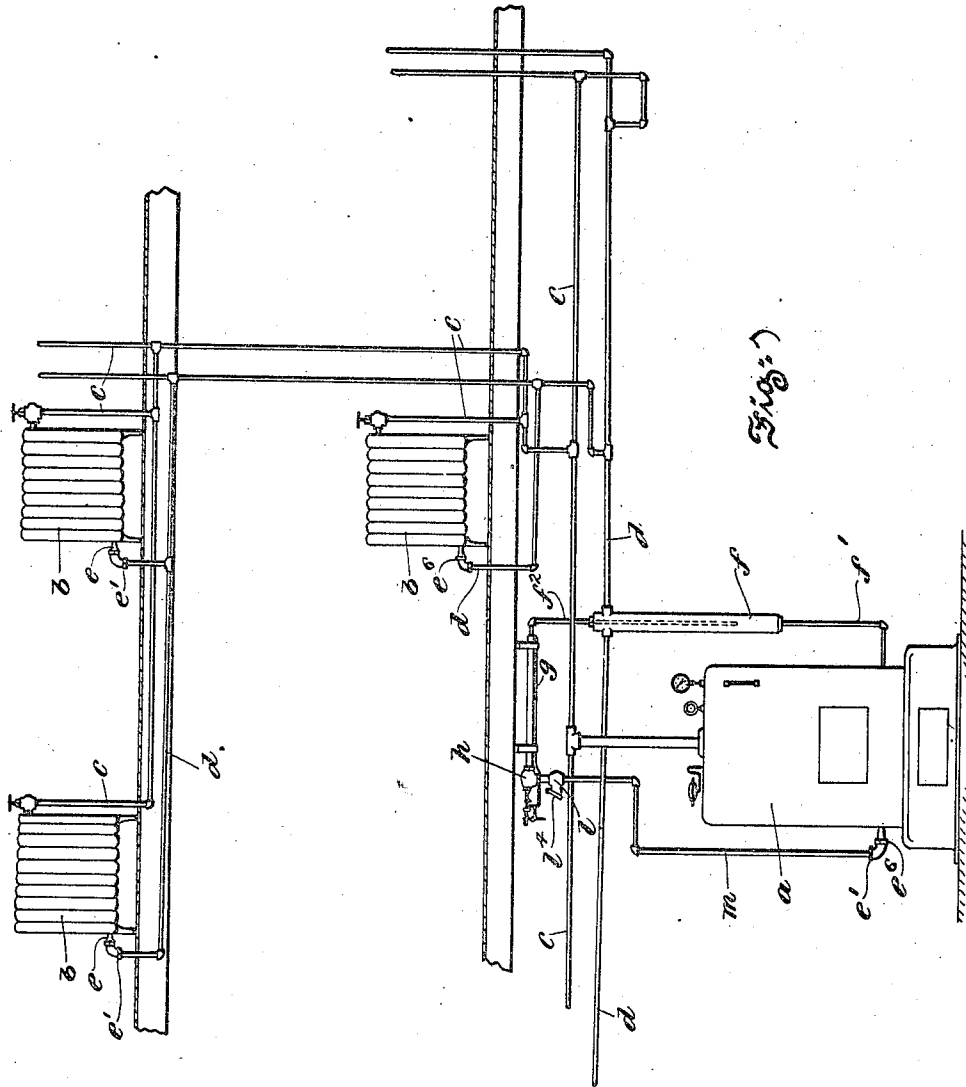


H. K. & I. Z. KRIEBEL.
SYSTEM OF STEAM HEATING.
APPLICATION FILED APR. 19, 1907.

968,668.

Patented Aug. 30, 1910.

2 SHEETS—SHEET 1.



Witnesses:
M. H. Egan
Ernest Rose

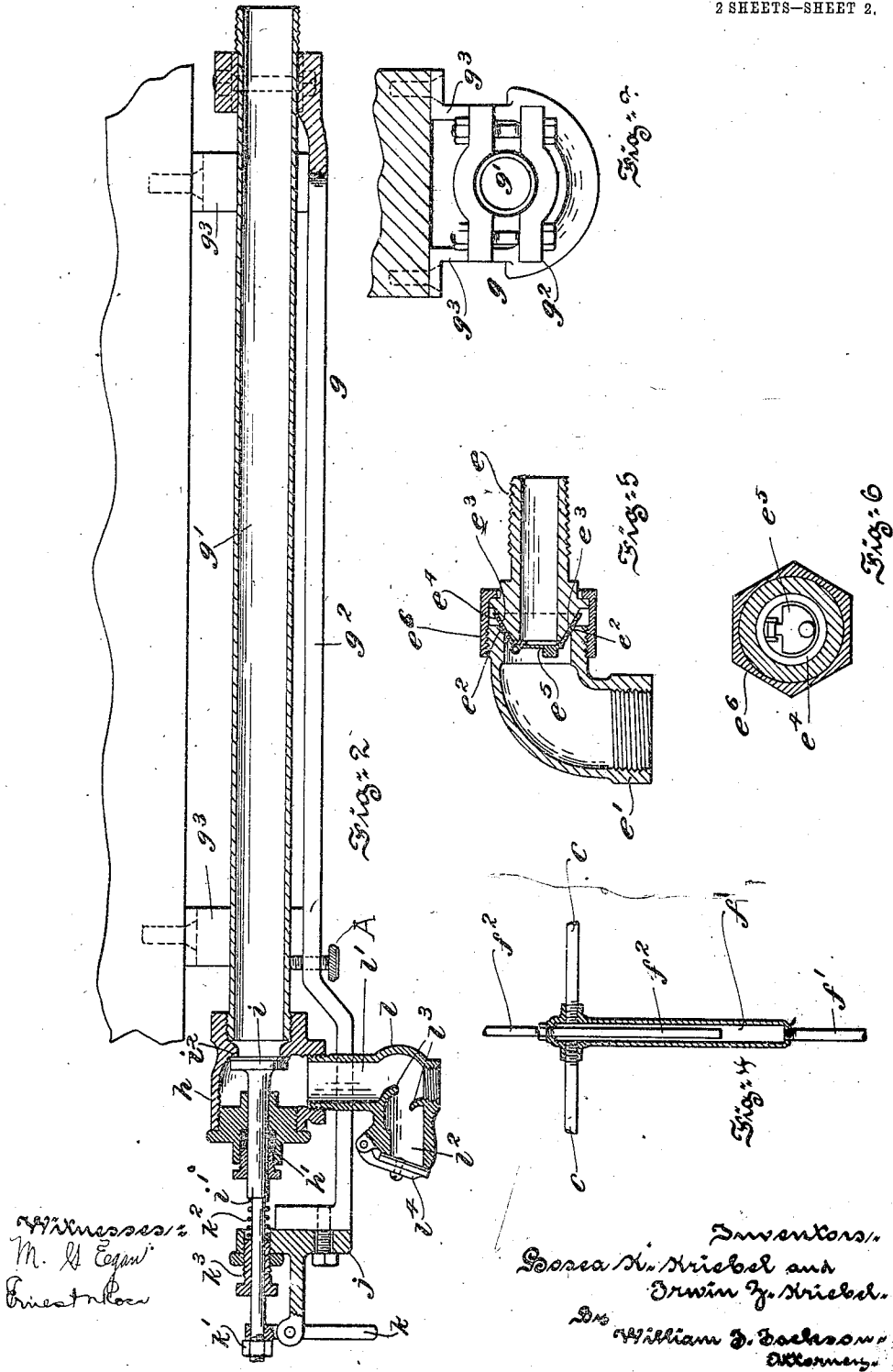
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UNITED STATES PATENT OFFICE.

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 there-through 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 alignment 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.

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IRWIN Z. KRIEBEL.

Witnesses:

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