C. C. PECK.

RADIATOR DRAIN VALVE.

APPLICATION FILED MAR. 24, 1910.

979,553. Patented Dec. 27, 1910.

2 SHEETS—SHEET 1.

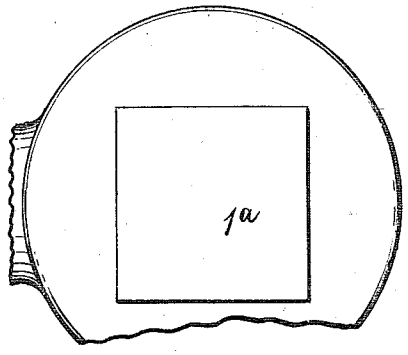


Fig. 2.

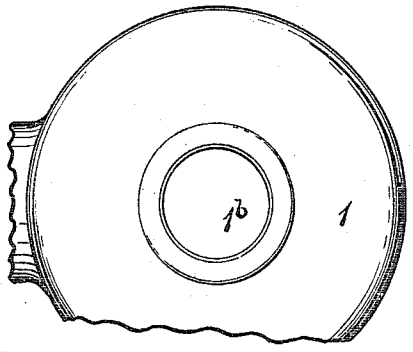


Fig. 3.

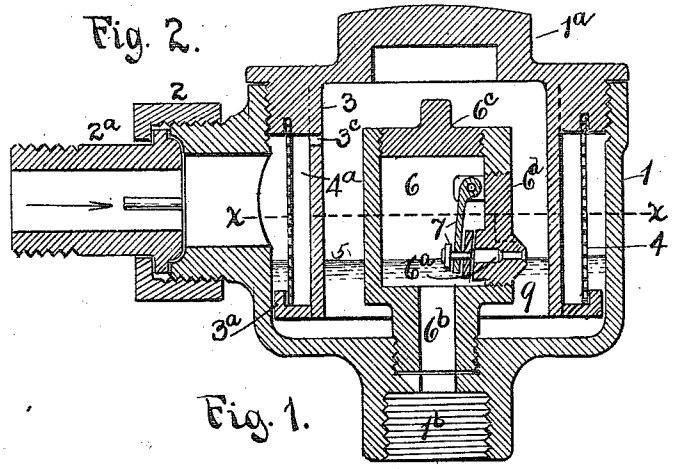


Fig. 1.

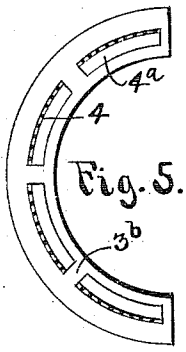


Fig. 5.

Fig. 7.

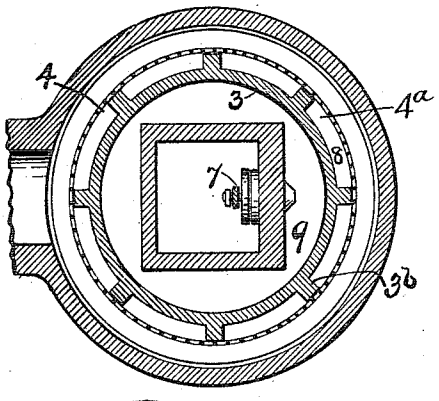


Fig. 4.

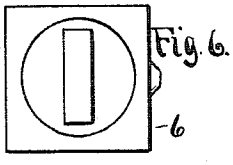
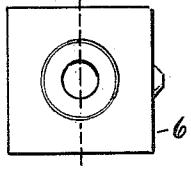


Fig. 6.



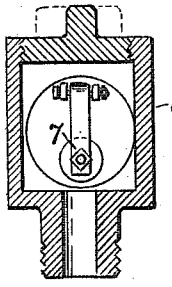


Fig. 9.

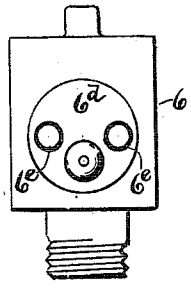


Fig. 8.

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2 SHEETS—SHEET 2.

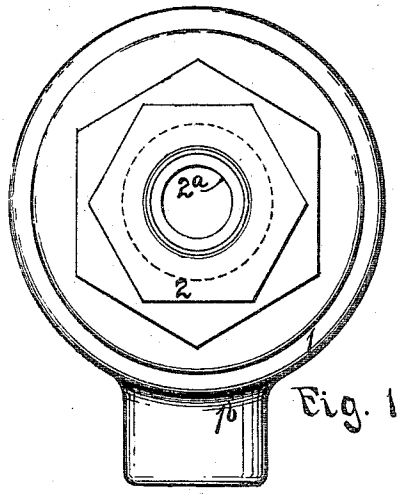

Fig. 13.

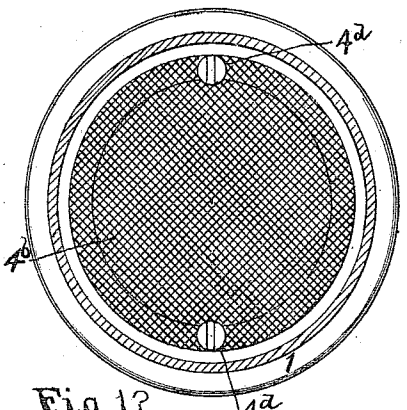

Fig. 12.

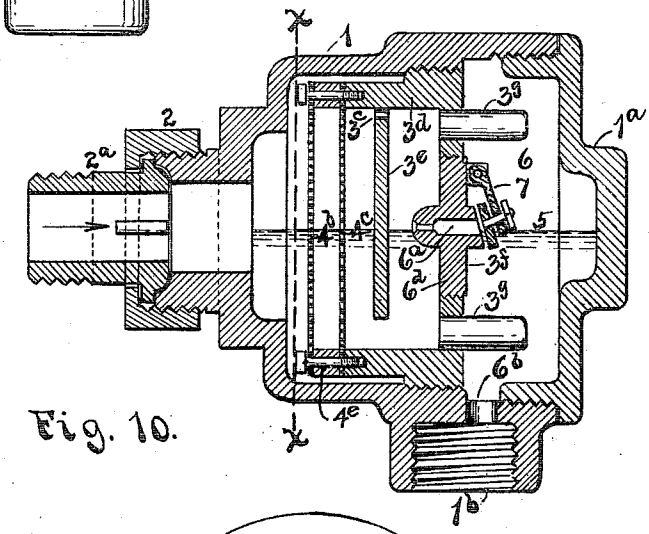

Fig. 10.

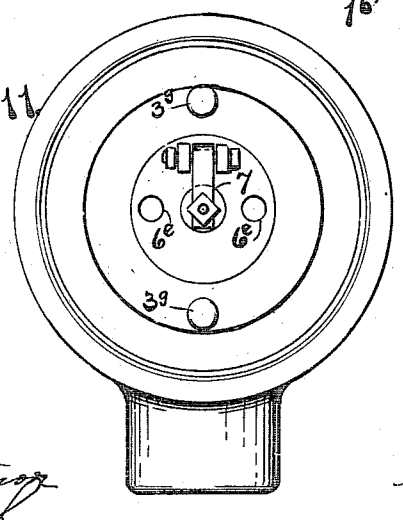

Fig. 11.

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CASSIUS CARROLL PECK, OF ROCHESTER, NEW YORK.

RADIATOR DRAIN-VALVE.

979,553. Specification of Letters Patent. Patented Dec. 27, 1910.

Application filed March 24, 1910. Serial No. 551,403.

To all whom it may concern:

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

My invention relates to that class of valves which are made especially for use at the return end of steam radiators.

It is more particularly intended for employment in connection with some degree of vacuum from return or drain pipes from said radiators, although suitable for use on return connections of steam heating systems in which no vacuum is maintained in return pipes. The rapidly developing art of aiding steam circulation through a system of pipes and removing air and water of condensation therefrom and from radiators by aid of vacuum in return pipes, has brought out many forms and types of valves and traps intended for the same service as my invention. Some of these operate intermittently and thermostatically by expansion, some are float-operated, some depend on differential pressure for operation, while others have differing forms of loaded checks, and some provide for constant discharge of air, some for intermittent discharge, and some do not provide in the water drainage valve for discharge of any air. Experience has shown that best heating conditions are maintained by constant withdrawal of both air and water of condensation from radiators, hence that in a radiator drainage valve there should be a constantly open passage connecting the interior of a radiator with its return pipe, and that some degree of vacuum should be always present in the latter to act inductively in withdrawing water and some mingled steam and air from radiators.

The chief object in my invention is the assembling in a radiator drainage valve of such construction as shall most fully aid in maintaining in best and most reliable manner said conditions. In attaining this end it is needful in the first place to well guard against stoppage of the passages by solid matter. This is a prime requisite in all valves designed for attachment to the return end of radiators which are to be used in connection with some degree of vacuum in their return pipes, since the area of the drainage passages in the valves is necessarily small, and constant accumulation of solid matter, such as grease, scale, rust, etc. occurs.

It is one object of my invention to provide so far as practicable against obstruction to operation of the valve from this source by combination of a large screen surface, a scum-plate and a sediment chamber for intercepting solid matter before it reaches the outlet valve passage.

Another important object sought and attained is prevention of backward circulation through the valve and into the radiator of vapor, air and water from the return pipe when steam supply has been shut off from the radiator. When a radiator which has been in use has its supply valve suddenly and completely closed the condensation of steam in the radiator causes a more or less degree of vacuum and this vacuum becomes high unless relieved by in-leakage of air or steam, hence will act to draw in to the radiator the vaporous and liquid contents of the return pipe. This vapor will be constantly condensed and so will fill the radiator more or less with water causing more or less noise through contact of air and vapor. This is a common and great source of annoyance in steam heating apparatus. It is the office of my small, horizontally swinging check-valve to prevent reëntrance of vapor or water from the return pipe to the radiator, and for this purpose it is effective, as any return current closes the valve.

Another object is to make the valve in all its parts easily and fully accessible, so that all parts may be reached without disconnecting the valve body from a radiator and its return pipe, and while other radiators of the system are in full use. This will be brought out in future description, as also other features, especially the fixed size and the form of the discharge passage by which the discharge of water, air and steam from the valve body is controlled and differential pressure, as between the inlet and the outlet, is maintained.

In the drawings, Figure 1 is a central vertical section of the vertically set complete valve. Fig. 2 is a top view of the valve body cover. Fig. 3 is a bottom end view of the valve body and its outlet. Fig. 4 is a cross section on plane of line X—X Fig. 1. Fig. 5 is a bottom end view of one half of the scum-plate frame with the screen. Fig. 6 shows the top of the check-valve chamber. Fig. 7 is a bottom end view of the check-

valve chamber. Fig. 8 is an elevation of the inlet side of the check-valve chamber looking toward the inlet valve passage thereto. Fig. 9 is a central vertical section of the check-valve chamber showing the check-valve in elevation. Fig. 10 is a central vertical section of the horizontal form of the valve taken as a whole. Fig. 11 is an end elevation with the valve body cover removed. Fig. 12 is a sectional elevation on plane of line x—x Fig. 10. Fig. 13 is an elevation of the inlet end of the valve viewed as a whole.

In the vertical form of the valve the valve body is indicated by the numeral 1, its cover being designated by 1^a. Said body has a screwed union made in usual manner consisting of the nut 2 and tail-piece 2^a for connecting into a radiator of any suitable form, usually either a sectional iron radiator or else a pipe coil. The body with its cover forms a chamber which contains a cylindrical plate which constitutes a frame 3 that is preferably attached to the cover 1^a, as shown in Figs. 1 and 4. The lower end of this frame plate has a narrow flange 3^a which fits the inner surface of the valve body with sufficient closeness to prevent passage of any coarser solid matter than would pass through screen 4, which is supported in cylindrical form on ribs 3^b and is recessed into flange 3^a at the lower edge of the screen and into cover 1^a at its upper edge, as shown in Fig. 1. Near the upper end of the frame plate is shown an air passage 3^c. As normal water level 5 in the valve body seals the lower end of the frame plate 3, the space inclosed by said plate, the lower end of the valve body, and the cover, constitutes a chamber 8, Fig. 4, which chamber is vented into the inlet of the valve body by air-hole 3^c while water passage 6^a in check-valve chamber 6 vents it to the valve body outlet. The check-valve chamber is shown in Figs. 1, 6, 7, 8 and 9. It is preferably attached to the lower side of valve body 1, as shown in Fig. 1, and given an open passage 6^b through said attachment into the valve body outlet 1^b, and provided with a removable top 6^c. Into one side of this chamber is screwed a plate 6^a, which carries a check-valve 7 made in the usual manner of making check valves, as shown in Figs. 1, 4 and 9, and to open inwardly as regards the valve chamber, it being intended that the valve face shall have only sufficient diameter to insure full bearing on the valve seat.

Operation of the valve as a whole is as follows: Valve body 1 being connected by tail-piece 2^a of the union with a radiator, and at outlet connection 1^b with a return pipe, and it being supposed that steam is being supplied to the radiator, and vacuum maintained at the said return pipe connection, the water of condensation constantly formed in the radiator will flow into the body of the valve where it will encounter screen 4, Figs. 1 and 4. This screen may be of any desired fineness and made either of wire or perforated metal and either single or double, the form shown being typical of a screen of any kind which is suitable to the service and placed practically as shown for the purpose both of retaining the coarser portions of suspended solid matter and of aiding effect of the scum chamber in retaining fine floating matter which passes the screen by checking and equalizing flow into and through said chamber and presenting anchorage surface for oily and gummy substances mixed with solids. As the flange 3^a at the lower edge of frame-plate 3 so nearly fits the valve body as to prevent practically all solid matter which enters the valve body from passing it, water of condensation must flow through screen 4, which is intended to catch nearly all solid matter held in suspension by the water. Of what remains, and is of a character to float, most is retained in the space 8 between screen 4 and frame-plate 3, which is thus a scum chamber, and frame-plate 3 constitutes a scum-plate. The entering water sinks through passages 4^a, Fig. 5, beneath the edge of said scum-plate and thus reaches the space 9 which contains valve chamber 6. Said space constitutes also a settling chamber well suited by its area and the quiet condition of water therein for determining deposit of such fine solids as pass the screen and the screen chamber 8. Normal depth of water in this space, as indicated at 5, Fig. 1, is such as to retain in the scum chamber 8 matter which floats on the surface of the water while heavier matter settles in chamber 9. At level 5 the water reaches the small discharge passage 6^a through which it flows by gravity aided by the constant suction of vacuum in return connection 1^b, and from the valve passage flows unrestrictedly through the larger passage 6^b into the valve body outlet 1^b. The small check-valve 7, which closes against the outlet end of valve passage 6^a, is hung in such manner as to be moved very easily away from said valve passage, that is so easily that the degree of unbalanced pressure of air and vapor on the discharge side shall serve to hold the valve open to some extent and thus promote constant circulation of some steam, with such air as it contains, through the valve passage so long as the radiator is receiving a supply of steam in excess of its condensing capacity, the vent hole 3^c allowing circulation from the radiator to valve passage 6^a. The sole office of this valve is to prevent return of steam or water from the discharge pipe into a radiator when steam supply has been shut off from the radiator and some degree of vacuum consequently formed therein. The number of air holes 3^c is not essential so

long as the total area is such as to fully equalize vapor pressure in the radiator as compared with that in chamber 9. The cross section of valve passage 6^a is made only sufficient to properly drain water of condensation and at the same time permit enough steam to pass to keep the radiator free from air without passing such amount of steam as would, under good working conditions, be detrimental to vacuum in return pipes. Size of the valve passage will be governed by the differential pressure between the radiator and its return pipe and by the size of the radiator. Thus, if it be necessary to carry relatively high vacuum on account of raising water of condensation at the end of the system, or elsewhere, the passage 6^a must be made smaller than when relatively low vacuum is maintained, it being intended that the passage shall be constantly wide open when the radiator is receiving steam from its supply pipe.

The screen 4 is readily cleansed by removing it with the valve body cover 1^a and holding it under a water faucet or in a jet of steam. After removal of said cover the check-valve chamber 6 is accessible either for running a wire through valve passage 6^a, in case it should be stopped, or for removal of the top 6^c of the chamber, or of the chamber itself. After removing said chamber the check-valve plate 6^d can be unscrewed by inserting a wrench having a yoke-shaped end to fit the two recesses 6^e.

The passage 6^a is enlarged at the outlet end for the double purpose of lessening liability to stoppage by solid matter and to give increased area for effecting opening of the check valve 7 by differential pressure existing between the inlet and the outlet of the valve body.

Figs. 10, 11, 12 and 13 show needful modifications in form and construction of the valve as a whole in adapting the valve body for setting in horizontal position, as the latter position will sometimes be more desirable than the upright position in suiting conditions of location or operation. As the two forms correspond in operation, the preceding description of operation will answer for both. In the drawings such parts as closely correspond in form are lettered alike in the upright and in the horizontal forms, while those which correspond in function but differ in form are given the same number but a special designating letter. It will be seen that the first difference is in the form of the screen, which, instead of being cylindrical, consists of two flat disks 4^b and 4^c, the first one of which may properly be of coarser mesh than the second. The two disks are held apart by a spacing ring 4^e which is secured to the cylindrical frame 3^d by stud-bolts as shown, and said frame is screwed into the body of the valve by aid of pins 3^g instead of being attached to the cover as in Fig. 1 and has a scum-plate 3^e. The screen plates 4^b, 4^c, Figs. 10 and 12, are set crosswise of the valve body, and correspond with the cylindrical form of screen 4 in the vertical form of valve. Frame 3^d has a solid head 3^f at its end opposite the screen, and valve disk 6^d is screwed into this head and carries check-valve 7 which opens toward the valve body cover 1^a. By unscrewing and removing said cover, both check-valve 7 and outlet passage 6^b can be reached.

My improved valve is primarily intended for use with my vacuum system of heating wherein sufficient auxiliary radiation is provided between primary radiators and the exhauster at end of the system to condense practically all steam which escapes from the primary radiators into the returns. In case of use on a heating circuit in which no vacuum is maintained in return pipes, the valve passage 6^a is given suitable area corresponding with predetermined pressure carried in supply pipes to radiators and drop in pressure in return pipes, differential pressure determining the area of the valve passage in providing for complete and constant drainage of water and air without admitting an objectionable amount of steam into returns. In case of ordinary low pressure systems where there is practically no differential pressure as between radiators and return pipes, the valve passage 6^a must be considerably enlarged to allow of outflow of water of condensation, as in this case gravity is the only moving force, and about the only advantage in use of this valve on such systems is that in two-pipe systems it can be substituted for a hand operated valve and it will be necessary to operate by hand only the supply valve, as the check-valve will prevent entrance of steam or water into radiators from return pipes.

I do not confine myself to the exact form and manner of assembling the several parts of the valve so long as proportion and relation of parts to each other are such as to correspond with those shown and described and are such as to give practically the same results. The term radiator as herein used is intended to include any form of radiator, or pipe coil, employed for condensing steam and dispensing heat.

What I claim as my invention and desire to secure by Letters Patent is,—

1. In a radiator drainage valve, the combination of a valve body having an inlet port and an outlet port; a division wall within the valve body between the inlet port and the outlet port; and a passage through said division wall at least as large at its discharge end as at its inlet end adapted to control by its size alone discharge of water, air and steam and to maintain desired differ-

ential pressure between the interior of a radiator and its drain pipe.

2. In a radiator drainage valve, the combination of a valve body having an inlet port and an outlet port; a removable chamber within the valve body having inclosing walls which separate the inlet port from the outlet port; and a passage of fixed size through the wall of said chamber adapted to control by its size alone discharge of water, air and steam and to maintain desired differential pressure between the interior of a radiator and its drain pipe.

3. In a radiator drainage valve, the combination of a valve body having an inlet port and an outlet port; a screen within the valve body placed to intercept solid matter which enters the valve body; a scum plate beyond the screen adapting the space between the screen and the scum plate for retaining floating matter which passes through the screen; a valved passage protected by the screen and scum plate adapted to control discharge to the outlet of the valve body; and a removable valve body cover.

4. In a radiator drainage valve, the combination of valve body having an inlet port and an outlet port; a chamber within the valve body having an inclosing wall which separates the inlet port from the outlet port; a passage through the wall of said chamber affording sole communication between the inlet and the outlet of the valve body and proportioned for efficiently draining water and air while preventing escape of all but a very little steam; an enlargement of said passage at its discharge end; a check valve within the chamber at the outlet end of said passage; and a removable cover for said valve body affording access to said check valve chamber.

5. In a radiator drainage valve, the combination of a valve body having an inlet port and an outlet port; a chamber within the valve body having an inclosing wall which separates the inlet port from the outlet port and is open to the outlet port; a passage through the wall of said chamber affording communication between the inlet and the outlet of the valve body; a removable piece in the wall of the chamber which piece contains said passage; and a removable cover for said valve body affording access to said check valve chamber.

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Witnesses:

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