E. E. GOLD.

STEAM HEATING SYSTEM.

APPLICATION FILED MAR. 12, 1910.

1,151,937.

Patented Aug. 31, 1915.

3 SHEETS—SHEET 1.

Fig. 1.

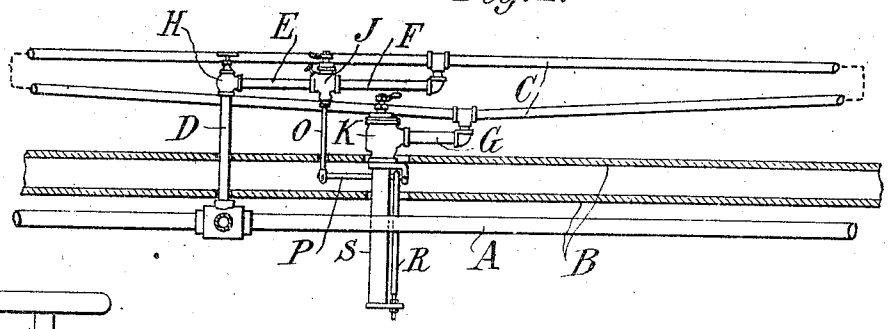
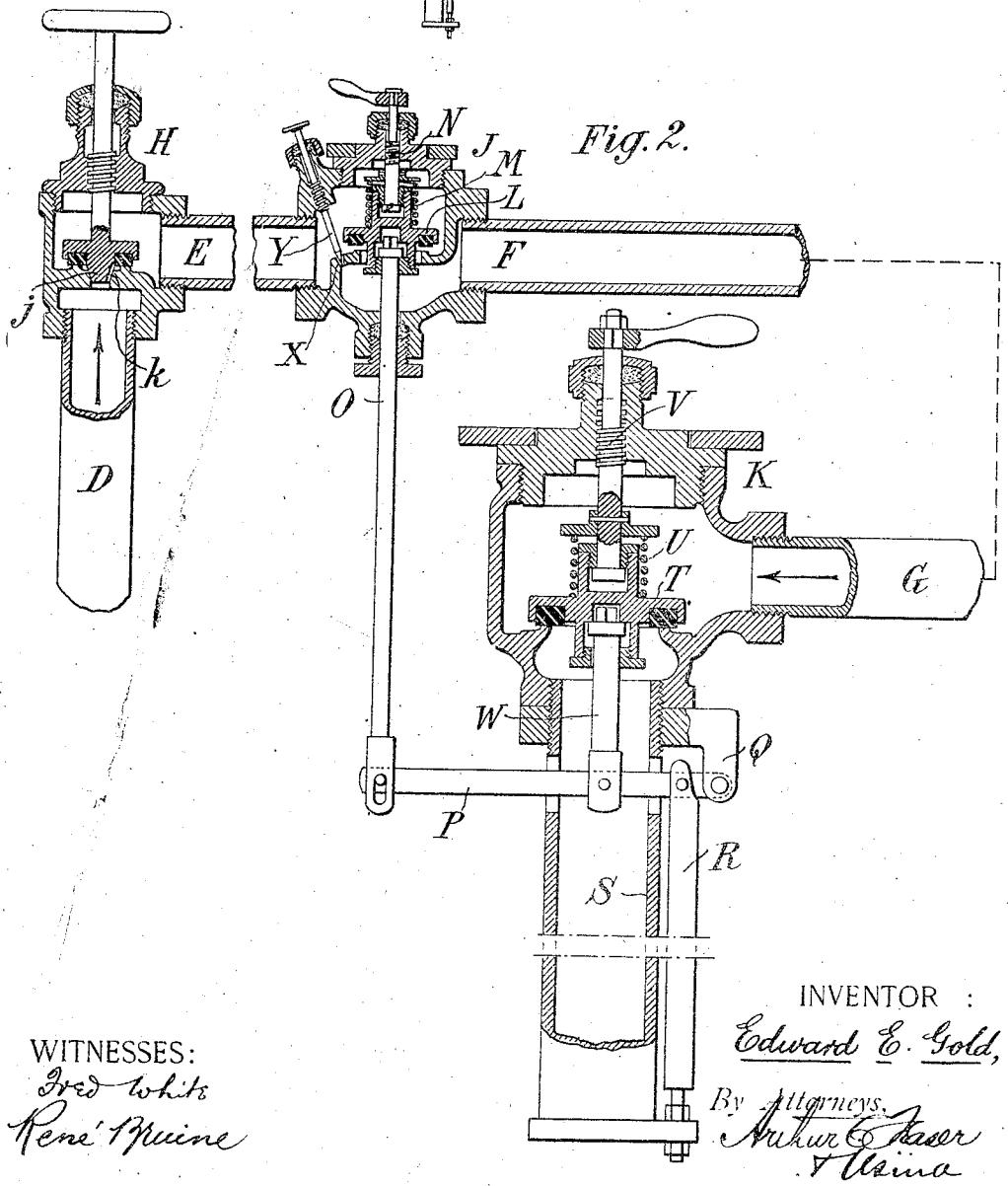


Fig. 2.



WITNESSES:

Fred White

René Pluine

INVENTOR:

Edward E. Gold,

By Attorneys,

Arthur G. Fraser

& Sons

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3 SHEETS—SHEET 2.

Fig. 3.

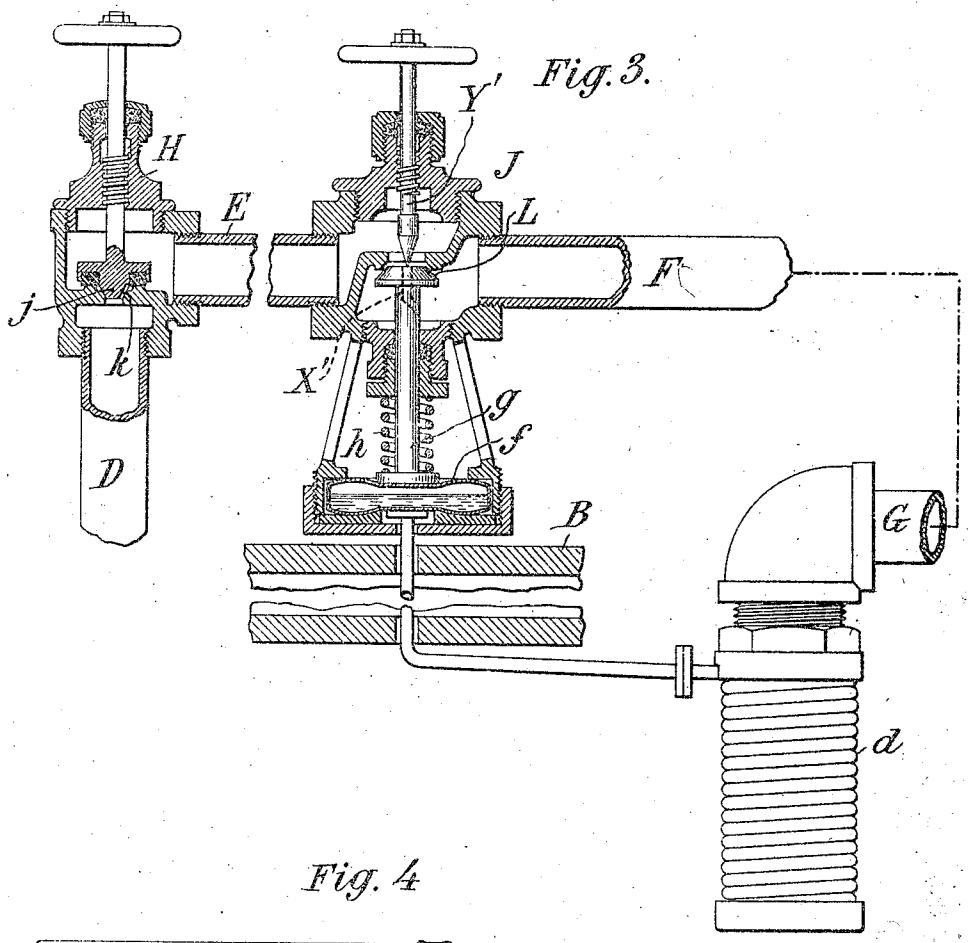
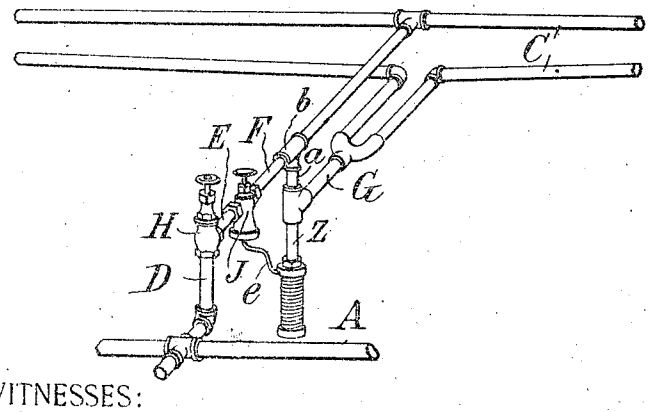


Fig. 4



WITNESSES:

Fred White

René Bruine

INVENTOR :

Edward E. Gold,

By Attorneys,

Arthur Fraser & Mann

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3 SHEETS—SHEET 3.

Fig. 5.

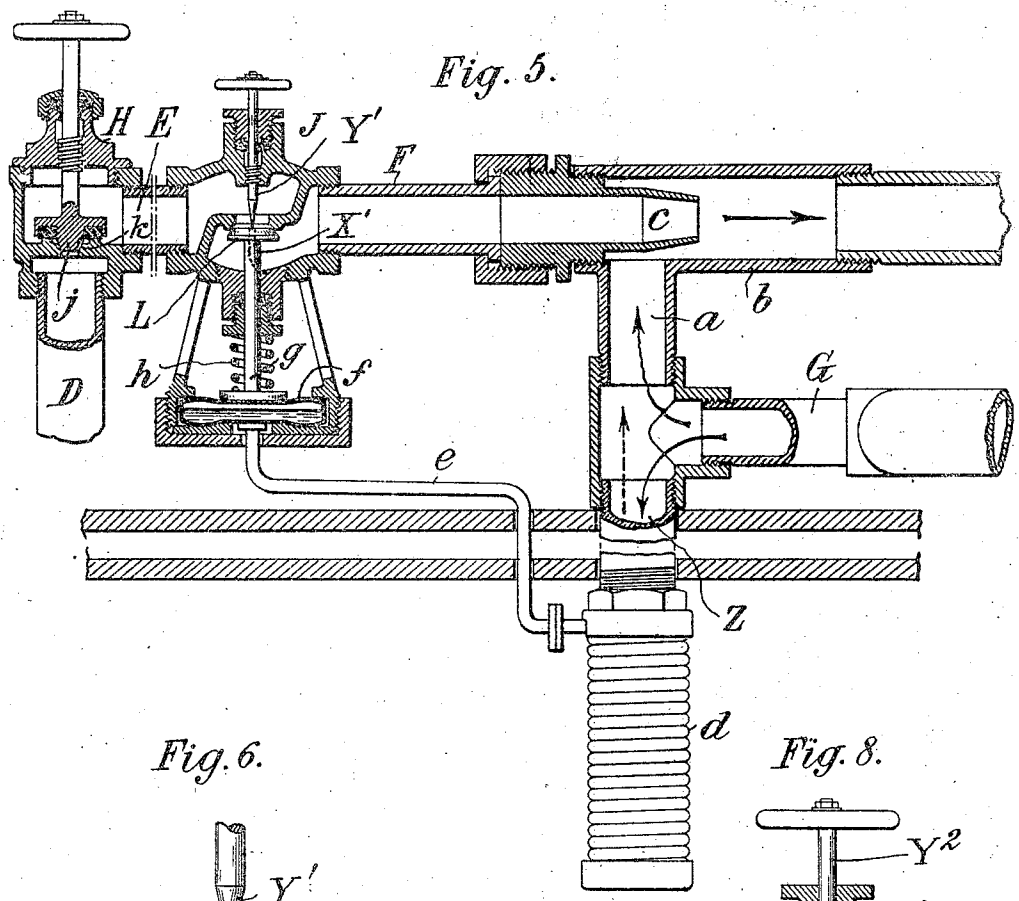


Fig. 6.

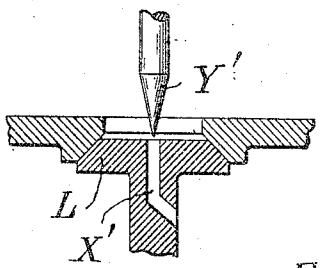


Fig. 7.

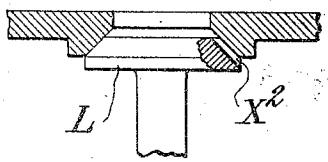
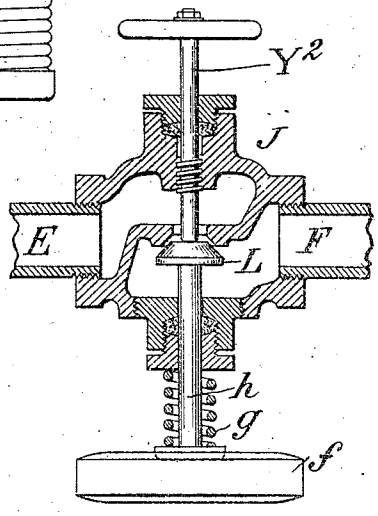


Fig. 8.



INVENTOR :

Edward E. Gold,

By Attorneys,

Arthur O. Fraser & Sons

WITNESSES:

Fred White

René Pruine

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.

1,151,938. Specification of Letters Patent. Patented Aug. 31, 1915.

Application filed March 12, 1910. Serial No. 548,906.

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 relates to steam heating systems, and especially to systems which are adapted for use in heating railway trains. It aims to provide a system which shall be economical in consumption of steam, but which shall nevertheless insure the maintenance of a sufficient supply of steam in the radiators to give the necessary warmth. This result is preferably effected by the use of a combination of automatic and non-automatic means controlling the supply, and preferably used in connection with a system in which the discharge end is maintained open to the atmosphere. In respect to the combination of such automatic and non-automatic means, this application is specific to my previous application No. 543,164 showing a restriction of the supply automatically in accordance with the pressure; while the present application is based upon a thermostatic control of the supply, and upon other points of difference, as will appear more fully hereinafter.

The accompanying drawings illustrate embodiments of the invention.

Figure 1 is a longitudinal sectional elevation through a car showing the principal parts of a radiator at one side of the car and its connections with the train-pipe; Fig. 2 is a sectional view of the admission and discharge ends of the system of Fig. 1; Fig. 3 is a view similar to Fig. 2 showing another style of system embodying the invention; Fig. 4 is a view similar to Fig. 1 of still another style; Fig. 5 is a sectional view through the valves and adjacent parts of the system of Fig. 4; Fig. 6 is a sectional view of the admission valve of Fig. 5; Fig. 7 is a similar view of an alternative construction; Fig. 8 is a similar view of another alternative construction.

Referring to the embodiments of the invention illustrated, Figs. 1 and 2 represent the invention as a modification of the apparatus shown in my application for patent No. 216,907, in which is claimed broadly a system which can be converted at will into a pressure system or a vapor system. The train-pipe A runs beneath the floor B of all the cars, receives steam from the locomotive, ordinarily through a pressure reducing valve at that end, and is the source of supply of steam for the radiators in the several cars. The radiator may be of any one of a great variety of styles, either heating the air in the car directly or indirectly. The radiator is indicated at C. It receives steam through a suitable branch from the train-pipe and through the vertical admission pipe D and a horizontal admission pipe E, F, and discharges through an approximately horizontal pipe G. A stop valve H is provided in the admission pipe, being of any ordinary or suitable construction which will permit the entire cutting off of the steam or the opening of a free passage therefor and adapted, in the particular construction illustrated, to permit the flow of only a restricted quantity of steam when set in an intermediate position. Besides the cut-off valve H the flow of steam is regulated by a pair of valves under automatic control, an admission valve and a discharge valve indicated respectively as a whole by the reference letters J and K.

The valve J contains a valve body L which is pressed to its seat by a spring M, and which is adapted to be held positively away from its seat by a threaded spindle N engaging the valve body with a suitable amount of lost motion and screwing through a part of the casing and extending to the outside where it can be operated by hand. The lost motion is secured by having a head on the lower end of the spindle, which head is located in the larger socket in the top of the valve proper, so as to permit a small amount of vertical play. When the spindle N is turned to lower the valve the latter is pressed to its seat by its spring while the head on the spindle is still in the upper part of the socket, so that the spindle opposes no resistance to a slight automatic lifting of the valve from its seat. The valve body L is also connected with a suitable amount of lost motion to a rod O running through the

opposite end of the valve casing and connected by a lever P pivoted to a fixed support Q, with a link R which extends to the lower end of a thermostatic tube S through which the discharge from the radiator takes place, and which is of material adapted to expend considerably under the action of heat.

The discharge valve K is similarly constructed, having a valve body T which is pressed toward its seat by a spring U, but kept held away from its seat by means of a threaded spindle V engaging the valve body with a suitable amount of lost motion; a rod W being connected with a suitable amount of lost motion to the under side of the valve and connecting it to the lever P previously referred to.

When the admission valve is held open by means of its spindle N and the discharge valve is allowed to operate under automatic control, the system works like an ordinary pressure system, maintaining the radiator full of steam at the pressure of the supply and trapping the water of condensation in the discharge pipe, from which it is discharged at intervals as the thermostat cools; the heating of the thermostat by the discharging water and steam serving to again close the discharge valve automatically. When the discharge valve is held open by screwing up the spindle V and the admission valve is released, the apparatus works according to the so-called vapor system. The discharge end is always open. When steam escapes therethrough, or when it escapes therethrough to a quantity beyond that which is desirable, the thermostat closes the admission valve, whereupon the steam remaining in the radiator condenses to a greater or less extent and the thermostat cools and reopens the admission valve. When such a system is in operation as a vapor system, and in systems which are designed solely as vapor systems, it is often desirable and at the same time difficult to maintain the radiating pipes full of steam, even though the rate of condensation be not sufficient to prevent the escape of some steam at the discharge end. This is particularly important in heating up a car in the beginning after it has become entirely cold, and in extremely cold weather when the radiating surface may be insufficient to provide the necessary quantity of heat with an ordinary vapor operation. This invention provides means by which at least a minimum supply of steam may be maintained for all positions of the automatic mechanism. Such a minimum supply can be secured through a simple opening in the diaphragm or in the valve body of the automatic admission valve as illustrated herein, or by a by-pass around such valve as indicated in my application No. 543,164. Preferably a very small opening is provided for the passage of this minimum quantity of steam. Preferably also a valve is provided for regulating this minimum quantity of steam, such as a needle valve, by which the area of the opening can be finely controlled, but where a valve is used it is not essential that the opening be a small one; a valve of large capacity may be found useful for other purposes, such as blowing out the pipes, and may serve at the same time to throttle the supply to a desired minimum.

Referring now to the apparatus shown in Figs. 1 and 2, the automatic admission valve J is provided with a small opening X through its diaphragm, and a needle valve Y is provided screwing through a part of the main valve casing and accessible by hand at its outer end, for manually regulating the effective area of the port X. With this valve open to a determined extent, and the discharge valve open, there is a minimum supply of steam which is approximately constant and is dependent upon the pressure in the supply pipe, and this minimum supply is increased from time to time by the opening of the main valve L whenever the radiation and condensation become so rapid as to necessitate it.

Fig. 3 shows a similar construction, omitting entirely the provision for automatic control of the discharge, so that the apparatus works only as a vapor system (modified in accordance with this invention). The parts of the apparatus are substantially the same as in Fig. 2, except that the constant supply port X′ is through the valve body L, and the needle valve Y′ is located accordingly.

Figs. 4 and 5 illustrate a system in which the steam which passes through the radiator without condensation is taken in again at its admission end for further circulation, together with a certain quantity of air depending upon the rate of condensation in the radiator. The discharge pipe G in this case communicates with a vertical pipe Z through which water of condensation runs down to a point below the floor of the car and is discharged, and communicates also through a short pipe *a* with an injector *b* in which is a nozzle *c* through which steam is admitted from the automatic supply valve J. The passage of the steam through a nozzle *c* produces a suction in the pipe *a* sufficient to draw up any steam discharging from the pipe G, at the same time drawing in some air through the open discharge pipe Z. If the quantity of steam becomes so great that a part of it is discharged through the pipe Z, its contact with the thermostatic coil *d* vaporizes the ether or similar liquid therein and creates a pressure which is communi-

cated through a tube *e* to an expansible vessel *f*, which engages the stem *g* of the valve body L and forces the latter to its seat against the opening pressure of the spring coil *h*. This style of thermostat and automatic valve controlled thereby, are fully described and claimed in previous applications for patent, especially No. 523,997. For maintaining a minimum supply to such a radiator a port may be provided according to any of the constructions above described, as for example the port X′ (Fig. 6) passing through the valve body L and regulated by a needle valve Y′. Or, in this last or in any of the constructions above described, the port may be provided by simply forming a small groove X^2 (Fig. 7) across the edge of the valve body L.

The valve H besides having the functions of the ordinary cut-off valve, is preferably designed for permitting in one position only a restricted quantity of steam to flow through. For this purpose, besides the usual seat and valve body, the valve stem is extended through the diaphragm by an extension *j* preferably slightly tapered, and this extension fits the opening in the diaphragm valve casing and is preferably provided with a groove *k* in its edge. When the valve spindle is turned only sufficiently to lift the valve body from its seat, steam is still admitted through a very restricted orifice. This construction is of special value in connection with the automatic admission valve with or without the special provisions described for providing a constant minimum supply, in that it insures a slow admission of steam to the radiator when the automatic supply valve is opened so as to fill the radiating pipes gradually and without a sudden puff or pressure of steam. It is useful to an even greater extent where the special minimum supply apparatus above described is used, in that the cut-off valve may be opened wide where a quick heating of the radiator is desired, and may be closed only to its intermediate, throttle, position when the minimum supply port X or X′ is closed.

In some cases, as for example with systems in which the automatic admission valve is closed by a yielding means, such as the fluid pressure apparatus of Figs. 3 and 5, or where yielding means are introduced between the thermostat and the valve, the minimum supply opening may be secured by limiting the approach of the valve to its seat. A mechanism for this purpose is shown in Fig. 8, the automatic admission valve in this case having a hand-operated spindle Y^2 adapted to bear on the face of the valve body L. By screwing the spindle Y^2 outward, the valve body L will be allowed to engage its seat and form a tight closure. By screwing the spindle Y^2 inward sufficiently, the valve body L may be held open to secure a minimum supply as above described.

Various styles of valves besides those herein illustrated may be substituted therefor without departure from the invention.

What I claim is:—

1. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere, said system including a supply pipe, a radiator and means for automatically regulating the supply of steam from said supply pipe to said radiator, a port being provided for constantly maintaining a supply of steam from said supply pipe, independently of such regulation.

2. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere, said system including a supply pipe, a radiator and means for maintaining at all times at least a minimum supply of steam from said pipe and automatically regulating the said supply above said minimum.

3. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere, and including a supply pipe, a radiator, means for maintaining a minimum supply of steam from said pipe, and a thermostatically controlled valve for admitting a supply greater than said minimum.

4. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere, and including a radiator, means for maintaining a minimum supply of steam and a valve for regulating the supply above said minimum, and a thermostat exposed to the discharge from the radiator and controlling said valve.

5. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere, said system including a supply pipe, a radiator and means for automatically regulating the supply of steam from said supply pipe to said radiator, a port being provided for constantly maintaining a supply of steam from said supply pipe, independently of such regulation, and means for controlling the effective area of said port.

6. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere and including a radiator, a supply valve, a thermostat exposed to the discharge from the radiator and controlling said valve, and a hand-controlled supply valve through which steam may be supplied to the radiator when the thermostatic valve is closed.

7. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere and including in combination a radiator, a supply pipe, means

for maintaining at all times a minimum supply of steam to the radiator, automatic means adapted to regulate the supply above said minimum, and a non-automatic valve having three determined positions, the first providing a complete cut off, the second an admission through a smaller port, and the third an admission through a larger port.

8. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere, and including in combination a radiator, an automatic supply valve, and a non-automatic valve having three determined positions, the first providing a complete cut off, the second an admission through a smaller port, and the third an admission through a larger port, and means for maintaining a minimum supply of steam when said non-automatic valve is in an open position.

9. A steam heating system the discharge end of which is adapted to be maintained open to the atmosphere, said system including a radiator and means for automatically regulating the supply of steam thereto, a port being provided through which to constantly maintain a supply of steam independently of such regulation.

10. A steam heating system, the discharge end of which is continuously open to the atmosphere, including a radiator, means for maintaining a minimum supply of steam, a valve for regulating the supply above said minimum and a thermostat exposed to the discharge from the radiator and controlling said valve.

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

EDWARD E. GOLD.

Witnesses:
WILLIAM F. MARTINEZ,
W. H. STOKES.