for guiding said valve and also constituting a conduit to permit the free entrance or exhaust of air to and from the interior of the disk.

5. An automatic trap, including a casing subdivided into two chambers or compartments and having an inlet to the lower chamber, a passage connecting said chambers, and an outlet from the upper chamber, a valve for controlling said passage, a valve for controlling said outlet, a thermostatically-operated device in the lower chamber for controlling the first-mentioned valve, and an expansion disk within the upper chamber for controlling the second-mentioned valve, said expansion disk having the interior thereof communicating with the outside atmosphere and said disk operating said second-mentioned valve upon a difference in air pressure upon the interior of the disk and the interior of the casing.

6. An automatic trap, including a casing having a passage therethrough, a hollow thermostatic disk within said passage and operating to close the same upon a predetermined change in temperature, a hollow vacuum disk within said passage and having the interior thereof in communication with the outside atmosphere and operating to close the passage upon a predetermined difference in pressure between the interior of the disk and the interior of the passage, and a float within said passage and operating to close the passage upon a predetermined change in liquid level.

7. A device of the class described, including a casing having an inlet at the lower portion thereof and an outlet at the upper portion thereof, a valve for closing the out-

let, a hollow expansion disk within said casing, said disk carrying said valve and having the interior in communication with the outside atmosphere through said valve, whereby said valve is operated by a difference in air pressure upon the interior and exterior of the casing, and means for moving said expansion disk and valve to close the latter independently of a difference in air pressure.

8. A device of the class described, including a casing having an inlet a gas outlet in the upper portion thereof, a valve for closing said outlet, a hollow expansion disk within said casing and having one side thereof secured to said valve to support and move the same, means secured to the opposite side of said disk for supporting the latter, and a valve stem carried by said valve and extending to the exterior of said casing and having a passage therethrough forming communication between the interior of said disk and the outside atmosphere.

9. A device of the class described, including a casing having an inlet a gas outlet, a valve for closing said outlet, a hollow expansion disk within said casing and having one side thereof secured to said valve to support and move the same, means secured to the opposite side of said disk for supporting the latter, a valve stem carried by said valve and extending to the exterior of said casing and having a passage therethrough forming communication between the interior of said disk and the outside atmosphere, and means for moving said expansion disk and valve bodily to close the outlet independently of the air pressure within the casing.

10. A device of the class described, including a casing having three casing sections, one of said casing sections constituting a partition subdividing the interior of the casing into two superposed chambers or compartments said partition having an aperture therethrough and having the upper surface downwardly-inclined to said aperture, an inlet to one of said compartments, an outlet for the other of said compartments, means within one compartment for controlling said aperture, and means in the other of said compartments for controlling said outlet, said above-mentioned casing section having annular threaded portions and an annular flange therebetween and provided with annular grooves in the opposed faces thereof and ring gaskets within said grooves, the other two of said sections having engagement with said threaded portions and with the opposed faces of said flange.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLAYTON AUBRA DUNHAM.

Witnesses:

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W. STORER.