G. E. HULSE.

SYSTEM OF HEATING.

APPLICATION FILED APR. 10, 1909.

1,052,923.

Patented Feb. 11, 1913.

2 SHEETS—SHEET 1.

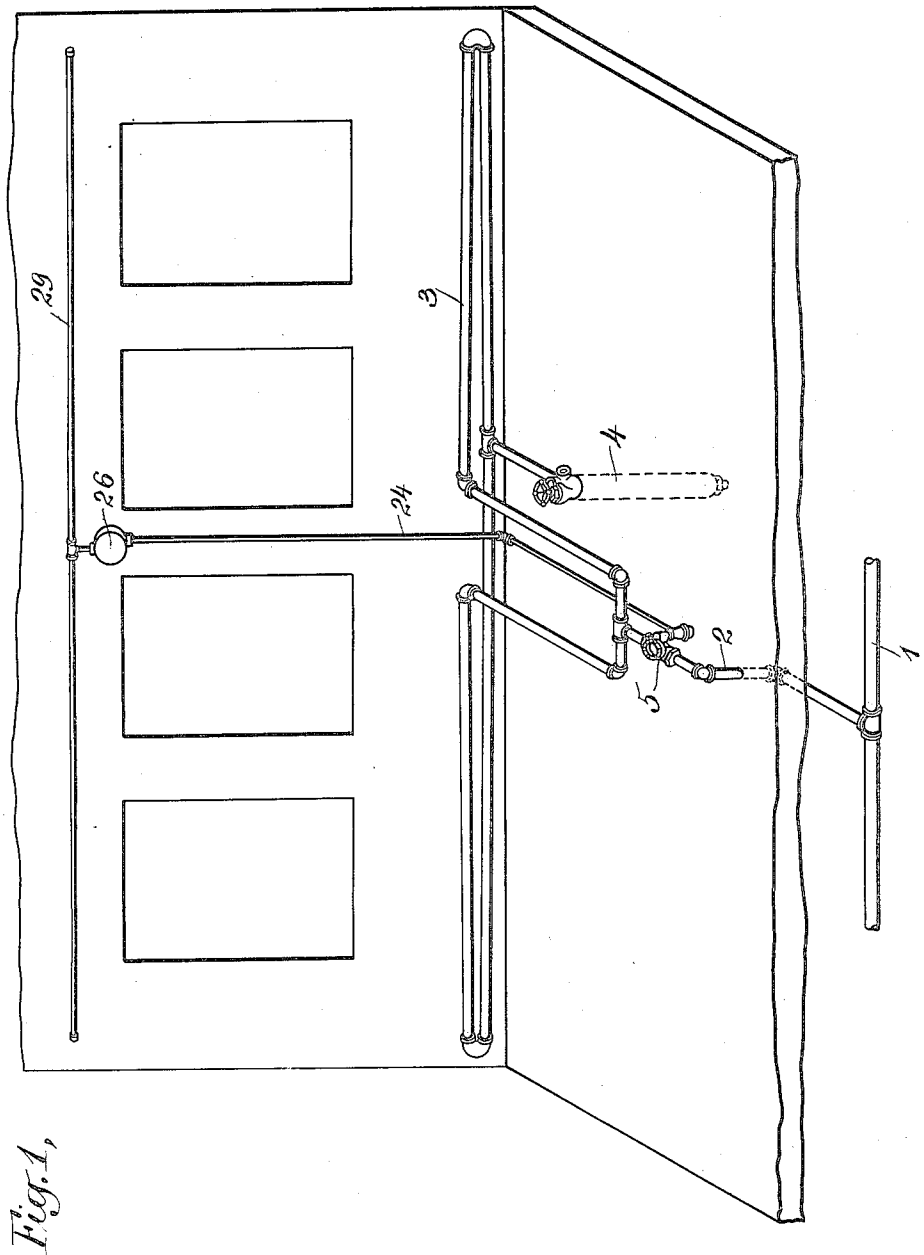

Fig. 1.

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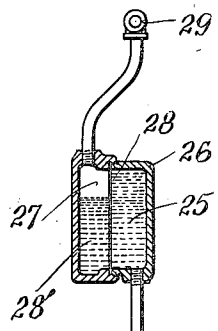


Fig. 2,

Fig. 4.

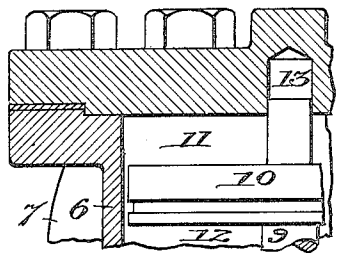
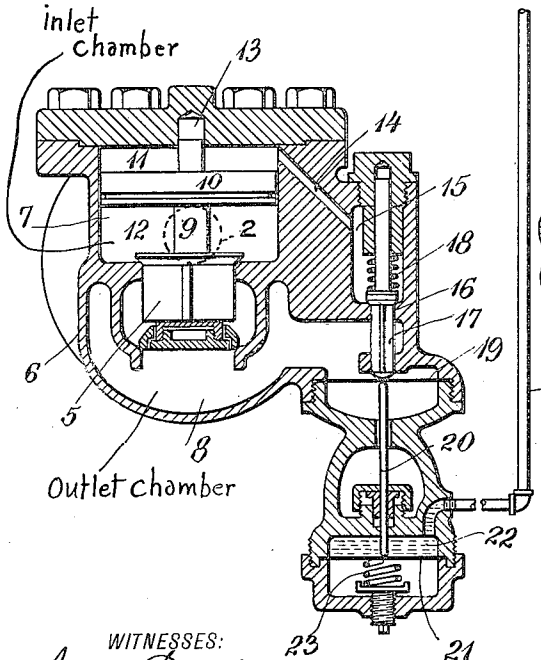
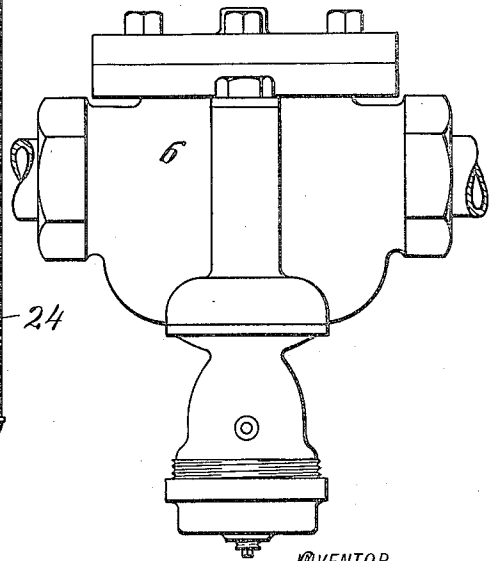


Fig. 3,





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UNITED STATES PATENT OFFICE.

GEORGE EGBERT HULSE, OF NEWARK, NEW JERSEY, ASSIGNOR TO SAFETY CAR HEATING & LIGHTING COMPANY, A CORPORATION OF NEW JERSEY.

SYSTEM OF HEATING.

1,052,923. Specification of Letters Patent. Patented Feb. 11, 1913.

Application filed April 10, 1909. Serial No. 489,224.

To all whom it may concern:

Be it known that I, GEORGE E. HULSE, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Systems of Heating, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to heating systems and more particularly to car heating systems.

One of the objects thereof is to provide an efficient heating system in which the temperature of an apartment is automatically maintained substantially constant.

Another object is to provide a device to be used in a system of this character which will be quick to respond to variations in temperature, and which will be positive in its action.

Another object is to provide a device of this character which will be simple in operation and which will be of durable and economical construction.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, wherein is shown one of various possible embodiments of the invention, Figure 1 is a perspective view illustrating the relative positions of the various parts of the system; Fig. 2 is a vertical, sectional view taken through the automatic regulator and the main valve; Fig. 3 is a side elevation of the valve; and Fig. 4 is an enlarged detail view of the piston in the inlet chamber.

In the drawings, in which similar reference numerals indicate similar parts throughout the several views, the system is shown as applied to a railway car, for which use it is peculiarly adapted.

A train pipe 1 which is in connection with a source of supply of a heated medium, preferably steam from a locomotive, is connected by branch piping 2 to the radiators 3 located in the various cars, the said radiators being connected to a suitable trap 4 through which the water of condensation is drained. Interposed in the branch piping 2 is a valve 5 located within a suitable casing 6 provided with inlet and outlet chambers 7 and 8. The valve 5 is provided with a stem 9 to which is secured a disk or piston 10 so positioned as to divide the inlet chamber 7 into upper and lower portions 11 and 12 and adapted to permit a leakage of fluid from said portion 12 to said portion 11 whereby the pressures in said portions are normally equalized, and the upper portion of the valve stem 9 preferably engages with a socket 13 formed in the casing, whereby it is guided in its movements. The upper portion 11 of the chamber 7 communicates by a conduit 14 with the chamber 15 provided with an opening 16 communicating with the outlet chamber 8 of the valve casing 6, and the flow of the heated medium through said opening 16 is controlled by the auxiliary valve 17 which may be provided with a suitable spring 18 adapted to hold said valve upon its seat. The outer extremity of said auxiliary valve operatively engages a diaphragm 19 secured to the valve casing in any suitable manner. A spindle 20 mounted to reciprocate within the casing is positioned with one of its ends engaging said diaphragm 19 and its other end engaging a diaphragm 21 secured within the lower portion of the casing and forming therewith a chamber 22. A spring 23 tends to raise said diaphragm and said spindle to unseat the auxiliary valve 17, the tension of said spring being greater than the tension of the spring 18. A conduit 24 communicates at one end with the chamber 22 and at its opposite end with the chamber 25 formed within the regulator casing 26 and separated from chamber 27, also formed in said casing, by a flexible diaphragm 28, and said chambers 22 and 25 and the communicating conduit 24 are completely filled with a non-expansive liquid by means of which movement of the diaphragm 28 will be communicated to the diaphragm 21. The chamber 27 contains a volatile liquid 28′ such as chloroform the vapor of which completely fills the piping 29, the ends of which are closed and which preferably extends substantially throughout the length of the car above the windows thereof and is in communication with said chamber as clearly

shown in Fig. 1. The regulator casing is preferably mounted upon the side wall of the car adjacent the piping 29.

The operation of the system, which should be largely obvious from the above description, is as follows: Supposing the temperature of the car to fall below a certain predetermined point, the pressure of the vapor within the piping 29 and chamber 27 will be decreased, permitting the diaphragm 28 to move to the left in Fig. 2, and the spring 23 acting against diaphragm 21 will force the same upward, forcing the non-expansible liquid out of the chamber 22 and causing it to move upward in the piping 24 and simultaneously will cause the stem 20 to move upward, thereby unseating the auxiliary valve 17. As soon as said valve is unseated the pressure upon the upper surface of the piston 10, which, of course, is equal to that acting upon the lower surface of said piston, will be relieved, the heated medium being permitted to pass therefrom through the conduit 14, valve chamber 15, and opening 16, into the lower or outlet chamber 8 of valve casing 6. When the pressure upon the upper surface of said piston is thus relieved the pressure acting upon the lower surface of said piston will cause the valve 9 to move off of its seat, thus permitting the heated medium to flow to the radiators 3. If, now, the temperature rises above said predetermined point the pressure of the vapor in piping 29 and chamber 27 will increase, thus causing a reverse movement of the diaphragm 28 which in turn will force the non-expansible liquid downward through the pipe 24 into the chamber 22, causing the diaphragm 21 to be moved against the tension of the spring 23 and permitting the spring 18 to seat the auxiliary valve 17, which results in closing the outlet of the upper portion 11 of the inlet chamber 7. The pressure upon the upper surface of the piston 10 will then equal the pressure upon the lower surface thereof, and on account of the pressure acting upon the upper surface of said valve it will be seated, thus cutting off the supply of the heated medium from the radiators.

While the system has been shown as applied to, and as peculiarly adapted to, a railway car, it will, of course, be understood that it could be installed in any building or apartment wherein it is desired to maintain a constant temperature.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

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

1. In a heating system, in combination, piping adapted to convey a heated medium from a source of supply to a radiating means, a chamber interposed in said piping, a valve in said chamber, a stem attached to said valve, a piston attached to said stem and dividing said chamber into an upper and lower portion, a second chamber, a conduit leading from said first mentioned chamber thereto, an auxiliary valve seated in said second chamber, means adapted to actuate said auxiliary valve to permit fluid contained in said first mentioned chamber to flow therefrom through said conduit to said second mentioned chamber, said means comprising a fluid-containing chamber provided with a diaphragm, a spindle having one end resting on said diaphragm, and a second diaphragm contacting with the other end of said spindle, said fluid being adapted upon motion therein to move said diaphragms to thereby actuate said auxiliary valve in accordance with changes in the temperature in said system.

2. In a heating system, in combination, a valve, means for controlling the movement thereof, comprising a chamber, a diaphragm in said chamber, a spindle resting on said diaphragm, a second diaphragm contacting with the other end of said spindle, and heat sensitive means adapted to move said spindle comprising a reservoir containing a non-expansive liquid, piping permitting said liquid to fill said chamber and said reservoir, and a second set of piping extending substantially throughout the length of said compartment and provided with the vapor of a volatile liquid.

3. In a heating system, in combination, a chamber, a valve situated therein, a diaphragm contacting with said valve, a spindle contacting with said diaphragm and adapted to move said valve, means adapted to move said spindle comprising a second diaphragm situated in a second chamber containing a non-expansive liquid, and a closed pipe containing a portion of the vapor of a volatile liquid.

4. In a heating system, in combination, a valve situated in a chamber, one end of said valve resting on a diaphragm, a spindle contacting with the other side of said diaphragm at a point below said valve, the other end of said spindle resting on a second diaphragm situated in a second chamber, said second chamber being supplied with a

non-expansive liquid by piping leading from a liquid-containing chamber, said liquid-containing chamber being divided into two portions, one of said portions containing a quantity of non-expansive liquid, the other compartment of said chamber containing a volatile liquid, and a second pipe extending substantially throughout the length of the compartment to be heated, said pipe being connected to said liquid-containing chamber and normally adapted to contain vapor produced by said volatile liquid, whereby said valve will be operated in accordance with changes in the condition of said vapor.

5. In a heating system, in combination, a casing comprising a chamber for receiving fluid, a valve therein, a piston attached to said valve and situated in said chamber, said piston being constructed to permit leakage of fluid thereabout, a second chamber communicating with said first chamber, an auxiliary valve therein, and means adapted to actuate said auxiliary valve, comprising a heat sensitive medium acting upon a non-expansive liquid acting in turn on a diaphragm, said diaphragm acting to move a spindle, said spindle being adapted to move a second diaphragm, said second diaphragm being adapted to move said auxiliary valve.

In testimony whereof I affix my signature, in the presence of two witnesses.

GEORGE EGBERT HULSE.

Witnesses:
E. E. ALLBEE,
W. L. GARLAND.