C. C. PECK.

AUTOMATIC DRAINAGE VALVE.

APPLICATION FILED AUG. 19, 1909.

944,816.

Patented Dec. 28, 1909.

FIG. 1.

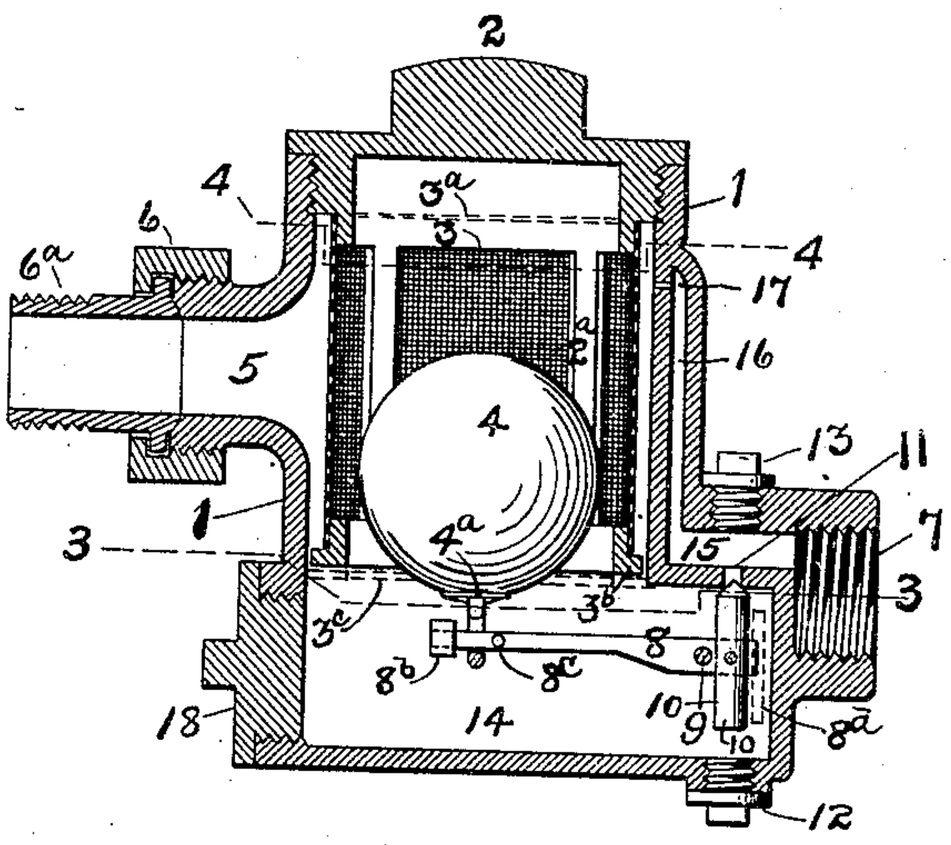


FIG. 2.

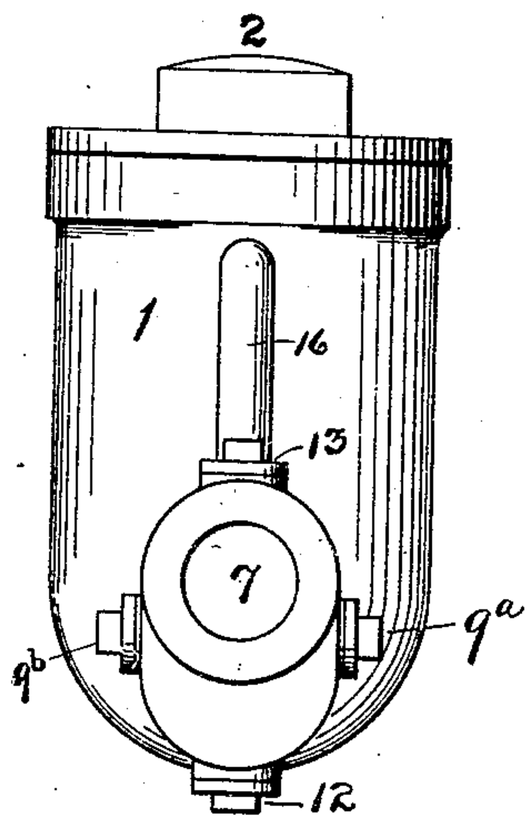


FIG. 3.

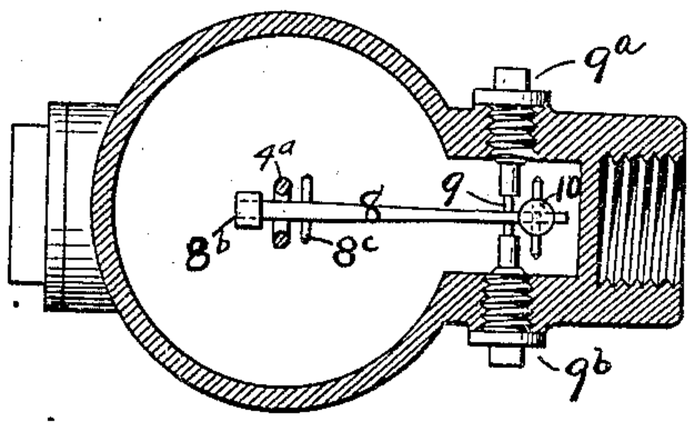
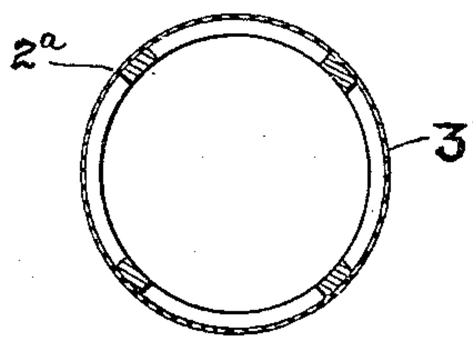


FIG. 4.



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UNITED STATES PATENT OFFICE

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AUTOMATIC DRAINAGE-VALVE.

944,816. Specification of Letters Patent. Patented Dec. 28, 1909.

Application filed August 19, 1909. Serial No. 513,685.

To all whom it may concern:

Be it known that I, CASSIUS CARROLL PECK, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Automatic Drainage-Valve, of which the following is a specification.

My invention relates more especially to the class of heating apparatus in which differential pressure is maintained as between radiators and their return pipes, there being usually some degree of vacuum in the latter, with less vacuum, or low steam pressure, in radiators.

It is also adapted to draining water of condensation from supply pipes and risers into return piping, and for other like uses.

The special object sought and attained in heating systems is to automatically and constantly drain water of condensation from supply pipes and radiators without allowing escape of steam from said pipes and radiators into return piping. In connection with water drainage separate provision is made for constant withdrawal of air from radiators by a small air passage opening into the valve case at the upper portion thereof and discharging into the connection with return piping, said passage being plugged, or not drilled, when the valve is used for draining supply mains, or risers, into returns.

In a valve for the aforesaid service the following are essential requirements, and are duly provided for in this invention, namely, large screen surface with fine mesh to prevent clogging and leakage at the valve seat by grease, scale and dirt which are always present in a heating circuit and which are constantly carried by the circulation to radiator drainage valves, this great source of trouble being guarded against by a cylindrical screen at entrance to the valve; secondly, a float for actuating the water drainage valve, said float having sufficient power to hold the valve tightly to its seat against any degree of vacuum that is maintained in return piping, this end being attained in this invention by the lever which is connected to the float at one end and with the valve-stem at the opposite end, the fulcrum of the lever being close to the valve; thirdly, a large sediment chamber for deposit of solid matter is provided in advance of the valve and its seat, as shown in the drawings; fourthly, making the valve and its seat accessible for cleaning, so as to avoid need of a by-pass, this end being reached by the plugged opening in the extension of the valve case; and, fifthly, means of reaching all parts of the valve structure for cleaning, repairs, or adjustment, these requirements being met in my valve by the plugged openings, the removable fulcrum supports, and the removable screen.

In the drawings Figure 1 is a vertical, central section through the valve body and the screen, showing the float, lever and valve-stem in elevation. Fig. 2 is an elevation of the discharge end of the valve. Fig. 3 is a cross-section of the valve body through broken line 3—3, Fig. 1, the valve lever with the valve stem and the lever fulcrum being shown in plan. Fig. 4 is a cross-section of the screen and its frame taken on plane of broken line 4—4, Fig. 1.

In the several figures the numeral 1 indicates the case, or body, of the valve which has a cap 2, made preferably to screw down upon the body of the valve, in manner to form an air-tight joint. This cap may have as an integral part thereof, as shown in Fig. 1, a downwardly projecting frame 2^a for carrying a screen 3 made of wire cloth, or of perforated sheet metal. Where wire cloth is used there should generally be from 18 to 24 wires per inch. The screen frame may, however, be made and used separately from the cap 2, as indicated by broken lines 3^a, Fig. 1, this latter arrangement being more especially suited to large sizes of the valve. The lower end of frame 2^a is made with a ring which has a flange 3^b at its lower edge, the circular diameter of which fits with sufficient closeness the inside of the valve body 1 to prevent anything but very fine solid matter from passing between the ring flange and the valve body, so that the screen shall be effective in intercepting solid matter which enters the valve body. In place of the flange on the frame ring, a ledge 3^c on the body of the valve may be substituted, as indicated in broken lines, in which case the screen frame would seat on the ledge. The former of these two ways of making the screen frame joint I consider preferable when said frame is attached either permanently, or removably, to cap 2. Frame 2^a also serves as a guide to float 4 as it rises

and sinks with varying water level in the valve body. The inlet to the valve body is at 5, this being usually provided with a union 6 having a tail-piece 6^a for attachment to a radiator, or other surface requiring to be drained. The outlet for the valve body is at 7. Float 4 is loosely connected with its lever 8 by an eye 4^a, and the lever is carried on fulcrum 9, which is supported by the two plugs 9^a and 9^b, and in turn carries valve-stem 10, which plays easily on its pivot and is preferably made heaviest at the lower end of the stem so as to hold the latter in a vertical position. The valve-stem is also made heavy for the purpose of counterbalancing the opposite end of the lever and thus relieve the float of the weight of the lever. In case the valve-stem does not sufficiently counterbalance the other end of the lever, increased weight may be given the valve end of the lever by weighting it, as indicated by broken lines at 8^d. Valve seat and passage 11, Fig. 1, are drilled from the lower side through the hole filled by plug 12 for the purpose of avoiding a rough edge of metal at the valve seat and for slightly beveling the seat, said passage serving to connect sediment chamber 14 with air and water passage 15. The latter passage and the valve passage are reached from the upper side through plugged hole 13. Air passage 16 connects water passage 15 with the upper interior space of the valve body by the relatively small opening 17, which constitutes a continuously operating air vent. A large clean-out plug 18 affords access to sediment chamber 14, and is serviceable in placing the float on the valve lever, two stops 8^b and 8^c being used on the lever to prevent the float eye 4^a from slipping out of place.

Operation is as follows: The tail-piece 6^a of union 6 being screwed into any receptacle which is to be drained, the valve may be used without other connection as an automatic draining device, in which case water that enters the valve body through inlet 5 will flow out by gravity through outlet valve passage 11 and discharge connection 7. Before any water enters the valve body, valve 10 will be held to its seat at passage 11 by weight of float 4 acting through the connecting eye 4^a on lever 8, fulcrumed at 9, on valve-stem 10, downward pressure of the float carrying that end of the lever in the same direction and the opposite end, with attached valve-stem, upward. When sufficient depth of water accumulates in the valve body it will raise the float and thus carry upward the end of the lever to which it is attached and by moving the opposite end downward will carry the attached valve away from its seat, thus giving passage for outflow of water through valve seat 11 and outlet 7. As discharge lowers water level in the valve body the float sinks with it, thus depressing the float end of lever 8 and raising the other end with the valve and bringing the latter to its seat. This action of the float, lever and valve is continuous so long as water continues to flow into the valve body; extent of movement of the float being determined by rapidity of influx.

Usually a pipe will be connected at 7 for conveying discharged water to some place of use, or to waste. The valve can therefore be used to drain any receptacle where there is excess of pressure on the inlet side of the valve. The valve is primarily designed for draining heating circuits, and is especially adapted for vacuum systems. One condition of its design is that the outlet shall be sufficiently below the inlet to insure water sealing of the outlet valve seat, so that no steam or air can at any time pass through the outlet valve passage in either direction. In circulating steam in heating systems by aid of vacuum in return piping this condition is of great importance, inasmuch as the presence of steam in return pipes reduces proportionately the degree of vacuum therein, or else increases expenditure of energy to maintain a given degree of vacuum, and the partial vacuum which forms in radiators after steam supply has been shut off from them tends to draw into radiators vapor in return pipes, which causes accumulation of water and water-hammer therein. In all so-called vacuum heating systems it is intended that vacuum in return piping shall extend only to the vacuum valves which are attached to the drainage outlet of heating units, except that it is needful to provide a quite small constantly open passage for removal of air. This requirement is met by my duct 16 and vent 17 through which lower pressure in return piping than in radiators acts to continually draw a little steam and air, said vent being placed so high as to avoid danger of being stopped. A good condition also secured by the air vent is that when a radiator is shut off, and vacuum is maintained on returns, the radiator will gradually acquire the same degree of vacuum as said returns, which will induce filling with steam very quickly when the supply valve is opened.

Float 4 can be given more or less power to move lever 8 in either direction by weighting the valve stem as required, or by adding or decreasing weight at the valve end of the lever as indicated by the broken lines 8^d, which are intended to represent a weight. If most power be required to open the valve, then the valve-stem, or end of lever, is weighted to more than counterbalance the opposite end, and therefore aid flotation and correspondingly increase power of the float; while if greatest power is desired for holding the valve closed, the float end of the

lever is made heaviest. If the lever be exactly balanced, then the line of flotation is at about the horizontal center of the float.

In vacuum heating systems one of the chief operative difficulties consists in the presence of grease, scale, core sand, iron rust, fiber, etc., which are carried along by the currents of steam and water and at length find lodgment in return valves of radiators. These valves all have relatively small openings as compared with ordinary valves and accordingly are liable to become more or less clogged, and in this state derange operation of a vacuum system, as it takes no great amount of leakage through return valves to flood return piping with steam and thus reduce, or destroy, vacuum. Such condition is guarded against in my valve, first, by the cylindrical screen 3 through which all water entering the valve body must pass; second, by the large sediment chamber 14 below the screen for deposit of such solids as pass through the screen; third, by locating the discharge valve at top of the sediment chamber so as to make outflowing water take an upward course past the valve seat and through the valve passage 11; and, fourth, by so placing the outlet valve seat that it shall remain always submerged, to the end that floating substances may tend to remain in the valve body above the seat and substances which are specifically heavier than water will tend to settle to the bottom of the sediment chamber. In case the valve seat and passage do become fouled, they can be reached and cleaned by removing plug 13. Plug 18 gives access to the sediment chamber 14 both for cleaning and for reaching the operative parts connected with the float, lever and valve.

What I claim and desire to secure by Letters Patent is:

1. In an automatic water drainage valve, a valve body having a vertical float chamber with an inlet port; a float in said chamber; a lever having one end attached to the lower side of the float; a horizontal extension of the valve body to form a valve chamber below the normal water level in the valve body and to provide suitable length of valve lever; an outlet valve passage with valve seat formed directly in the metal of the valve body at the top of said chamber; a short stemmed, upwardly closing valve for said passage attached to the aforesaid lever at the opposite end from the float; a fulcrum for the lever near the valve; and a plugged opening in the valve body directly beneath the outlet valve passage to provide for drilling the said passage from the valve seat side and for cleaning the valve chamber.

2. In an automatic water drainage valve, the combination of a valve body having a float chamber with an inlet port; a float in said chamber; an upwardly opening outlet port above its valve and below the level of the inlet port and of the normal water level in the valve body; a lever attached at one end to the float; a fulcrum for said lever placed near the outlet valve; with an upwardly discharging outlet valve having its stem attached to said lever at the end of the lever which is opposite to the float and having the valve stem supported above its center of gravity in such manner as to swing freely and its lower end weighted to maintain the valve stem in vertical position and to counterbalance the long arm of its lever.

3. In an automatic drainage valve for a vacuum heating system, the combination of a valve body having an inlet port at its upper portion; an outlet valve in a side extension of the valve body forming a valve chamber at the lower portion of said valve body; a float in the valve body having its line of flotation and normal water level in the valve body below the inlet port; a lever attached to the float at one end and to the outlet valve stem at the opposite end; a fulcrum for the lever near the outlet valve stem; a combined air and water outlet passage in communication with the valve body drain pipe connection above the valve chamber; a small air duct formed on the outside of the valve body adapted for conducting a little air and vapor from the upper portion of the float chamber into said air and water passage; and a valve passage from the valve chamber beneath into the air and water passage above adapted to be closed by upward movement of the outlet valve stem caused by lowering of the water level in the valve body and consequently of the float controlling the valve lever, substantially as shown and described.

4. In an automatic drainage valve for steam radiators, the combination of a vertical cylindrical valve body having an inlet port on its side near its top; an outlet port in a side extension of the valve body forming a valve chamber at the lower portion of said valve body; a float in said cylindrical portion of the valve body so placed that the normal water line in the valve body will bring its line of flotation below the inlet port; a removable screen inclosing the vertical sides of the float and so fitting at its lower end the vertical walls of the valve body as to compel all water which enters the valve body to pass through the screen before reaching the float; a sediment chamber below the screen and the float; a lever so hinged to the float as to allow of directly vertical movement of the float as it is raised and lowered by changes of water level in the valve body; an outlet valve with a vertically set stem having a hinged connection to the end of the lever in the valve chamber; a fulcrum for said lever near said valve

stem; an outlet passage above the valve adapted to be closed by upward movement of the valve stem; a combined air and water passage above said outlet valve communicating with the valve drain pipe connection; and an air passage exterior to the valve body providing communication with the upper portion of said body and with the valve body outlet, all substantially as shown and set forth.

CASSIUS CARROLL PECK.

Witnesses:

HOWARD W. CLARK,

FRED FISH.