

No. 634,547.

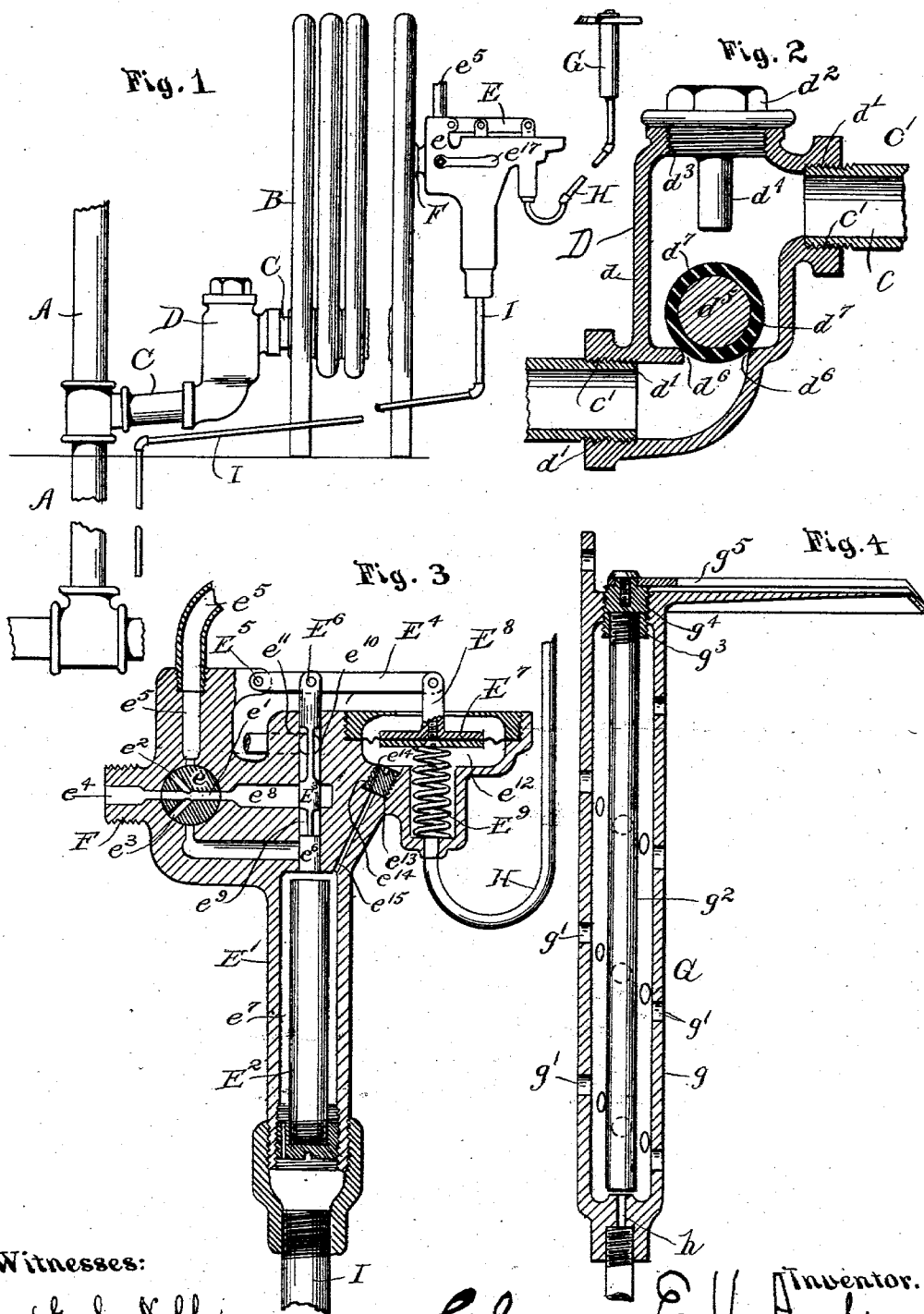
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STEAM HEATING APPARATUS AND DEVICE FOR CONTROLLING ACTION THEREOF.

(No Model.)

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STEAM HEATING APPARATUS AND DEVICE FOR CONTROLLING ACTION THEREOF.

SPECIFICATION forming part of Letters Patent No. 634,547, dated October 10, 1899.

Application filed May 31, 1899. Serial No. 718,896. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE E. VAN AUKEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam Heating Apparatus and Devices for Controlling the Action Thereof, of which the following, when taken in connection with the drawings accompanying and forming a part hereof, is a full and complete description, sufficient to enable those skilled in the art to which it pertains to understand, make, and use the same.

This invention relates to a steam heating apparatus comprising a radiator, means for discharging steam thereinto, alternately-operative temperature and hand controlled means for determining the actively-operating heating area of the radiator, means for supplying steam to the radiator, means for discharging water of condensation from the radiator, means for inducing steam to enter the radiator, and means for substituting air for steam in the radiator to vary the actively-operating heating area thereof, as desired, by hand and as automatically required by the temperature-controlled apparatus.

The invention consists, essentially, in the construction of devices and connecting the same to the radiator, so that by the operation thereof steam will be discharged into the radiator from the steam-supply pipes, water of condensation will be discharged from the radiator to such steam-supply pipes, either by force or gravitation, (and thereby a connecting of the branch pipe of the steam-riser at a point above the top of the radiator or the raising of the steam while in the branch pipe to above the top of the radiator before such steam is delivered into the radiator or an air-column or an ordinary steam-valve interposed in the steam-supply pipes between the radiator and the steam-supply riser is obviated,) and the connection of the branch steam-supply to the steam-supply riser is made at a point permitting the water of condensation to be discharged therethrough to the riser, thus obviating the necessity of a water-of-condensation discharge-pipe independent of the steam-supply pipe, and, further, in the construction of devices and connecting the same to the radiator, so that by

the operation thereof the radiator will contain a variable quantity of steam as required by the automatically-controlled devices or as desired and determined by the hand-controlled devices.

In the drawings referred to and forming a part hereof and in which a letter of reference applied to designate a given part is used to indicate such part throughout the several views wherever the same appears, Figure 1 is an elevation of a radiator, a steam-riser supplying steam to the radiator by means of a branch pipe, mechanism interposed in the branch pipe between the radiator and the riser, a combined temperature and hand controlled apparatus attached to the radiator for determining the actively-operating heating area of the radiator, and a thermostat device connected to the apparatus adapted to be operated by hand or by thermostatic means; Fig. 2, a vertical sectional view of the mechanism interposed in the branch pipe between the radiator and the riser, whereby steam is permitted to flow freely into the radiator from the riser, water of condensation is permitted to flow freely from the radiator to the riser, and air is prevented from flowing from the radiator to the riser; Fig. 3, a vertical sectional view of the temperature and hand controlled apparatus—that is, an apparatus adapted to be operated by hand or by thermostatic means—attached to the radiator; and Fig. 4, a vertical sectional view of the thermostat device communicating with the temperature and hand controlled apparatus. The several vertical sectional views Figs. 2, 3, and 4 are on an enlarged scale.

A is a steam-riser.

B is a radiator.

C is a branch pipe forming a communicating passage-way between the riser A and the radiator B.

D is an automatically-operating valve mechanism, hereinafter fully described, interposed in the branch pipe C between the riser A and the radiator B.

E is a combined temperature and hand controlled apparatus—that is, an apparatus adapted to be operated by hand or by thermostatic means—attached to the radiator, as at F and having attached thereto the thermostat device, as by the communicating pipe

H, by means of which the actively-operating area of the radiator is varied in the manner hereinafter fully described, and also steam is prevented from passing from the radiator to the pressure-reducing pipe I of the system.

The automatically-operating mechanism D comprises the casing d , to the lower end of which the branch steam-supply pipe C is attached in the ordinary way, as by screw-threads C' thereon fitting into the corresponding screw-threads d' in the casing d and to the upper end of which a continuation of such branch pipe C is secured in the same manner, as by the screw-threads C' thereon fitting into the screw-threads d' , the cap d^2 , secured in place by screw-threads d^3 thereon fitting into corresponding screw-threads in the casing d , the spindle d^4 , extending downward into the casing from the under side of the cap d^2 , and the float-valve d^5 , seating to close the aperture d^6 . The float-valve d^5 is preferably constructed of an inner core of wood having an outer covering of rubber, such rubber coating being lettered d^7 in Fig. 2.

The temperature and hand controlled apparatus E comprises the hand-controlled stem e , (provided with passage-ways e' , e^2 , and e^3 therein,) rotatably mounted in the casing E' , such casing provided (adjacent to such stem) with the passage-way e^4 , communicating with the radiator, passage-way e^5 , communicating with a source of air-supply having a pressure greater than the pressure of steam used as a heating fluid in the radiator, and passage-way e^6 , communicating with the reduced pressure-pipe I of the system, as by means of passage-way e^7 , in which is placed the expansible member E^2 , as illustrated in Fig. 3 of the drawings, to form a hand-controlled cock, by means of which the temperature-controlled portion of such apparatus may be shut out of operation (relative to the radiator) and air under pressure greater than the heating fluid admitted to the radiator or air contained in the radiator withdrawn therefrom and the radiator completely filled with steam in addition to the thermostat-controlled portion thereof. Such thermostat-controlled portion comprises the valve E^3 , seating to close communication between passage-way e^8 and passage-ways e^9 and e^{10} and to be moved from such seating to establish communication between passage-way e^8 and passage-way e^{10} , air-inlet e^{11} to passage e^{10} , communicating with a source of air-supply having a pressure greater than the pressure of the heating fluid in the radiator, (such source being preferably the same one from which air is supplied to passage-way e^5), lever E^4 , fulcrumed at E^5 and connected to the stem of valve E^3 , as at E^6 , diaphragm E^7 to chamber e^{12} and the connection E^8 between diaphragm E^7 and lever E^4 , spring E^9 in chamber e^{12} , and adjustable plug e^{13} , having passage-way e^{14} therethrough adjustably restricting passage-way e^{15} , such passage-way e^{15} extending from chamber e^{12} to the passage-way or chamber e^7 .

The connecting conduit or pipe H between this hand and temperature controlled apparatus and the thermostat device G discharges into the chamber e^{12} , as is illustrated in Fig. 3.

The thermostat device (illustrated in vertical section in Fig. 4) comprises the casing g , having apertures g' g' therein, and the adjustable member g^2 , seating to close the passage-way h to conduit or pipe H, when the temperature to which such expansible member is adjusted is obtained and to retract and open such passage-way h when the temperature is less than that to which such expansible member is adjusted. The adjustment of the expansible member g^2 is obtained by securing the upper end thereof in cap g^3 , such cap being provided with external screw-threads g^4 , fitting into corresponding screw-threads in the casing g , and handle or lever g^5 , by means of which its adjustment may be readily varied.

The operation of the automatically-operating valve mechanism D is substantially as follows: When the pressure of the contents of the radiator B is less than is the pressure of the contents of steam-riser A and branch pipe C, steam will pass through the branch pipe C, aperture d^6 , (thereby raising the float-valve d^5), and into the radiator. Water of condensation forming in the radiator will flow through the passage-way d^6 and branch pipe C into riser A, raising by gravity the float-valve d^5 from its seat. The raising of the float-valve d^5 by the water of condensation flowing into the riser from the radiator is done independently of and may be additional to the raising of such float-valve by the steam passing from the riser through such opening d^6 into the radiator, and when, as described, water of condensation is passing in one direction through opening d^6 from the radiator and steam is passing in the opposite direction through such opening d^6 into the radiator such float-valve d^5 will be raised a sufficient distance to permit the passage of both such fluids through such aperture and no farther. The raising of the float-valve d^5 is therefore automatically controlled by the combined operative force of the steam passing into the radiator and the water of condensation passing out of the radiator, and it occurs that the velocity of the steam passing into the radiator through the passage-way d^6 is sufficient to prevent the passage of air from the radiator through such passage-way d^6 into the riser A. In practice I have found that when water of condensation is passing out of the radiator and steam is passing into the radiator through the passage-way d^6 such water of condensation appears to flow adjacent to the walls of the casing d and the steam to pass through the casing in the axial center thereof and of the aperture d^6 .

The operation of the hand-controlled portion of the hand and temperature controlled apparatus E is very simple, and consists merely in turning the handle e^{17} (illustrated in Fig.

1) on the plug *e* so that the several passage-ways *e'*, *e²*, and *e³* or some one thereof shall register with passage-ways *e⁴*, *e⁵*, *e⁶*, and *e⁸*, or some one thereof, as required for the purpose. For instance, when the temperature-controlled portion of the apparatus E is to be made operative the handle *e¹⁷* is to be turned into position so that the passage-way *e'* in the plug *e*, controlled by such handle, shall register with passage-ways *e⁴* and *e⁸*. When the steam in the radiator is to be (as fast as such steam is reduced into water of condensation) replaced by air, the handle *e¹⁷* is to be turned so that the passage-way *e³* will register with passage-way *e⁴* and passage-way *e²* will register with *e⁵*. When the quantity of steam to be continuously contained in the radiator is to be determined by the hand-operated portion of this apparatus, the handle *e¹⁷* is to be turned until the passage-way *e²* in the plug *e* registers with passage-way *e⁴* and passage-way *e³* registers with passage-way *e⁶*. Steam will then continuously enter the radiator until the radiator is filled with steam or until the position of the handle *e¹⁷* is changed. Such handle may be changed when the radiator is partially filled with steam, so that the actively-heating area of the radiator will remain unchanged by turning the handle *e¹⁷*, (after the right quantity of steam is obtained in the radiator by the passage-ways *e²* *e⁴* and *e³* *e⁶*, registering,) so that the passage-way *e⁴* is closed by the plug *e*, either because none of the passage-ways *e'* *e²* *e³* register with such passage-way *e⁴* or because if any of such passage-ways do register with passage-way *e⁴* none of passage-ways *e'* *e²* *e³* register with either passage-way *e⁵*, *e⁶*, or *e⁸*. The foregoing manipulation of the handle *e¹⁷* constitutes what I term "hand-regulation" by this system.

The operation of the temperature-controlled portion of the apparatus is not new and is fully set out in Letters Patent No. 625,306, dated May 16, 1899, steam-heating systems, and the same is not, therefore, herein described, such operation being attained when such handle *e¹⁷* is turned so that passage-way *e'* is in the position illustrated in Fig. 3 of the drawings, with passage-way *e'* therein registering with passage-ways *e⁴* *e⁸*. It is evident that a key or wrench may be substituted for handle *e¹⁷* if the hand-regulation, as well as the temperature-controlled regulation, of this heating apparatus is not to be controlled by those coming casually adjacent to the radiators of the system.

It is evident that the term "reduced-pressure pipe" as hereinbefore used applies to a pipe. The contents thereof are at a pressure less than is the pressure of the steam used in the heating system embodying this invention and that the air-supply from which the passage-ways *e⁵* and H obtain whatever air passes therethrough should be under pressure greater than is the pressure of such steam—that is, if steam above atmospheric pressure is used in this system the air must

be of still greater pressure, while if steam of less than atmospheric pressure is used in this system the air may be at atmospheric pressure, and the contents in such case of such reduced-pressure pipe must have a pressure of less than atmospheric pressure and below the steam-pressure.

Observation of the operation of this system as a whole makes it evident that the pressure of air-supply, being greater than the pressure of the steam-supply, when no steam is contained in the radiator the air in such radiator will press the valve *d⁵* firmly on its seat under a pressure equal to the difference in pressure of the air-supply and the steam-supply of the system and no air can at any time enter the steam-supply pipes of the system from the radiators of such system, while water of condensation may at all times flow from the radiators into the steam-supply pipes of the system, the pressure in the radiator and steam-supply pipes being equalized and such valve being lifted by flotation, and steam may at all times when the pressure of the contents of the radiator is substantially at or less than the pressure of the contents of the steam-supply pipe flow from such steam-pipes into such radiator. The radiator being full of air of course no condensation of steam occurs therein, and it will be understood from the foregoing that the statement is not made that at such time there is any water of condensation in the radiator to flow back therefrom to the steam-supply pipes of the system; but it will be distinctly understood that even if a small portion only of the radiator be filled with steam (by the action either of the hand or temperature controlled portion of the apparatus E) steam will constantly enter the radiator from the steam-supply pipes of the system and water of condensation will suddenly flow from the radiator from the steam-supply pipes of the system.

When the method of controlling the action of a steam-heating plant embodied in the hereinbefore-described apparatus is to be embodied in a two-pipe system—that is, where the steam is supplied at one end of the radiators and the water of condensation is discharged from the other end of the radiators to a return-pipe—it will simply be necessary to place one of the automatically-operating valve mechanisms D at the discharge end of the radiator to communicate with the water-of-condensation return-pipe, as well as to place such mechanism in the steam-supply pipes of the several radiators, as hereinbefore described.

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

1. In an automatically-operating mechanism to be interposed adjacent to a radiator in the branch pipe of the steam-supply, a valve-casing, attachable to the branch pipe from the supply-riser and to the radiator, and

provided with a passage-way communicating with the branch-pipe aperture and with the radiator's aperture, such communicating passage-way provided with a valve-seating, a float-valve arranged to fit the valve-seating and close the passage-way, and to be moved from such seating by steam passing from the steam-supply to the radiator, and by water of condensation passing from the radiator to the steam-supply; substantially as described.

2. In a steam heating apparatus, a radiator, an air-supply pipe and a reduced-pressure pipe, in combination with an automatically-operating valve mechanism consisting of a casing attachable to the radiator and to the steam-supply branch pipe, such casing provided with a passage-way therethrough having a valve-seating therein, and a float-valve arranged to automatically open to permit steam to pass from the branch pipe to the radiator when the pressure in the radiator is less than the pressure of the steam, to automatically open by flotation to permit water of condensation to pass from the radiator to the steam-supply branch pipe, and to automatically seat against the passage of air from the radiator to the branch pipe, and means for reducing the pressure of the contents of the radiator to less than the pressure of the steam supplied to the radiator through the branch pipes; substantially as described.

3. In a steam heating apparatus, the combination of a steam-supply pipe, a radiator, a branch pipe between the supply-pipe and the radiator, an automatically-operating valve mechanism in the branch pipe consisting of a casing attachable to the radiator and to the branch pipe, such casing provided with a passage-way therethrough having a valve-seating therein and a float-valve seating to close such

passage-way and to be moved from such seating to open the passage-way by steam passing into the radiator and by water of condensation passing from the radiator to the branch pipe, the arrangement of parts being such as to prevent the entrance of air to the steam-supply pipe, with a hand-operated mechanism for admitting air to the radiator from an air-supply having a pressure greater than the pressure of the steam in the radiator, and for opening communication between the radiator and a reduced-pressure pipe; substantially as described.

4. In a steam heating apparatus, the combination of a steam-supply pipe, a radiator, a branch pipe between the supply and the radiator, an automatically-operating valve mechanism in the branch pipe, consisting of a casing attachable to the radiator and to the branch pipe such casing provided with a passage-way therethrough having a valve-seating therein, and a float-valve seating to close such passage-way and to be moved from such seating to open the passage-way by steam passing into the radiator and by water of condensation passing out of the radiator, the arrangement of parts being such as to prevent the entrance of air from the radiator to the steam-supply pipe, with an apparatus adapted to be operated by hand or by thermostatic means for admitting air to the radiator from an air-supply having a pressure greater than the pressure of the steam in the radiator and for opening communication between the radiator and the reduced-pressure pipe, and a reduced-pressure pipe, substantially as described.

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In presence of—

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