

E. E. GOLD.
STEAM HEATING SYSTEM.
APPLICATION FILED NOV. 3, 1910.

1,059,356.

Patented Apr. 22, 1913.

4 SHEETS-SHEET 1.

Fig. 1.

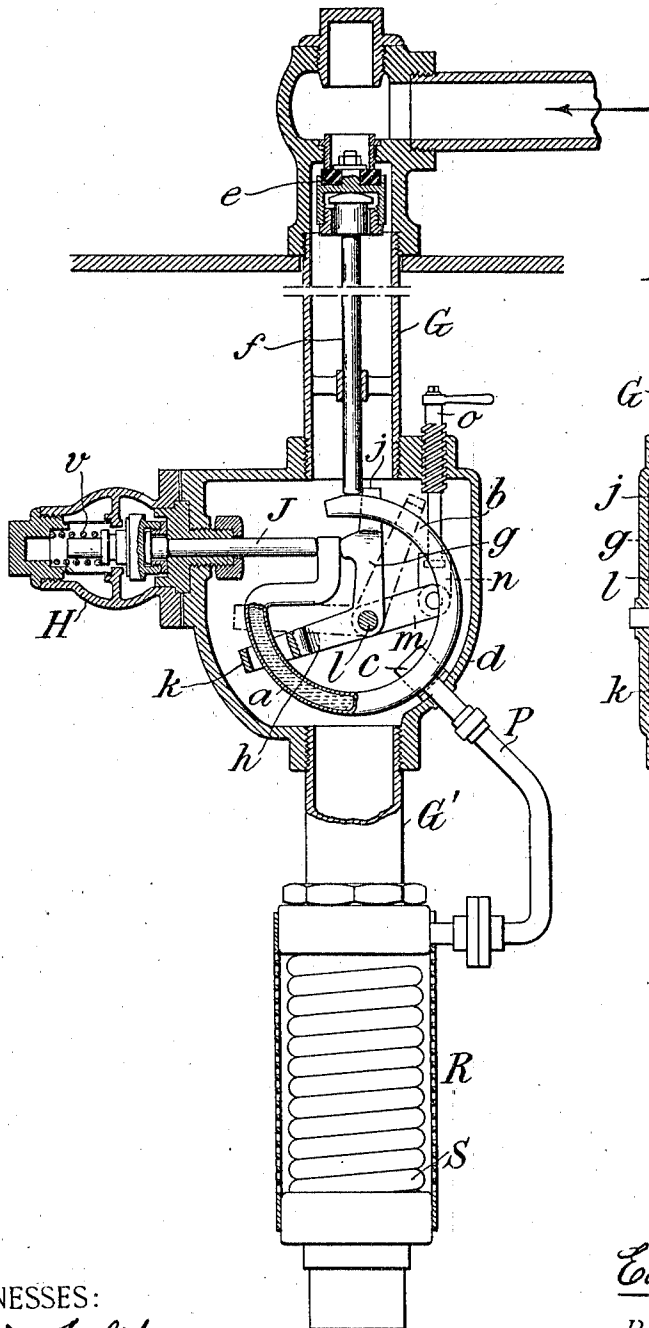
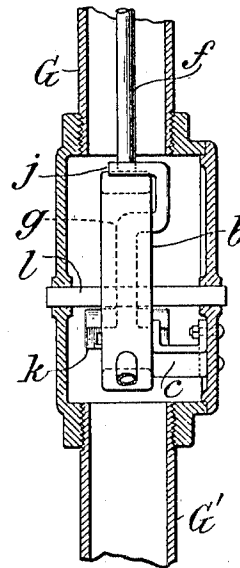


Fig. 2.



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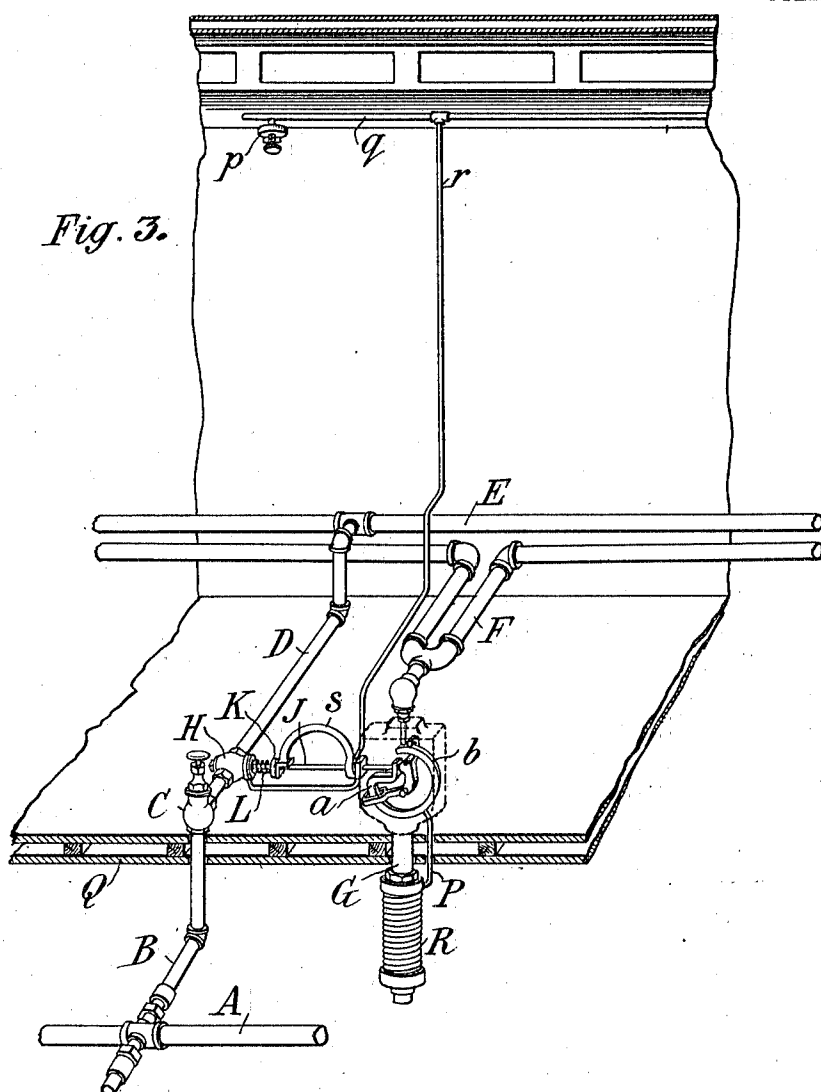
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4 SHEETS—SHEET 2.



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4 SHEETS-SHEET 3.

Fig. 4.

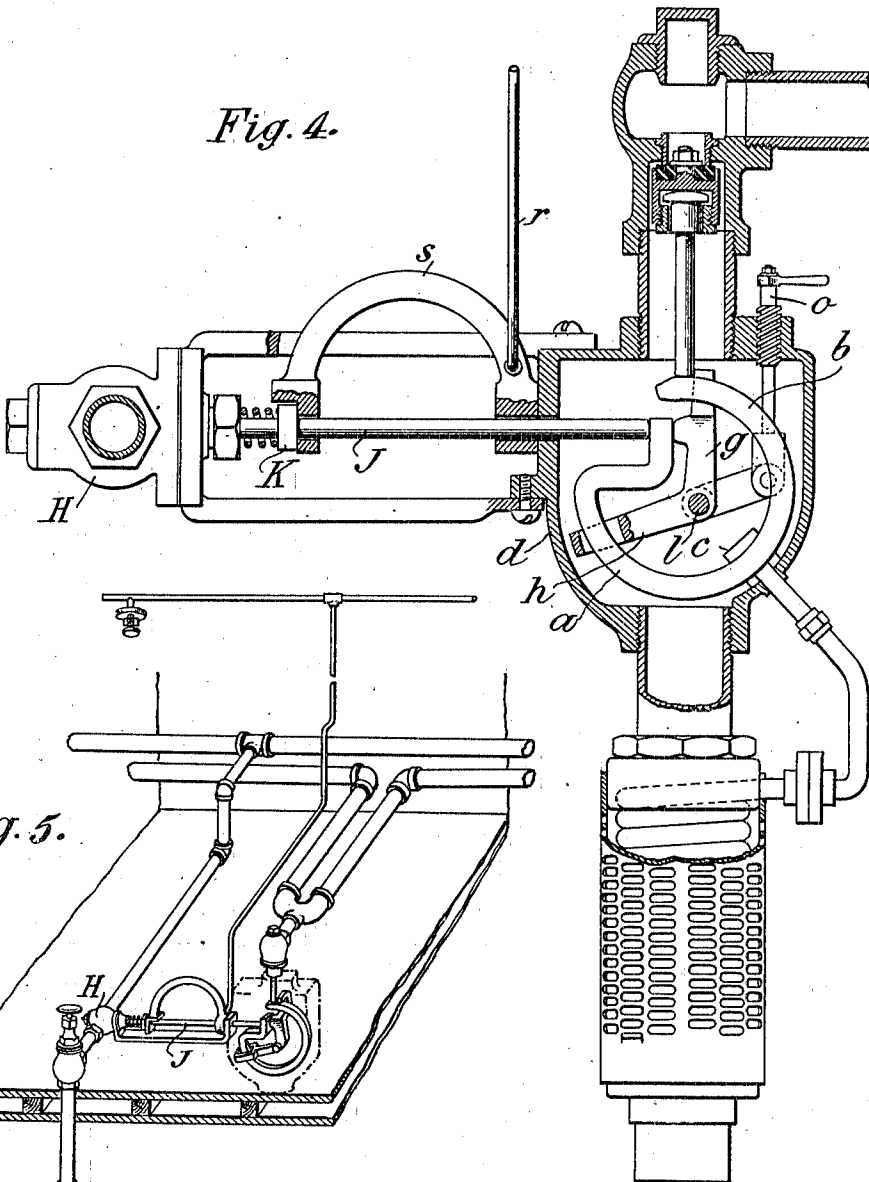
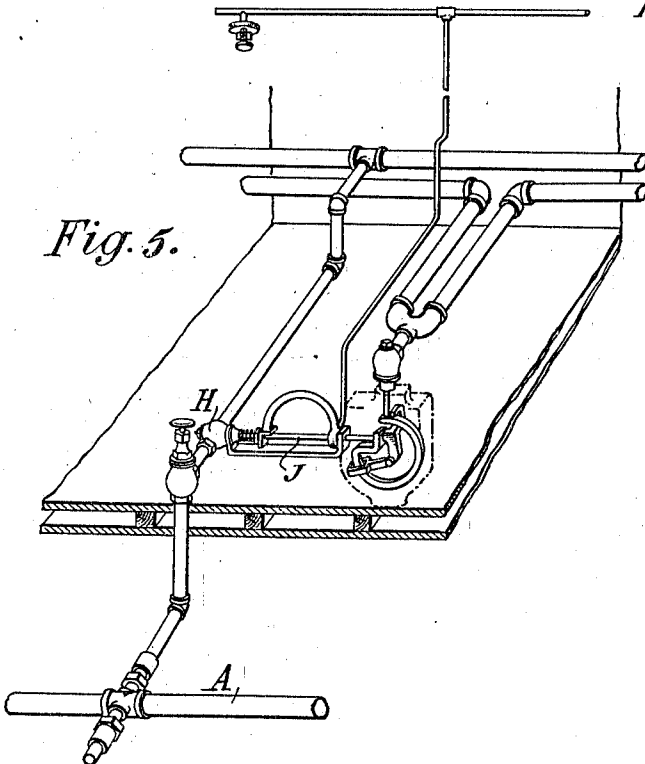


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

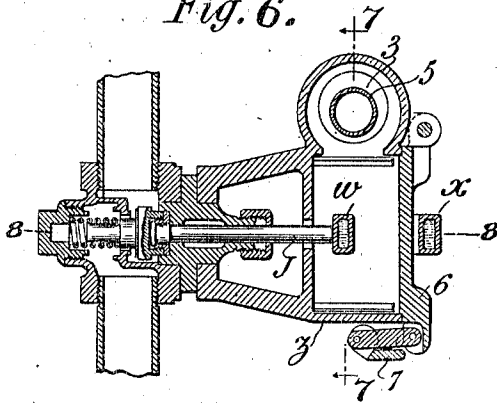


Fig. 7.

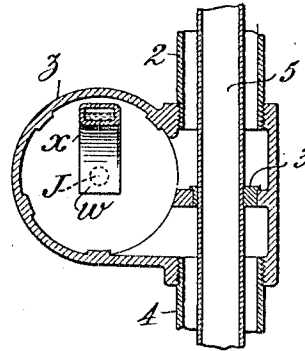


Fig. 8.

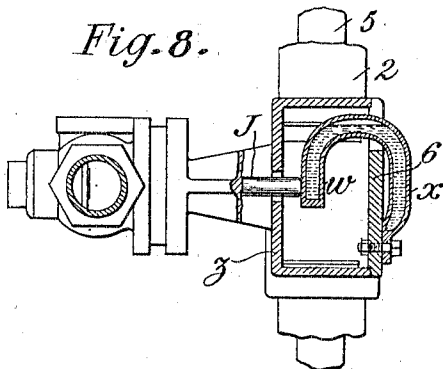
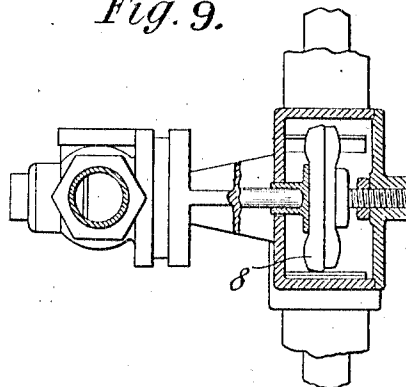


Fig. 9.



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UNITED STATES PATENT OFFICE.

EDWARD E. GOLD, OF NEW YORK, N. Y., ASSIGNOR TO GOLD CAR HEATING & LIGHTING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

STEAM-HEATING SYSTEM.

1,059,356.

Specification of Letters Patent.

Patented Apr. 22, 1913.

Application filed November 3, 1910. Serial No. 590,492.

To all whom it may concern:

Be it known that I, EDWARD E. GOLD, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Steam-Heating Systems, of which the following is a specification.

This invention aims to provide an improved steam heating system especially adapted for railway cars, the apparatus being highly sensitive and being durable and not as likely to get out of order as other apparatus of this class at present in use.

This application is in parts a continuation of certain of my prior applications for patent, notably Nos. 455,470 of September 30, 1908 and 463,109 of November 17, 1908.

The accompanying drawings illustrate an embodiment of the invention.

Figure 1 is a vertical section of the discharge end of a system embodying the invention; Fig. 2 is a side elevation of the thermostat and setting means of Fig. 1, with the casing shown in section; Fig. 3 is a perspective view of a complete system embodying the invention; Fig. 4 is a detail of Fig. 3 on a larger scale; Fig. 5 is a view similar to Fig. 3 of a slightly modified system; Fig. 6 is a horizontal sectional view of another system; Fig. 7 is a vertical section approximately on the line 7-7 of Fig. 6; Fig. 8 is a section partly in elevation approximately on the line 8-8 of Fig. 6; Fig. 9 is a view similar to Fig. 8 of another style of construction.

Referring now to the embodiment of the invention illustrated, A (Fig. 3) is the train-pipe running the full length of the train and carrying a supply of steam under pressure from the locomotive, and B is a branch running therefrom to the radiator. The branch B passes upward through the floor of the car, being provided usually at its upper end with a hand stop-valve C from which a pipe D runs to the radiator E in which is an expansion loop F, at the end of which is a vertical discharge pipe G passing through the floor of the car to a point below.

Interposed in the pipe D is a thermostatic admission valve H, the valve stem J of which extends through a stuffing box and is provided with a collar or enlargement K. A spring L is arranged between the collar K and the adjacent part of the valve casing,

tending normally to hold the valve open. The valve H is closed thermostatically as hereinafter described. When the hand valve C is opened the steam fills the radiator and discharges, closing the automatic valve and cutting off the supply. When the steam ceases to appear at the discharge end, the automatic valve opens, renewing the supply of steam. This is the method of operation of the well known vapor system.

In Figs. 1 and 2 there are illustrated the principal parts of a convertible or interchangeable system which may be set at will to operate either on the vapor principle or on the ordinary pressure principle with the discharge end normally closed and the admission end continuously open, only the water of condensation being discharged at the discharge end. For this purpose the expansible vessel is made in the form of a double tubular bow composed of two parts *a* and *b* fastened to a block *c* or other fixed part of a casing *d*. The casing is connected at its upper end to the discharge pipe G of the system, and at its lower end to a continuation G' of the discharge pipe upon the lower end of which is applied the coil S exposed on its inside to the discharge and on its outside to the atmosphere. The small flexible pipe P from the coil extends to the bow *a b*, and communicates with the latter at the point of attachment of the bow. The stem J of the admission valve H abuts against the free end of the part *a* of the expansible bow, so as to cause the shutting of the valve when this part of the bow is expanded. At the upper end of the discharge pipe G there is a discharge valve *e* of any usual or suitable type, the stem *f* of which extends downward and bears on the free end of the part *b* of the bow. When this part *b* expands, it lifts the stem *f* and closes the valve so as to cut off the discharge of steam. The bow being arranged substantially in the discharge pipe is subjected directly to the discharge heating medium, and may be made in itself sufficiently responsive to changes of temperature to operate the admission and discharge valves, omitting the coil S. Preferably, however, it is used in connection with the coil S.

In order to set the apparatus for a vapor operation or for a pressure operation at will, means are provided for rendering the bow inoperative to close one or the other of the

valves. The means illustrated for this purpose comprise a pair of arms *g* and *h* having their outer ends *j* and *k* adapted to embrace or overlie the respective arms of the bow, the two arms *g* *h* being supported on a short shaft *l* which carries at one side an arm *m* at the outer end of which is a pivoted socket *n* connected to an adjusting rod *o* which screws through a part of the casing *d*. The threads of the rod *o* are made with a rapid pitch, and the rod is accessible outside the casing and can be turned about three-fourths of a revolution, which moves the rod through a distance sufficient to swing the arms *g* and *h* through the desired range of movement. The part *b* of the bow acts positively to close the valve *e* when this part of the bow is expanded; and when contracted permits the valve *e* to open by gravity and the pressure of the steam within. Similarly the part *a* of the bow when expanded positively closes the admission valve *H*, but when contracted permits the opening of the latter by its spring *v*. The purpose of the arm *g* is to hold the part *v* of the bow contracted, which causes the discharge valve to remain permanently open; and when the arm *g* is inoperative the part *v* of the bow is free to expand or contract in accordance with the condition of the discharge so as to operate the discharge valve *e* like an ordinary trap. Similarly the arm *h* serves to hold the part *a* of the bow contracted and to cause the admission valve to be held open permanently by its spring; the withdrawal of the arm *h* to its inoperative position releasing the part *a* of the bow so as to permit it to yield to the expansive tendency and to cause the opening and closing of the admission valve as the conditions of temperature in the discharge vary.

The arms *g* and *h* take their operative or retracting positions alternately. The two arms move simultaneously, being fixed on the central shaft *l*. One extreme position is shown in dotted lines and the other in full lines in Fig. 4. In the full line position the arm *g* has its outer end *j* projecting over the part *b* of the bow, and thus holds the latter retracted, while at the same time the arm *h* has its outer end *k* clear of the part *a* of the bow, so that this part of the bow is free to yield to temperature changes. In the dotted line position, on the other hand, the arm *h* and its outer end *k* hold the part *a* of the bow positively against any expansive influence, while the arm *g* has its outer end *j* moved clear of the part *b* of the bow so as to permit the latter to yield to temperature changes.

The systems previously described control the valves in accordance with the temperature of the discharging heating medium. It is desirable also to determine the operation of the system in accordance with the tempera-

ture of the atmosphere within the car. For this purpose I may add, as in Figs. 3 and 4, a thermostatic vessel *p* near the roof of the car or at any other convenient point for determining the temperature of the atmosphere within the car. Such a thermostatic vessel may be of any usual or suitable make communicating with a tube *q* running a considerable portion of the length of the car so as to average the effect of the temperatures at different points and communicating by a tube *r* with a bow *s*, and the free end of which expands to shut the automatic admission valve *H* and, when contracted, releases the valve to permit it to be opened by its spring. The stem *J* of the valve in this case is extended to bring its end into engagement with the part *a* of a double bow *a* *b* similar to that shown in Fig. 1. The other parts of the apparatus are as previously described. The thermostatic bow *a* *b* of this system will operate in the same way as in the apparatus of Fig. 1. There is imposed upon this operation, however, a supplementary operation, namely, the closing of the admission valve when the temperature of the atmosphere in the car rises beyond the desired point. Thus the admission valve is closed in either of two cases, first, when the temperature of the atmosphere within the car is too high and regardless of the operation of the system under vapor or pressure, and second, when the system is operating as a vapor system and the discharge of steam takes place.

Fig. 4 shows in somewhat enlarged detail the two valves and the thermostatic mechanism of Fig. 3. The parts *a* and *b* of the thermostatic bow are arranged as in Fig. 1 and likewise the support *c* and the shaft *l* carrying the arms *g* and *h* for setting the apparatus to one position or another by means of the hand shaft *o*. The only difference is that the valve spindle *J* is made sufficiently long between the adjustable thermostat and the valve proper *H* to permit the introduction in an intermediate position of the bow *s* which is connected by the tube *r* to the supply of thermostatic fluid in the top of the car, the right-hand end of the bow being attached to the casing *d* of the double thermostat *a* *b*, and the shaft *J* passing freely through holes in the casing and in the fixed end of the bow; and the movable end of the bow being arranged to engage the collar *K* on the valve spindle to shut the valve; the opening of a valve when the bow is contracted being effected by means of a spring *v*, Fig. 1, within the casing. It is not essential to the operation of the adjustable thermostatic mechanism that the double bow *a* *b* be expanded by pressure generated in another vessel such as the coil *S* of Fig. 1. The double bow may be itself filled with ether, alcohol, or other liquid which vapor-

izes at the proper temperature. By completely filling the bow with liquid the expansive tendency at the boiling point of the liquid becomes extremely high and the thermostat most efficient. After filling the bow with the thermostatic liquid it may be sealed in any known or suitable way. A suitable arrangement without the outside pressure generating vessel is shown in Fig. 5, the interchangeable thermostat being indicated diagrammatically and without a casing for the sake of clearness, the casing being shown only in dotted lines. The parts are the same as in the mechanism of Fig. 3, except for the omission of the coil R and supporting parts and connection.

Instead of providing a coil as in Fig. 4 separate from the thermostatic bow and exposed to the steam and air, I may shape and mount the bow itself in such a manner as to secure a partial exposure to the air. For example in Figs. 6 to 8 the bow $w\ x$ is shown, the part w of which is within the casing y , and the part x of which is outside of the casing y , one end being fast and the other end being free and engaging the end of the valve stem J. The operation will be similar to that of the bow s or the bow $a\ b$ of the previous figures. When steam from the discharge pipe G passes into or through the casing y , it heats the thermostat sufficiently to press the free end against the valve stem so as to close the latter. When the steam ceases to escape then the exposure of the part x of the thermostatic bow to the outside atmosphere quickly chills the liquid therein and contracts the thermostat so as to allow the bow to open. The device is thus of the greatest simplicity and at the same time of the greatest sensitiveness. This device is made readily attachable to and detachable from the system so that it can be substituted for the flat circular style of diaphragm shown in my applications for Patents Nos. 562,397 and 576,054. In these applications there is shown a casing adapted to be applied to the side of the discharge pipe and corresponding with the casing z of the construction here shown adapted to be applied to the side of the blow-off pipe 2, a diaphragm 3 being arranged to cause the steam to circulate through the casing z before passing to the outlet pipe 4. The central pipe 5 is for the discharge of the water of condensation when the outer pipe 2 is closed and the system is to be operated under pressure. The casing z is provided with a door 6 hinged at one side and latched by means of an eccentric latch 7 at the outer side. In the construction previously referred to this door holds the flat diaphragm against the end of the valve spindle J so that the steam passing through the chamber closes the valve. The diaphragm 8 must in fact be fastened directly to the door as

shown in Fig. 9. The tube $w\ x$ is also fastened upon the door 6 so that by opening the door the device may be put out of use and access may be had at the same time to the inner side of the casing and the inner end of the bow. This construction enables me to readily substitute one style of thermostat for the other by simply providing a new door with the thermostat applied thereto. I may in practice provide with my system two such doors as part of the complete system and adapted to be substituted one for the other.

I claim as my invention:—

1. A steam heating system including in combination a radiator in which steam is circulated and which discharges into the atmosphere, a substantially non-expansible casing through which the discharge from the system passes to the atmosphere, an expansible tubular bow having a movable end in said casing and exposed to the discharge from the system and sensitive to variations in the temperature of such discharge, another part of said bow being exposed to the atmosphere, and a valve controlled by the movable end of said bow.

2. A steam heating system including in combination a radiator in which steam is circulated and which discharges into the atmosphere, a substantially non-expansible casing through which the discharge from the system passes to the atmosphere, an admission valve adjacent to said casing and having a rod projecting thereinto, and an expansible tubular bow having a movable end in said casing and adapted to engage and operate said valve rod and exposed to the discharge from the system and sensitive to variations in temperature of such discharge, another part of said bow being exposed to the atmosphere.

3. A steam heating system including in combination a substantially non-expansible casing through which passes the discharge from the system, a discharge valve and an admission valve, said valves having rods extending into said casing, and an expansible tubular bow having two movable ends in said casing adapted respectively to operate said valve rods and exposed to the discharge in the system, and sensitive to variations in the temperature of such discharge, another part of said bow being exposed to the atmosphere.

4. A steam heating system including in combination a substantially non-expansible casing through which passes the discharge from the system, a discharge valve and an admission valve, said valves having rods extending into said casing, and an expansible tubular bow having two movable ends in said casing adapted respectively to operate said valve rods and exposed to the discharge in the system, and sensitive to variations

in the temperature of such discharge, another part of said bow being exposed to the atmosphere, and means for holding said movable ends alternatively fixed so as to permit the operation of one or the other of said valves alternatively.

5. A steam heating system including in combination a substantially non-expansible casing through which passes the discharge from the system, a discharge valve and an admission valve, said valves having rods extending into said casing, and an expansible tubular bow having two movable ends in said casing adapted respectively to operate

said valve rods and exposed to the discharge in the system and sensitive to variations in the temperature of such discharge, and means for holding said movable ends alternatively fixed so as to permit the operation of one or the other of said valves alternatively.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

EDWARD E. GOLD.

Witnesses:

HENRY M. FINK,
FRED WHITE.