H. K. & I. Z. KRIEBEL.

AIR AND VACUUM CONTROLLING DEVICE.

APPLICATION FILED FEB. 18, 1908.

924,617. Patented June 8, 1909.

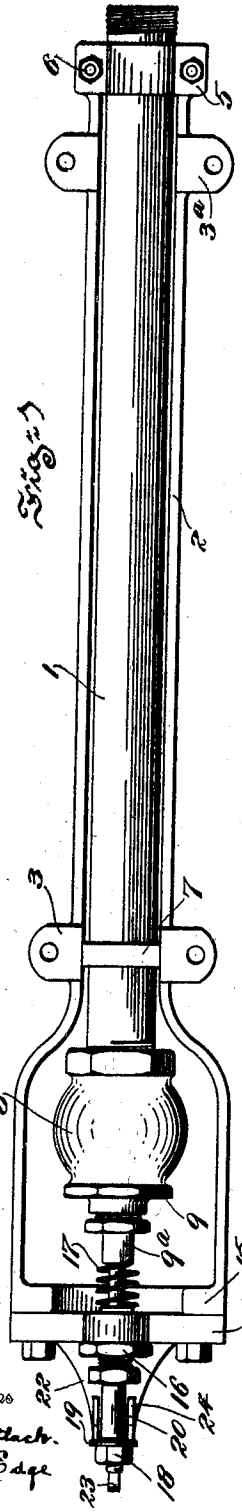

Fig. 1.

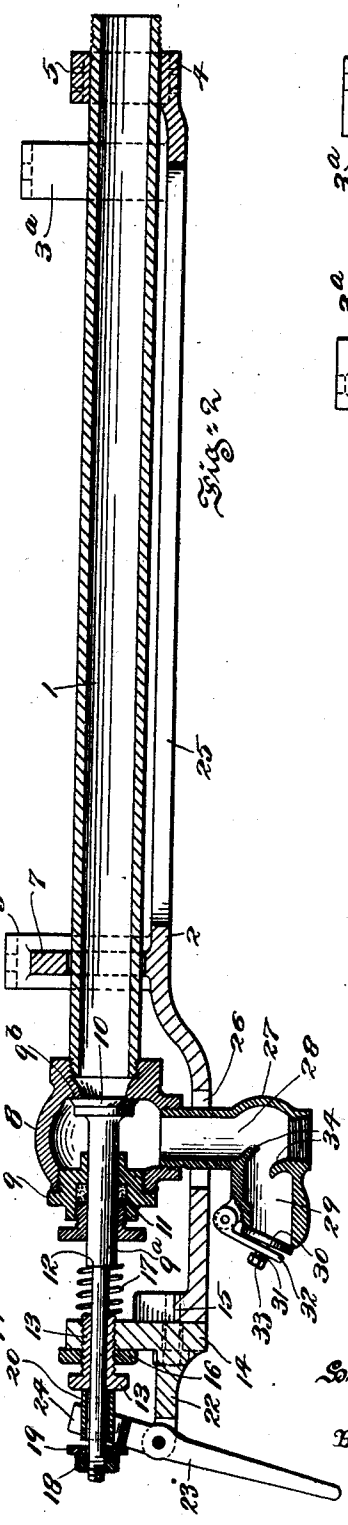

Fig. 2.

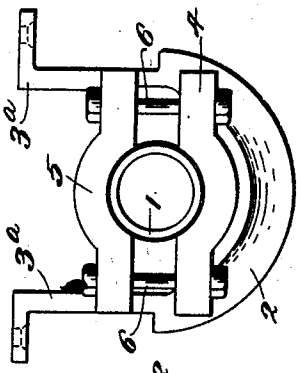

Fig. 4.

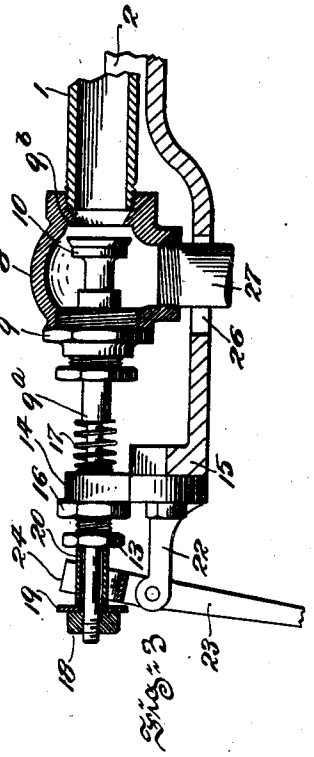

Fig. 3.

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UNITED STATES PATENT OFFICE.

HOSEA K. KRIEBEL AND IRWIN Z. KRIEBEL, OF PHILADELPHIA, PENNSYLVANIA.

AIR AND VACUUM CONTROLLING DEVICE.

No. 924,617. Specification of Letters Patent. Patented June 8, 1909.

Original application filed April 19, 1907, Serial No. 369,055. Divided and this application filed February 18, 1908. Serial No. 416,458.

To all whom it may concern:

Be it known that we, HOSEA K. KRIEBEL and IRWIN Z. KRIEBEL, both citizens of the United States, and residents of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have jointly invented a new and useful Air and Vacuum Controlling Device, of which the following is a specification.

This invention relates to an improved air and vacuum controlling device in which the expansion and contraction of a tube and its complemental valve casing, caused by the difference in temperature of the tube, so operates in connection with an adjustable and cushioned valve as to permit air and water of condensation to escape from the tube when in a state of contraction and when in a state of expansion to operate to abut against the said valve and is intended for use in connection with systems of steam heating such as is described in an application for Letters Patent serially numbered #369,055 and of which the present case is a divisional application; and the principal objects of the present invention may be said to be to provide apparatus for separating air and water of condensation from steam within a system of steam heating; expelling air at one place; delivering water of condensation at another place; retaining steam or vapor in the system; preventing cooling of the system from outside sources and to make provision for maintaining a vacuum in the system by excluding therefrom atmospheric air.

A further object is to provide simple, reliable, efficient and comparatively inexpensive apparatus for attaining the above enumerated objects.

Other objects relate to the providing of details of construction and the combination thereof with other adjuncts described hereinafter.

The invention consists of the improvements hereinafter described and finally claimed.

The nature, characteristic features and scope of the invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof and in which:—

Figure 1, is a top or plan view of an air and vacuum controlling device embodying the invention. Fig. 2, is a view in central section of the same and showing the position of the valve when the apparatus is in a state of expansion. Fig. 3, is a similar view of the left-hand portion of Fig. 2, and illustrating the position of the valve when the apparatus is in a state of contraction; and Fig. 4, is a view in end elevation of the apparatus shown in Figs. 1 and 2.

In the drawings the device of the invention is shown to comprise a generally elongated expansion tube 1, preferably of brass, supported within a cast iron frame or hanger 2, as by arms 3 and 3^a, from any convenient place. One end of this tube is screw threaded for attachment to the return pipe connection of a system of steam heating, and is clamped to the frame or hanger 2. As may be seen in Fig. 4, this hanger 2, is of semi-circular concaved cross section and is provided with a bracket or clamp 4, formed integral therewith and a second bracket or clamp 5, adapted to be removably secured to the former by means of bolts 6. The screw threaded end of the tube 1, is clamped between these two brackets or clamps which firmly hold the tube against displacement and at the same time center the tube with respect to the frame or hanger 2. The opposite end of the tube 1, is supported by means of a rib 7, arranged between the respective arms 3, of the hanger and is screw threaded for attachment to the hollow fitting or valve casing 8. The valve casing is shown as being located within an enlarged extension of the frame or hanger 2, and is provided with a valve seat 9^b, and a removable cap 9, penetrating which is a longitudinally arranged valve stem 9^a, having a valve disk 10, arranged in alinement with the tube 1, and the valve stem is suitably packed as at 11, with respect to the valve casing to provide a steam tight connection. The outer end of the valve stem is reduced in diameter, by reason of which a shoulder 12, is provided, and passes through and is supported by an adjustment nut 13, carried by the end piece 14, which is bolted to an angular extension 15, of the frame or hanger 2. A lock nut 16, is provided to fix the adjustment nut 13, with respect to the end piece 14, and between the shoulder 12, and said adjustment nut is interposed a coiled spring 17, constituting a cushion for a purpose hereinafter disclosed. The extreme outer end of the valve stem is equipped with a nut 18, and a washer 19, between which and the adjustment nut 13, and loosely surrounding the stem 9^a, is a

section of tubing 20. This arrangement of parts is necessary in order that the valve disk 10, may be normally held free of its seat 9^b, in the valve casing since if it were not for the fact that the tubing 20, abuts against the adjusting nut the tension of the spring 17, would tend to normally close the valve opening.

Having pivotal relation with a bracket 22, carried by the end piece of the frame or hanger 2, is a lever 23, having a forked portion 24, that straddles the section of tubing 20, of the valve stem and is adapted to abut against the nut 18, and washer 19, to provide means for dislodging dust and dirt from between the valve disk and its seat, when the lever 23, is reciprocated back and forth. In this connection the spring serves to return and keep in proper position the valve disk.

The frame or hanger 2, is provided in its base with a slot 25, and an opening 26. Depending from the valve casing 8, and through the last mentioned opening is a hollow casting or fitting 27, having a vertically arranged water of condensation passage 28, therethrough, the lower portion of which is screw threaded for attachment to a pipe adapted to return water of condensation to the boiler of a heating system. Arranged crosswise of the fitting and having communication with the passage 28, is another passage 29, which acts as an air vent and communicates with atmospheric air. Normally closing this vent is a flap or disk 30, having a stem 31, penetrating an arm 32, pivotally carried by the fitting, the said stem having a nut 33, to hold the flap or disk to the arm 32. The function of the flap or disk 30, is to serve as a valve that readily permits of the escape of air from the system and prevents the admission of atmospheric air to the system thereby maintaining within the system a vacuum. In this connection it may be remarked that the slightest pressure in the system above that of the atmospheric air is sufficient to cause the flap or disk 30, to move outward and thus relieve the system of air. Baffle plates 34, are positioned in the passage 28, to deflect water of condensation from the air passage 29, during the egress of water of condensation from the controller.

The operation of the above described apparatus is as follows:—Assuming that the controller is cool and that the radiating system to which the controller is connected is being heated the controller is in the position shown in Fig. 3, and air and any water of condensation that may be present in the expansion tube 1, pass along together in advance of the exhaust steam and are caused to pass through the valve opening, air passing out by way of the air vent 29, and water of condensation passing through the passage 28, from which it may pass to the boiler of the heating system. As the controller heats up the tube 1, will gradually expand together with its valve casing and close the space between the valve seat 9^b, and the valve disk 10, and thus causes the system being heated to retain its full capacity of heat by confining steam within the system as is shown in Fig. 2. Obviously when the system cools off the tube 1, contracts sufficiently to provide an air space between the valve seat and the valve.

A vacuum is maintained within the system above referred to and in this respect the door or flap prevents such vacuum from sucking atmospheric air into the apparatus through the air passage. The valve being cushioned prevents buckling or straining of the parts during the expansion of the tube 1.

What we claim is:—

1. A device of the class described comprising an expansion tube, a valve casing at one end thereof having a valve seat arranged in juxtaposition to and in alinement with said tube, a cushioned valve within said casing said valve being provided with a valve stem projected through said casing, means operatively connected with said valve stem for normally keeping the valve free of its seat and means carried by the valve casing for separating air and water of condensation in their egress from the device.

2. A device of the class described comprising an expansion tube suspended within and one end of which is fixed to a hanger, the other end of said tube carrying a valve casing having a valve seat, an adjustable and spring controlled valve having an elongated valve stem arranged in alinement with said tube, means carried at the outer end of said valve stem for normally keeping the valve free of its seat and means depending from the valve casing for separating air and water of condensation in their egress from the device.

3. A device of the class described comprising an expansion tube, a valve casing at one end thereof having a valve seat arranged in juxtaposition to and in alinement with said tube, a cushioned valve within said casing said valve being provided with a valve stem projected through said casing, means operatively connected with said valve stem for normally keeping the valve free of its seat, means carried by the valve casing for separating air and water of condensation in their egress from the device and means operatively connected therewith for preventing ingress of atmospheric air to the device.

4. In combination a hanger, an expansion tube within said hanger, means for clamping one end of said expansion tube to the hanger, a valve casing carried by the opposite end of said expansion tube, said valve casing being provided with a valve seat, a cushioned valve normally held free of said seat, said valve being provided with a stem projected through said casing, adjusting and reciprocating

mechanism carried by the hanger and operatively connected with said valve stem, a fitting depending from said valve casing having air and water of condensation passages therethrough and a valve for normally closing the air passage.

5. In combination a hanger, an expansion tube within said hanger, means for clamping one end of said expansion tube to the hanger, a generally spherical valve casing having a valve seat carried by said expansion tube, a cushioned valve within said casing provided with a valve stem projected through a packing connected with said valve casing, adjusting and reciprocating means carried by the hanger and operatively connected with said valve stem, a generally L-shaped fitting depending from said valve casing and projected through the hanger having air and water of condensation passages therethrough and a valve for normally closing the air passage.

In testimony whereof we have signed our names to this specification.

HOSEA K. KRIEBEL.
IRWIN Z. KRIEBEL.

In the presence of—
WILLIAM J. JACKSON,
HOWARD E. LINDERMAN.

H. K. & I. Z. KRIEBEL.

SYSTEM OF STEAM HEATING.

APPLICATION FILED APR. 19, 1907.

968,668.

Patented Aug. 30, 1910.

2 SHEETS—SHEET 1.

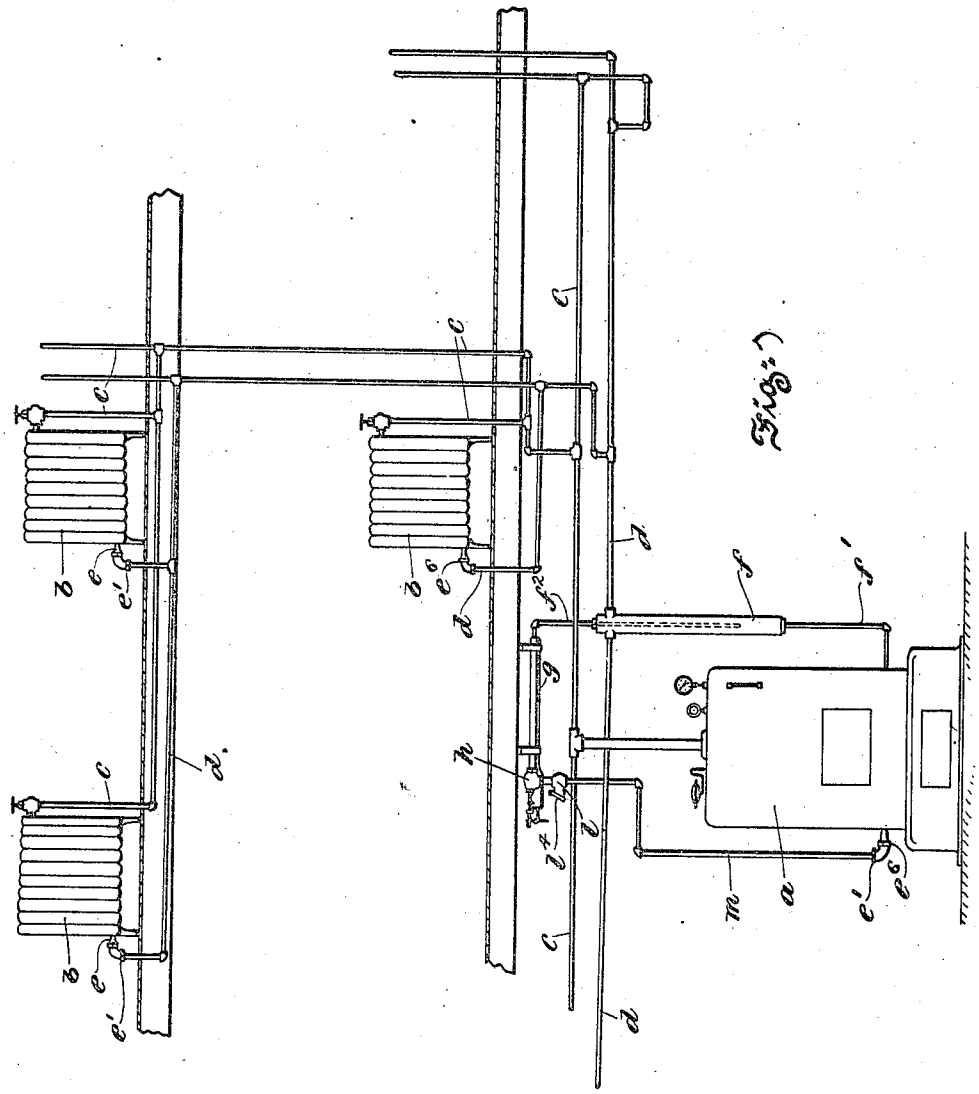

Fig. 1.

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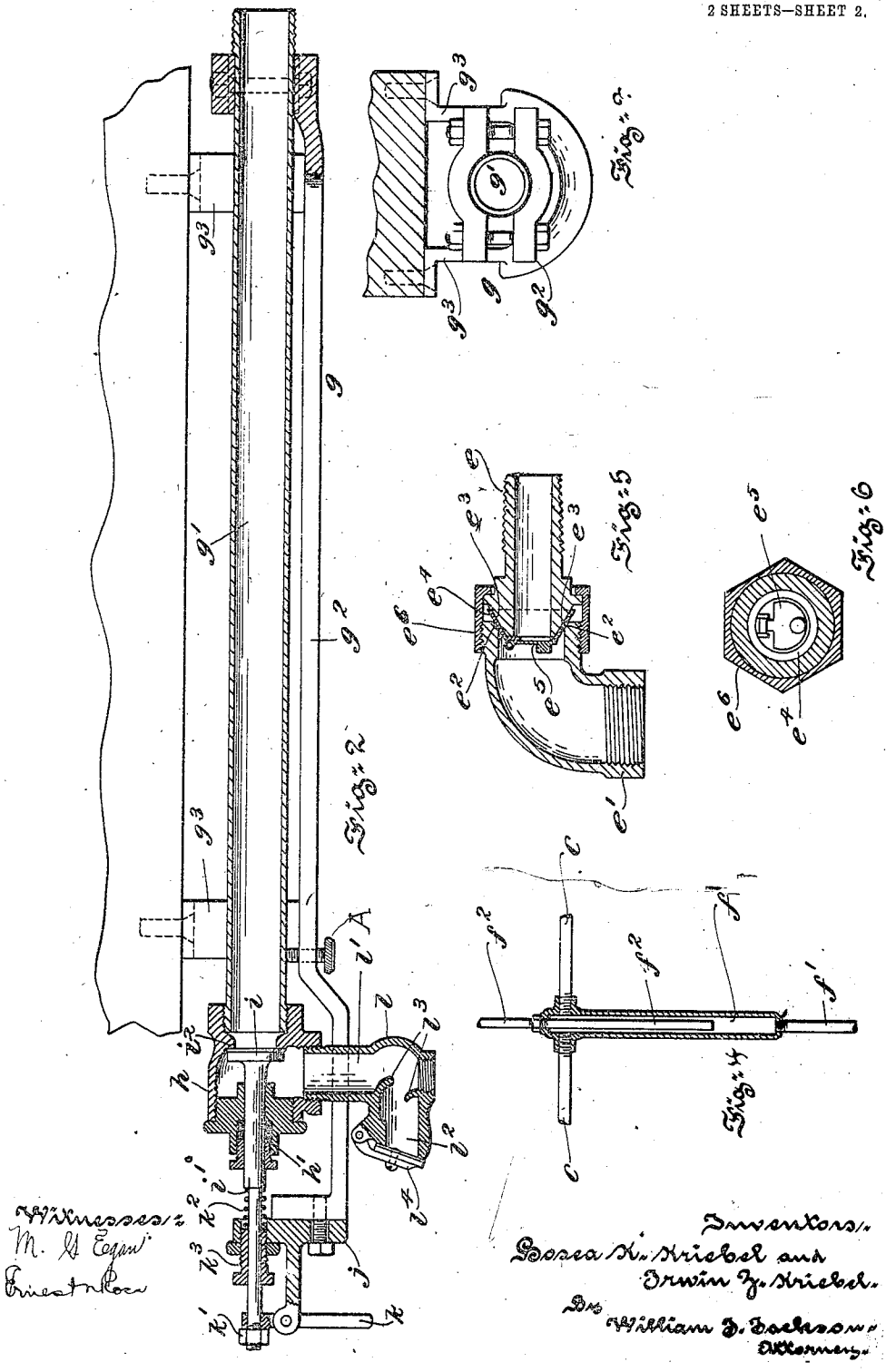
H. K. & I. Z. KRIEBEL.

SYSTEM OF STEAM HEATING.

APPLICATION FILED APR. 19, 1907.

968,668. Patented Aug. 30, 1910.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

HOSEA K. KRIEBEL AND IRWIN Z. KRIEBEL, OF PHILADELPHIA, PENNSYLVANIA.

SYSTEM OF STEAM-HEATING.

968,668. Specification of Letters Patent. Patented Aug. 30, 1910.

Application filed April 19, 1907. Serial No. 369,055.

To all whom it may concern:

Be it known that we, HOSEA K. KRIEBEL and IRWIN Z. KRIEBEL, both citizens of the United States, and residents of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have jointly invented a certain new and useful Improved System of Steam-Heating, of which the following is a specification.

This invention relates to steam heating systems and the principal objects are to provide such a system in which ordinary air valves upon radiators are dispensed with and means provided for collecting and expelling air from the system at one place; to provide apparatus for preventing cooling of the system from outside influences and to make provision for maintaining a vacuum within the system by excluding therefrom atmospheric air; to provide apparatus for separating air and water of condensation from steam in the system, expelling air at one place and delivering water of condensation to the boiler and retaining steam or vapor in the system; and to provide a series of check valves for the radiators to permit of the circulation of steam in one direction only and to prevent water of condensation remaining in the radiators.

Other objects will appear hereinafter.

The invention stated in general terms comprises the improvements to be presently described and finally claimed.

The nature, characteristic features and scope of the invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof, and in which—

Figure 1, is an elevational view of a system of steam heating as installed in accordance with the invention. Fig. 2, is an enlarged view partly in elevation and partly in section of a portion of the apparatus illustrated in Fig. 1. Fig. 3, is an end view thereof. Fig. 4, is a sectional view drawn to an enlarged scale of the separator shown in Fig. 1, and Figs. 5 and 6, are detail views of one of the check valves shown in Fig. 1.

In the drawings there is shown a boiler *a*, having steam connections with radiators *b*, through the supply and return pipes *c* and *d*. These radiators have no air valves and the object thereof will appear hereinafter. In each return pipe *d*, in juxtaposition to the radiators and also in the pipe *m*, leading to the boiler and hereinafter referred to, are check valves, see Figs. 5 and 6. These valves permit of the steam circulating in one direction only and in the case of the pipe *m*, permit of water of condensation flowing in one direction without back action from the boiler. The valves comprise a union elbow connection, of which the parts *e*, are screwed into the radiators and the parts e^1, are joined to the return pipes from the radiators. Within the elbow and between the beveled parts e^2, and e^3, thereof is fitted a removable and somewhat dish-shaped member e^4, having an opening therethrough provided with a pivotally arranged door or flap e^5, that normally covers the opening. The member e^4, is clamped between the parts e^2 and e^3 and may be readily adjusted to accommodate various angles to which the elbow may be placed by merely loosening the coupling e^6.

Located in the return pipe in close proximity to the boiler is an air and water of condensation separator *f*. This separator may be of cylindrical form and is provided with a chamber that receives from the return pipes moisture from the system and conveys the same by means of the pipe f^1, to the boiler *a*. Penetrating the top of the separator and extending into the same to a point above the level of the normal water line of the boiler is a pipe f^2, that leads to one end of an air and vacuum controller *g*. This controller *g*, comprises a generally elongated tube g^1, preferably of brass, supported in a cast iron frame g^2, as by hangers g^3, from any convenient place. One end of this tube g^1, is clamped, as by means of nuts and bolts to the frame g^2, and the other end has screw threaded engagement with a hollow fitting *h*. Passing through the frame g^2, and engaging the tube g^1, adjacent the fitting *h*, is a thumb screw A, which may be present if desired for securing proper alinement of said tube with respect to the fitting *h*. The fitting *h*, is provided with a longitudinally arranged, spring controlled valve-stem i^1, and its complemental valve *i*, arranged in alinement with the tube g^1, and is suitably packed in relation to the fitting *h*, to provide a steam tight connection h^1.

The outer end of the valve stem i^1, of the valve *i*, passes through the angular member *j*, that is carried by an angular extension of the frame g^2, and at its extremity may be provided with a nut k^1, forming an abut-

ment against which a lever k, is adapted to abut to provide means for dislodging dust and dirt from between the valve i, and its valve seat i^2, when the lever is reciprocated back and forth. In this connection the spring k^2, interposed between a shoulder on the valve stem and an adjustment nut k^3, having screw threaded engagement with the member j, serves to return and keep in proper position the valve i.

Depending from the fitting h, is a hollow casting l, having a water of condensation passage l^1, therethrough communicating with an air vent l^2. The passage l^1, leads to the boiler a, by means of the pipe m, and has interposed in said passage baffle plates l^3, that serve to deflect moisture from the air passage. This casting l, is provided with a pivotally arranged door or flap l^4, that normally rests over and closes the air passage l^2.

The mode of operation of the above described system may be described as follows: Assuming that the system is cool and is about to be heated, steam traverses the supply pipes c, from the boiler a, to and through the radiators b, causing to issue therefrom any air and water of condensation that may be present by way of the return pipes d. Air and condensation pass along together in advance of steam until the separator f, is reached whereupon air and steam escape through the controller connections f^2, and water of condensation passes through the pipe f^1, to the boiler. Passing to the air and vacuum controller g, air still passes along together with any condensation present and is caused to pass through the valve opening, air passing out by way of the air passage l^2, and condensation returning to the boiler through the pipe m. In this connection it will be observed that it is unnecessary for steam pressure to force air and condensation from the system, since said system is practically open to atmospheric air through the air passage l^2, and the slightest pressure above that of the atmosphere is sufficient to cause the flap l^4, to move and thus permit air to leave the system, and of course the water of condensate will readily gravitate to the boiler. As the system heats up the tube g^1, will gradually expand together with the fitting h, and close the space between the valve seat i^2, and the valve i, and cause the system to retain its full capacity of heat by confining steam within the system. It is to be noted that the controller tube g^1, is of brass, which readily expands, and is clamped at one end to a cast iron bracket g^2, that does not expand as readily, the other end being screw threaded to the fitting h.

By this construction it will be obvious that when the system cools off the tube contracts sufficiently to provide an air space between the valve seat and the valve. The above described system in operation maintains therein a vacuum and in this respect the door or flap l^4, prevents such vacuum from sucking atmospheric air into the apparatus through the passage l^2.

We do not intend by the use of the above language or words to limit our invention further than the prior state of the art may require, but

Having thus described the nature and objects of our invention, what we claim as new and desire to secure by Letters Patent is:

In a vapor-vacuum heating system the combination of a boiler, a radiator, supply and return pipes establishing a circuit between the boiler and radiator, a thermostatic device having an inlet port in communication with the return pipe, a discharge port, and a valve for said discharge port, said thermostatic device arranged above the water level in said return pipe and acting in its expansion to automatically close said valve for retaining steam in the system, a water of condensation pipe leading from the discharge port of said thermostatic device to the boiler, an air vent arranged in said latter pipe for excluding at all times atmospheric air from the system to form a vacuum therein said vent being free to operate at all times to permit egress of air from the system but retaining heat therein and permitting water of condensation to pass from said device to the boiler and a check valve opening toward the boiler located in said water of condensation pipe for preventing water in the boiler from escaping through said air vent when under pressure.

In testimony whereof we have hereunto signed our names.

HOSEA K. KRIEBEL.
IRWIN Z. KRIEBEL.

Witnesses:
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M. G. EGAN.

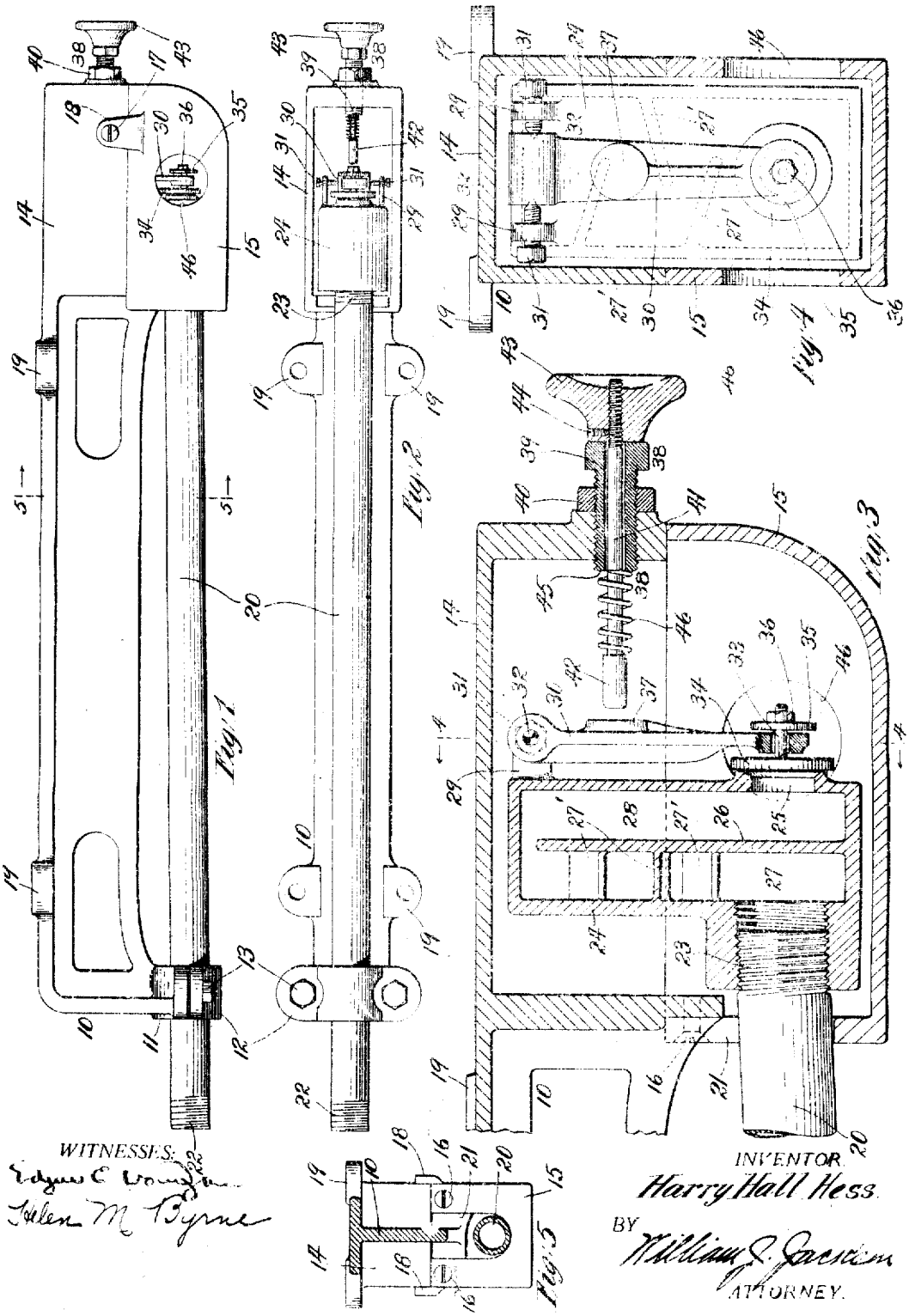
H. H. HESS.

AIR AND VACUUM CONTROLLING DEVICE.

APPLICATION FILED SEPT. 10, 1915. RENEWED JULY 25, 1916.

1,239,440.

Patented Sept. 4, 1917.



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AIR AND VACUUM CONTROLLING DEVICE.

1,239,440. Specification of Letters Patent. Patented Sept. 4, 1917.

Application filed September 10, 1915, Serial No. 50,091. Renewed July 25, 1916. Serial No. 111,276.

To all whom it may concern:

Be it known that I, HARRY HALL HESS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improved Air and Vacuum Controlling Device, of which the following is a specification.

The present invention relates to an improvement upon the air and vacuum controlling device shown and described in United States Letters Patent No. 924,617, dated June 8, 1909. Installation of the device manufactured under the above patent has demonstrated the presence of certain disadvantageous features, notably, difficulty with the stuffing-box arrangement, and water of condensation sputtering at the valve opening. The principal object of the present invention is to replace the aforementioned device with an air and vacuum controller, possessed, commercially speaking, of more efficient and reliable working parts, of more compact and more readily accessible parts and of simplified and cheapened construction. Other and further objects of the present invention reside in the providing of general details of construction and the combination thereof with other adjuncts hereafter referred to.

The invention consists of the improvements hereinafter described and finally claimed.

The nature, characteristic features and scope of the invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof and in which:

Figure 1, is a view in side elevation of the air and vacuum controlling device embodying the invention,

Fig. 2, is a plan view of the underside of the same, certain casing parts being removed,

Fig. 3, is a fragmentary view, principally in section, of the right hand side of Figs. 1, and 2,

Fig. 4, is a view in cross-section taken upon the line 4—4 of Fig. 3, and

Fig. 5, is a similar view taken upon the line 5—5 of Fig. 4.

In the physical embodiment of the invention illustrated in the drawings, 10, designates an elongated frame or hanger of cast iron. As shown in Fig. 5, this hanger is of T-shaped cross-section. Integral with one end of the hanger and depending therefrom is, one part of a bracket or clamp 11, adapted for detachable attachment, to which is a companion part 12, bolts 13, being present for securing the parts together. The opposite end of the hanger has formed integral therewith one part of a shell or housing 14, detachably connected to which is a companion part 15. Screws 16, 17, are present for securing the parts together. One of the shell parts, in the drawings, the lower shell, is provided with lugs 18, for accommodating the screws 17. This shell is adapted to house certain parts to be presently described. The relatively broad, flat, top of the hanger 10, has formed integral therewith, laterally disposed ears 19, apertured for the passage therethrough of bolts for securing the hanger to place. Clamped beneath the vertical rib of the hanger 10, and in a medial line therewith, by the parts 11—12—13, is an elongated, brass, expansion tube 20, screw-threaded at each end. As shown this tube is slightly inclined from the clamp 11—12, upwardly toward the shell 14—15 for a purpose to presently appear, the free end of which tube is supported within the U-shaped, slotted portion 21, of the lower shell, see Figs. 3, and 5. The end 22, of the tube 20, is adapted for attachment to the return pipe of a so-called vapor-vacuum heating system, such as is disclosed in U. S. Letters Patent No. 968,668, dated August 30, 1910. The end 23, of the tube 20, carries a hollow casting 24, which is contained within the shell 14—15. This casting 24, is of rectangular configuration, is vertically disposed and is provided at one side and near its base with a screw-threaded boss to accommodate the end 23, of the tube 20. The outer wall of the casting has formed therein, at a point opposite the expansion tube, a valve-opening 25, see Fig. 3. Extended from the bottom of the casting 24, to within a short distance of the top thereof is a central partition 26, thus forming separate compartments, 27, and 28. Compartment 27, has therein baffle plates 27′, arranged at an angle and oppositely disposed as shown by dotted lines in Fig. 4, to form a tortuous passage. The baffle plates, preferably, are formed integral with the compartment walls. Hingedly connected to the outer wall

of casting 24, is means for closing the valve-opening 23. A description will now be given of such means. Suspended in a vertical manner from ears 29, on the casting, is an arm 30. The mode of suspension is accomplished by oppositely disposed screws 31, the points of which center in counter-sunk portions 32, of the arm 30. Lateral adjustments of the arm may thus be readily secured and a very easy moving hinge joint provided. Loosely passing horizontally through the lower end of the arm is a pin 33, screw-threaded at one end and having fixed to its other end a metallic vertical disk-valve or flap 34, for closing the valve-opening 23. A nut 35, and lock nut 36, coöperate with the screw-threaded end of the pin 33, to retain the flap 34, in proper position. In this connection it may be stated that there is a loose fit provided by this arrangement, see Fig. 3, so that the flap may readily adjust itself to any inequalities of the seat of the valve-opening 23. The rear of the arm 30, is provided with a boss 37, for abutting against an adjustably mounted, cushioning, device 38, for maintaining in closed position the flap valve and to prevent buckling of the controller parts during an expansion period. The device 38, embraces the following parts: Penetrating the outer wall of the shell 14, and extended within the shell is an elongated nut 39, a lock nut 40, being present to retain the nut in adjusted position. Passing horizontally through the nut 39, is a rod 41, the inner end of which is provided with a fixed cap 42, and the outer end is screw-threaded to receive a knob or handle 43, which is fixed thereto as by a screw 44, see Fig. 3. Interposed between the cap 42, and the end 45, of the nut 39, is a coiled spring 46. By proper manipulation of the handle 43, the distance between the cap 42, and arm 30, may be regulated. Also tension of spring 46, may be regulated to prevent shifting of rod 41, by very slight pressure in system.

In installation the operation of the above described air and vacuum controlling device is as follows: Air which is present in the system passes through expansion tube, being pushed by the vapor in the system, and escapes through valve-opening 25, the flap-valve permitting of such escape. Simultaneously, vapor heats up the tube 20, and in expanding the casting 24, is moved outward so that the part 37, of the flap-valve arm abuts against the cap 42, of the cushioning device and maintains in closed position the flap-valve 34, thus confining vapor within the system. In this connection, it is to be noted that in order to prevent moisture or water of condensation reaching the valve opening, vapor in the casting 24, is caused to first advance away from and then toward said valve opening. As vapor advances away from the valve opening, the baffles separate the moisture from the vapor and deflect the moisture or water of condensation back to the expansion tube. The latter being inclined away from the casting the water of condensation drains back through the tube and finds its way to the boiler. Thus water sputtering at the valve opening is eliminated. Should for any reason, a small quantity of water of condensation escape to the shell 15, it readily evaporates. In this connection the vents 46, in the shell permit of egress of air from the system, permit of air entering said shell and further provide means for inspecting the flap valve during operation of the device and the insertion therethrough of proper implements for cleaning of ground surfaces of valve and valve seat if necessary. With the flap valve closed, there is now confined within the system a full capacity of vapor, the heat units of which in transmission to a room being heated, cause condensing of the vapor, thus creating a vacuum within the system, the advantages of which are well known.

What I claim is:—

1. A device of the class described embracing an expansion tube clamped at one end and equipped at its free end with a casting forming a combined air and vapor chamber provided with a single egress opening, means within said chamber for causing air and vapor to pass first away from said egress opening and then toward it, a flap-valve for closing said opening, and means operative for maintaining in closed position said valve during expansion period.

2. A device of the class described embracing an expansion tube clamped at one end and equipped at its free end with a casting forming combined air and vapor chamber provided with a single egress opening, said tube being inclined downwardly from the said chamber to its clamped end, means within said chamber for causing air and vapor to pass first away from said egress opening and then toward it, a flap-valve for closing said opening, and means operative for maintaining in closed position said valve during an expansion period.

3. A device of the class described embracing an expansion tube clamped at one end and equipped at its other end with a casting forming a combined air and vapor chamber provided with a single egress opening, said tube being inclined downwardly from said chamber to its clamped end, means within said chamber for causing air and vapor to pass first away from said opening and then toward it, means for separating and deflecting backward to said tube water of condensation as the vapor passes in a direction away from the egress opening, a flap-valve for closing said egress open-

ing, and means operative for maintaining in closed position said valve, during an expansion period.

4. A device of the class described embracing an expansion tube clamped at one end and provided at its free end with a casting forming a combined air and vapor chamber having a single egress opening, said tube being inclined downwardly from said chamber to its clamped end, a partition within said casting for forming communicating divisions, so disposed that air and vapor first pass in a direction away from the egress opening and then toward it, baffle plates within the division in which said air and vapor pass in a direction away from said opening, a loosely suspended flap-valve for relatively closing said egress opening and means operative for maintaining positively closed said valve during an expansion period.

5. A device of the class described embracing a hanger carrying at one end a shell, an expansion tube one end of which is clamped to the hanger and the free end of which projects within the shell and supports a hollow casting provided with a single egress opening said tube inclining downwardly from said casting to its clamped end, a flap-valve hinged to the casting for relatively closing said opening and cushioned means carried by the said shell for positively maintaining closed said valve during an expansion period.

6. A device of the class described embracing a hanger carrying at one end a shell, an expansion tube one end of which is clamped to the hanger and the free end of which projects within the shell and supports a hollow casting provided with a single egress opening said tube inclining downwardly from said casting to its clamped end, means arranged within the hollow casting for deflecting water of condensation back to the expansion tube, a flap-valve hinged to the hollow casting for relatively closing said opening and cushioned means carried by the shell operative for positively closing said valve during an expansion period.

7. A device of the class described embracing a hanger carrying at one end a two-part separable shell, an expansion tube one end of which is clamped to the hanger and the free end of which projects within the shell and supports a hollow casting provided with a single egress opening, said tube being inclined downwardly from said casting to its clamped end, means arranged within the hollow casting for separating water of condensation from vapor and deflecting it back to said tube, a flap-valve hingedly suspended from the hollow casting for relatively closing said opening and adjustably cushioned means carried by a fixed part of the shell operative for positively closing said valve during an expansion period and for preventing buckling of the controller parts.

8. A device of the class described embracing a hanger carrying at one end a two-part shell provided with vents adjacent the egress opening of which one of said shell parts is detachable, an expansion tube, one end of which is clamped to the hanger and the other end of which projects within the shell and supports a hollow casting provided with a single egress opening, said tube being inclined from said casting downwardly to its clamped end, means within the casting for separating water of condensation from vapor and deflecting it back to the said tube, a flap-valve hingedly suspended from the hollow casting for relatively closing the said opening and adjustably cushioned means carried by a fixed part of the shell operative for positively closing said valve during an expansion period.

9. A device of the character stated embracing a hanger, an expansion tube clamped at one end to said hanger, a member provided with an egress opening and adapted to separate water of condensation from air and vapors fixed to the free end of the expansion tube, which tube is operatively positioned to drain water of condensation away from said member, a flap-valve mounted upon said member operative to relatively close said egress opening and cushioned means carried by the hanger coöperatively disposed with respect to the flap-valve to cause the latter to positively close said egress opening during an expansion period.

10. A device of the character stated embracing a hanger, an expansion tube clamped at one end to the hanger, a member provided with an egress opening and adapted to separate water of condensation from air and vapors fixed to the free end of the expansion tube, which tube is operatively positioned to drain water of condensation away from said member, a valve mounted upon said member operative to relatively close said egress opening and means carried by the hanger coöperatively disposed with respect to said valve to cause the latter to positively close said egress opening during an expansion period.

11. A device of the character stated embracing a member provided with an egress opening and adapted to separate water of condensation from air and vapors, an expansion tube connected at one end to and positioned to drain said member, a hanger to which the other end of said tube is fixed, means mounted upon said member for relatively closing said egress opening and independent means carried by the hanger positioned to cause said closure means to positively close the egress opening during an expansion period.

12. A device of the character stated em-

bracing a member provided with an egress opening for the escape of air and vapors, an expansion tube connected at one end to and positioned to drain said member of any water of condensation that may be present therein, a hanger to which the other end of said tube is fixed, a freely suspended self alining valve mounted upon said member for relatively closing said egress opening and means carried by the hanger positioned to cause said valve to positively close the egress opening during an expansion period.

In testimony whereof, I have hereunto signed my name.

HARRY HALL HESS.

Witnesses:
WILLIAM J. JACKSON,
HELEN M. BYRNE.

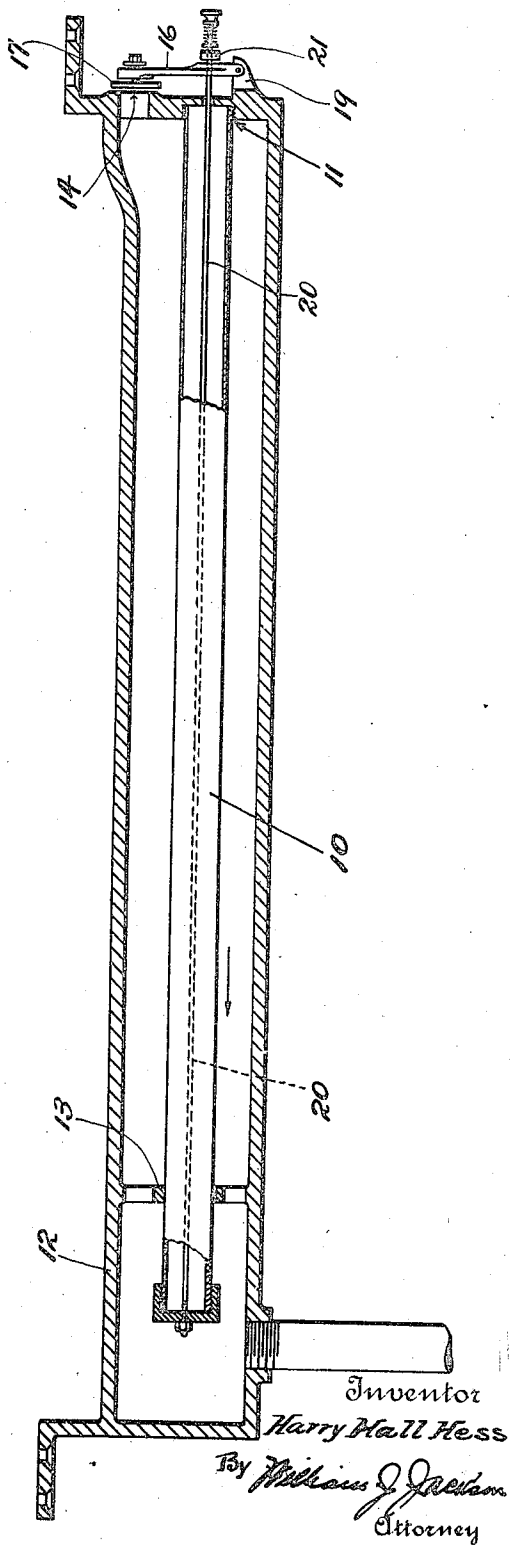
H. H. HESS.

VAPOR VACUUM CONTROLLER VALVE.

APPLICATION FILED MAR. 9, 1917.

1,288,887.

Patented Dec. 24, 1918.



Inventor
Harry Hall Hess
By William J. Jackson
Attorney

UNITED STATES PATENT OFFICE.

HARRY HALL HESS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO VAPOR-VACUUM HEATING CO., OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF NEW JERSEY.

VAPOR-VACUUM-CONTROLLER VALVE.

1,288,887. Specification of Letters Patent. Patented Dec. 24, 1918.

Application filed March 9, 1917. Serial No. 153,698.

To all whom it may concern:

Be it known that I, HARRY HALL HESS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Vapor-Vacuum-Controller Valve, of which the following is a specification, the same being a continuation in part of my application for Letters Patent serially numbered 111,276, the latter being a renewal of application serially numbered 50,091 as filed September 10, 1915, patented September 4, 1917, and numbered 1,239,440.

The controller as manufactured under United States Patent No. 924,617 and upon which device the present invention is an improvement, requires separate valves to prevent egress of vapor from and to prevent ingress of atmospheric air to the heating system. By such construction not only are two separate valves required but the stem of the valve for preventing egress of vapor works through a stuffing box and the valve for preventing ingress of atmospheric air to the system has substantially unrestricted outward movement.

The present invention has for its object to provide a controller having a single self seating flap valve calculated to positively close a single valve opening upon vapor expansion and to remain seated as vapor pressure lowers due to the vacuum in the system being heated, which vacuum is maintained constant by the prevention of ingress of atmospheric air to the system.

The invention consists of the improvements hereinafter described and finally claimed.

The nature, characteristic features and scope of the invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof and in which there is shown in side elevation partly sectioned a vapor-vacuum controller equipped with a valve construction embodying the invention.

For the purpose of illustrating my invention, I have shown in the accompanying drawings a form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of the instrumentalities as herein shown and described.

Referring to the drawings 10 represents a tube, preferably of brass, upon which the vapors of the heating system (not shown) act for expansive purposes. Such tube is clamped as at 11 at one end to a fixed support 12 and its other end is free for longitudinal movement through a guide 13. At a suitable place, provision is made in the form of a single opening 14, for the egress of air from the system. As shown, the opening is provided in one end of the support 12. Positioned for relatively closing the opening 14 is a self-alining flap-valve. Such valve consists of a pivotal arm 16 the free end of which is provided with a self-alining disk or flap 17. The arm 16 is carried by an extension 19 on support 12. The valve is advanced toward the opening 14 by the expansion of tube 10. The direction of movement of the respective tubes is designated by an arrow in the drawing and in this connection it is to be noted that the free end of tube 10 has fixed thereto a rod 20 which passes preferably through the tube and through the arm 16 and is provided at its free end with a nut or the like. Preferably having cushioned relation between said rod and the far side of arm 16 is a stop 21 so that undue expansion of tube 10 will not cause buckling of controller parts. It will be observed that expansion of tube 10 serves to close opening 14, vapor acting exteriorly upon tube 10. The effect is that of closing a single opening 14 to the expulsion of vapor from the system and the prevention of egress of atmospheric air to the system by a single valve. From the above described controlling valve construction, it will be understood that with the vapor pressure rising, air as may be within the system is caused to move in advance of the vapor and finds its way to the atmosphere through opening 14 past the loosely positioned flap-valve. With the heated vapor reaching the controller, the tube 10 rapidly heats and expands thereby causing positive closing of opening 14. As vapor pressure drops the

system cools and a vacuum is produced which vacuum serves to maintain seated upon the opening 14 the flap valve. As the flap valve is thus kept seated, no atmospheric air finds its way within the controller so that a constant vacuum is maintained without the employment of any locking or interlocking attachments. Water of condensation drains away from opening 14. The opening 14 is located at the top of casing 12.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

What I claim is:

In a device of the character stated, an expansion tube located in the direct path of travel of heated vapor; a casing supporting and surrounding said tube said casing being provided with an opening for the passage of air and an outlet connected to a vacuum system for draining water of condensation away from said opening, a flap valve located beyond said expansion tube and pivoted for free vibratory movement toward and away from said opening, and means controlled by the movement of said tube for closing said valve whereby the built-up vacuum maintains said valve closed under predetermined conditions.

In testimony whereof, I have hereunto signed my name.

HARRY HALL HESS.

June 15, 1926.

1,589,009

H. K. KRIEBEL

AUTOMATIC AIR VALVE

Filed August 22, 1922

FIG. 1.

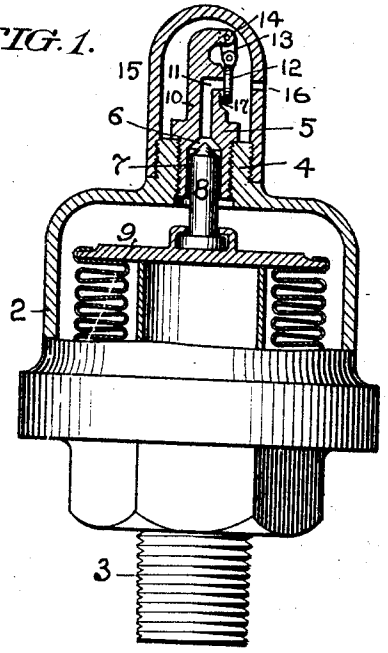


FIG. 3.

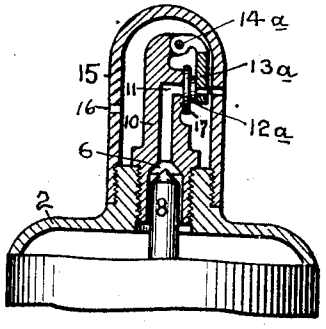
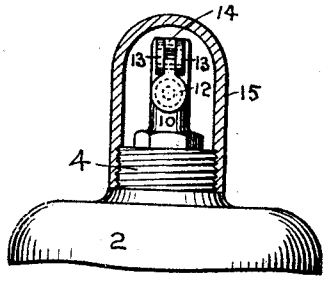


FIG. 2.



INVENTOR.
Hosea K. Kriebel
BY
ATTORNEY.

Patented June 15, 1926. 1,589,009

UNITED STATES PATENT OFFICE.

HOSEA K. KRIEBEL, OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC AIR VALVE.

Application filed August 22, 1922. Serial No. 583,489.

The object of my invention is to provide an effective and positively acting thermostatic air valve for automatically operating as an air venting device for radiators of a steam heating system; and which has also capacity of acting as a check valve to prevent inflow of air in the event of a partial vacuum being created within the radiator by the condensation of the steam therein.

With the above and other objects in view, the nature of which will be more fully understood from the description hereinafter, the inventiion consists in the novel construction of automatic air valves, as hereinafter more fully described and defined in the claims.

Referring to the drawings: Fig. 1 is a side view, with part in section, illustrating my improved automatic air valve; Fig. 2 is an elevation of the upper portion of the same with the hood in section; and Fig. 3 is a vertical section of the character of Fig. 1, but illustrating a modified construction.

2 is the main casing and is provided with a screw threaded nipple 3 for attachment to the radiator. Arranged within this casing is a thermostatic bellows 9 of any suitable construction, containing a volatile fluid or condensable gas, which under the application of steam heat expands to expand the bellows and upon cooling, as when no steam is passing, permits the bellows to contract. Thermostatically operating bellows of this character for use in air valves have been heretofore in use and this device of itself is not of my invention.

The upper part of the casing 2 is provided with a hub 4 having an internal or external screw threaded aperture in which is screwed a plug 5 having a valve seat 6 and a tubular passage 7 leading thereto from the interior of the casing 2. The upper end of the thermostatically operating bellows 9 is fitted with a valve piece 8 which is loosely guided in the tubular passage 7 and is made conical on the top to seat upon the valve seat 6 and thus control the venting orifice from the casing 2 in such manner that when air is passing from the radiator, the bellows 9 holds the valve piece 8 away from its seat 6 and permits the air to escape under the pressure of the steam which drives the air from the radiator. When, however, steam, following the air, attempts to pass through the casing 2, the bellows 9 is expanded and in doing so causes the valve piece 8 to seat and shut off the escape of the steam. If, however, the radiator be shut off from the steam supply, the steam within it will condense and produce a partial vacuum within the same and if not otherwise prevented, would cause air to be sucked through the valve into the casing and thence into the radiator. Similarly, during the operation of the radiator, it sometimes happens that, in case of a severe drop in atmospheric temperature or from a shortage of steam supply, condensation in the radiator takes place to such an extent that a partial vacuum is created and air drawn into the radiator. To prevent this inflow of air, I provide the air valve with a check valve means of specific character which effectively prevents such inflow and this I will now describe.

The plug 5 is provided with a collar or shoulder portion which clamps down upon the top of the hub 4 to make a steam and air tight joint and its upper portion is extended upward in a body 10 having a tubular air passage 11, the bottom thereof opening through the valve seat 6 and its top opening laterally through a vertically arranged valve seat 17. A check valve 12 rests by gravity against the valve seat, so as to act as a check valve to prevent air entering the passage 11 but offering no material obstruction to the escape of air from the passage when venting the radiator. As shown in Figs. 1 and 2, this check valve 12 is hung by links 13 from a pivot 14 in an angular projection at the top of the body 10; and it will be noted that the pivot 14 is slightly to one side of the center of gravity of the valve 12 so that it tends to seat by the action of gravity and hence is very sensitive to pressures in both directions. This air check valve construction is very small and being delicate is protected by a hood 15 in dome form which may either be screwed upon the outside of the hub 4, as shown, or may be made as a tightly fitting sleeve joint. This hood not only protects the check valve structure against injury from breakage, but keeps out dirt and dust. 16 is a side aperture or vent through the wall of the hood to permit the escape of air when venting the radiator.

In place of having the valve 12 in the manner shown in Fig. 1, it may be made as shown in Fig. 3, in which the valve piece 12^a may be loosely carried on the end of an arm 13^a which extends upwardly and in-

wardly to a pivot connection 14ª on the lateral projecting portion of the body 10. In this case, as in that of Figs. 1 and 3, the valve piece seats by gravity.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that I do not restrict myself to the details, as the same are susceptible of modification in various particulars without departing from the spirit or scope of the invention.

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

1. An automatic air valve, comprising a casing and a thermostatic expansive element therein having a valve piece directed upwardly, in combination with a plug in one piece screwed into the upper part of the casing and having an angular tubular passage terminating at the bottom with an air vent seat directed toward and in alinement with the valve piece of the thermostatic element and at its upper part provided with a laterally opening check valve seat whose plane is substantially vertical, and a gravity actuated check valve freely suspended from the plug like a pendulum in a substantially vertical position and normally seating upon the outside of the check valve seat with a very light contact so as to offer practically no resistance to opening in response to a very small pressure released by the thermostatic valve.

2. The invention according to claim 1, wherein further, the plug extends upwardly from the casing and has its check valve seat at a distance above the vent valve seat, and in which the check valve is hung at the outside of the plug extension and freely exposed from all sides, and a hood independent of the check valve and its seat is detachably secured to the casing and extending over the plug to enclose it and the check valve, said hood having a vent aperture and when removed exposing all of the working parts of the check valve and its supporting means whereby they may be directly handled in case of derangement.

In testimony of which invention, I hereunto set my hand.

HOSEA K. KRIEBEL.

H. K. & I. Z. KRIEBEL.

CHECK VALVE.

APPLICATION FILED FEB. 18, 1908.

934,548. Patented Sept. 21, 1909.

Fig. 1

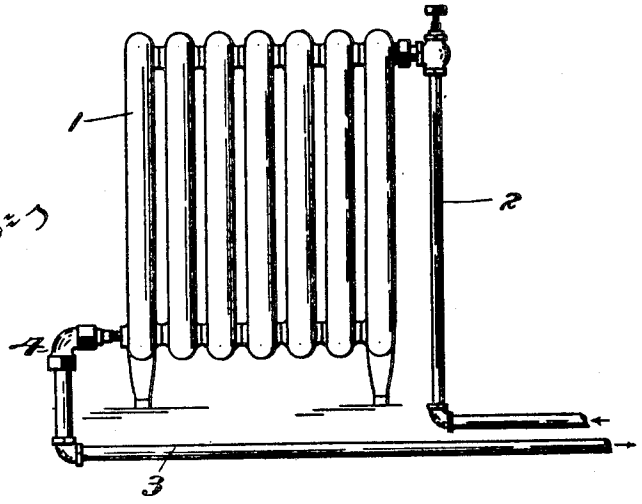
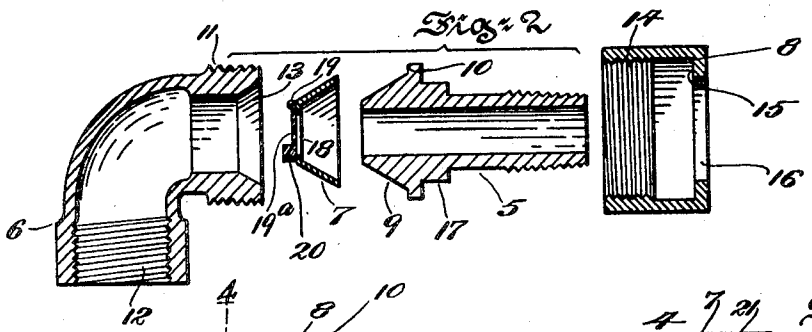


Fig. 2



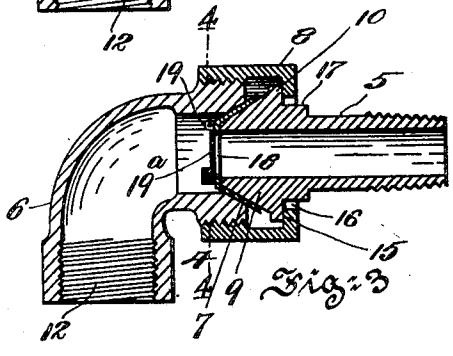


Fig. 3

Fig. 4

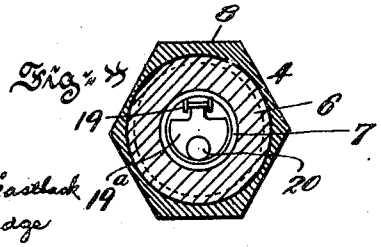


Fig. 5

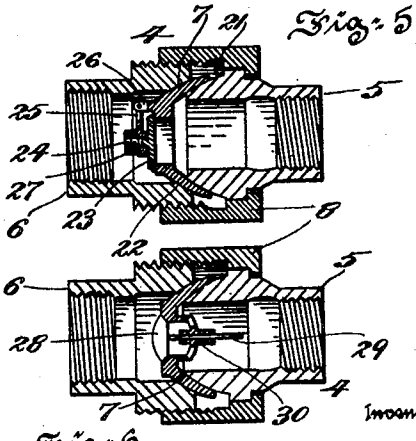


Fig. 6

Witnesses
M. Emmet Eastlack
Eva E. Edge

Inventors.
Theresa K. Kriebel
and Irwin Z. Kriebel
by William E. Jackson
Attorney

UNITED STATES PATENT OFFICE.

HOSEA K. KRIEBEL AND IRWIN Z. KRIEBEL, OF PHILADELPHIA, PENNSYLVANIA.

CHECK-VALVE.

934,548. Specification of Letters Patent. Patented Sept. 21, 1909.

Original application filed April 19, 1907, Serial No. 369,055. Divided and this application filed February 18, 1908. Serial No. 416,457.

To all whom it may concern:

Be it known that we, HOSEA K. KRIEBEL and IRWIN Z. KRIEBEL, both citizens of the United States, and residents of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have jointly invented certain new and useful Improvements in Check-Valves, of which the following is a specification.

This invention consists of an improved check valve intended for use in connection with systems of steam heating such as is described in an application for Letters Patent serially numbered #369,055 and of which the present case is a divisional application; and the principal object of the present invention may be said to be to provide a check valve for radiators to permit of the circulation of steam in one direction only and to permit air and water of condensation to readily escape from the radiators.

A further object is to apply to what is usually termed a steam fitter's union, the valve of the invention without in any way altering the construction of said union.

A still further object is to provide a union having a gravity flap or valve disk which may be properly positioned irrespective of the angle of the union.

Other objects will appear hereinafter.

The invention stated in general terms comprises the improvements to be presently described and finally claimed.

The nature, characteristic features and scope of the invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof and in which:—

Figure 1, is an elevational view of a radiator having applied thereto a check valve embodying the invention. Fig. 2, is a view in central section of the valve parts embodying the invention and illustrating the same about to be assembled. Fig. 3, is a view in central section of the valve parts assembled. Fig. 4, is a view in cross section of Fig. 3. Fig. 5, is a view in central section of a somewhat modified form of the invention; and Fig. 6, is a similar view of a still further modified form of the invention.

In the drawings there is shown a radiator 1, to which is connected a steam supply pipe 2, and a return pipe 3. In the return pipe 3, arranged in juxtaposition to the radiator, is a check valve 4. This check valve permits of a free circulation of steam through the radiator in one direction only and at the same time readily permits of air and water of condensation leaving the radiator. Referring more especially to Figs. 2, 3 and 4, the check valve is shown to comprise what is known as a steam fitter's union consisting of inlet and outlet branches 5 and 6, interposed between the beveled portions of which is a generally dish-shaped, comparatively shallow, member 7, carrying a valve disk, the said branches being securely held to place by means of a coupling or spanner-nut 8. The inlet branch 5, is shown as being in one piece, the inner end of which is considerably enlarged at 9, and is of the configuration of a frustum of a cone terminating in a shoulder 10. The outer end of the branch 6, is screw threaded for application to the outlet end of the radiator. The outlet branch 6, is arranged at an angle to the inlet branch and is externally threaded as at 11, for a purpose to be described and is internally threaded as at 12, for application to the return pipe. The wall of the inner portion of the branch 6, is increased in thickness as shown in order to provide a beveled seat 13. The coupling or spanner-nut 8, is internally threaded as at 14, and is adapted to engage the threaded portion 11, of the branch 6, and its outer portion is provided with a flange 15, which is adapted to abut against the shoulder 10, of the branch 5, the opening 16, of the nut 8, passing over the enlarged part 17, of the said branch. The generally dish-shaped member 7, is shown as being of comparatively thin metal the walls of which are aslant and is provided in its bottom wall with a central opening 18, above which are lugs 19, having pivotal relation with which is a valve-disk 19^a, which may be weighted as at 20. When the parts are assembled, this dish-shaped member 7, is arranged between the two branches so that the part 9, of the inner branch fits within the dish-shaped member 7, and the beveled seat 13, of the branch 6, fits over the dish-shaped member, or in other words are nested one with respect to the other as clearly illustrated on Fig. 3, and may be readily adjusted within the union by merely loosening the nut 8, so that the valve-disk may be shifted to always assume a vertical position irrespective of the various angles in which the union may be placed.

In Fig. 5, the inlet and outlet branches are shown in alinement and the part 21, of the inlet branch is curved convexly, and the part 22, of the outlet branch is curved concavely, and the dish-shaped member is convexly-concavely curved to fit between these parts. The valve disk 23, thereof is provided with a stem 24, which loosely fits within an opening in the arm 25, pivotally hinged from lugs 26, arranged above the opening in the dish-shaped member. The stem is screw threaded for the reception of a nut 27, to confine the disk to the arm.

In Fig. 6, instead of a hinged flap, the dish-shaped member is equipped with a valve-disk 28, having a stem 29, that works through a bearing in the spider 30, otherwise the construction is the same as described in Fig. 5.

It will be readily seen by reference to the drawing that the valves open in a direction away from the taper or slant of the side walls of the dish-shaped members.

What we claim is:—

A check valve comprising a union consisting of a pair of members having their meeting faces inwardly and outwardly beveled to seat each other, a generally dish-shaped member having a vertical valve opening in its bottom wall and a valve therefor adapted to open in a direction away from the taper of said dish-shaped member, said member being positioned between the beveled parts of the union and a nut for coupling the union parts together.

In testimony whereof we have hereunto signed our names.

HOSEA K. KRIEBEL.
IRWIN Z. KRIEBEL.

Witnesses:
WILLIAM S. JACKSON,
HOWARD E. LINDERMAN.