N. M. FINLEY.

HEATING SYSTEM.

APPLICATION FILED APR. 29, 1907.

944,183. **Patented Dec. 21, 1909.**

2 SHEETS—SHEET 1.

Fig. 1.

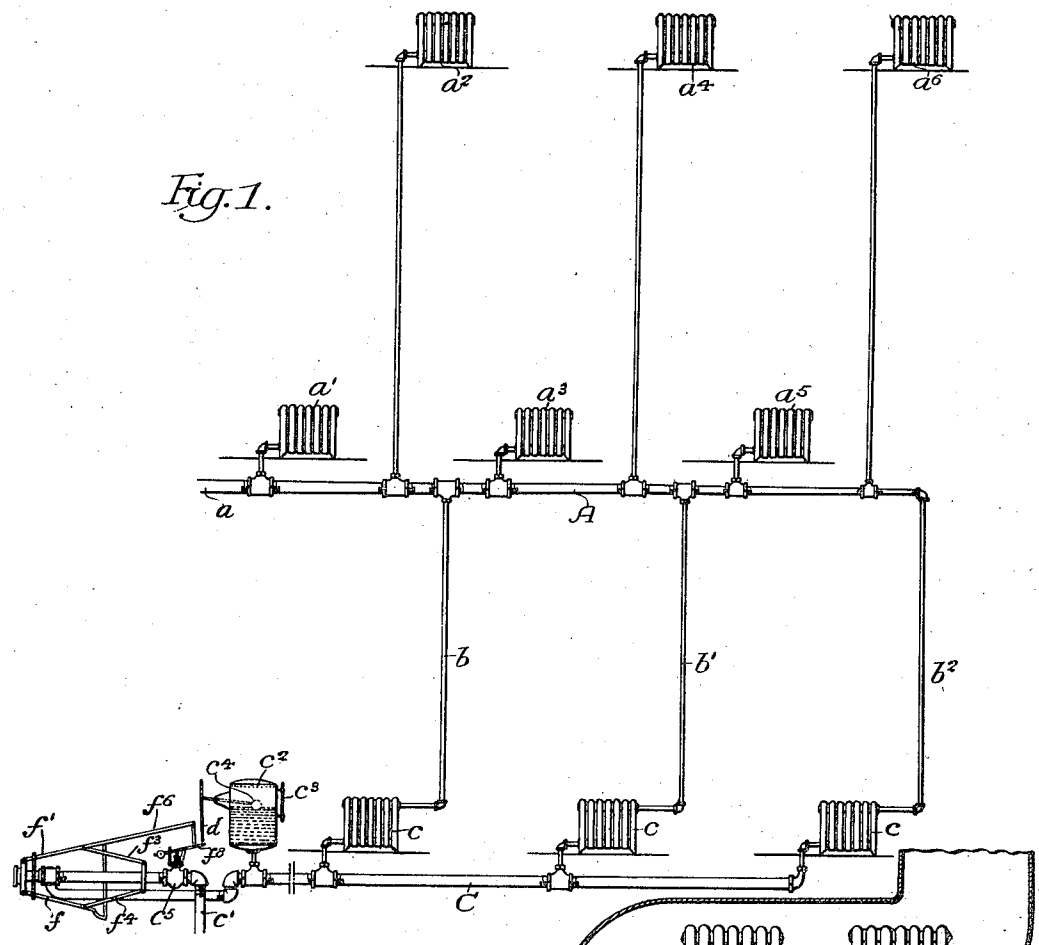
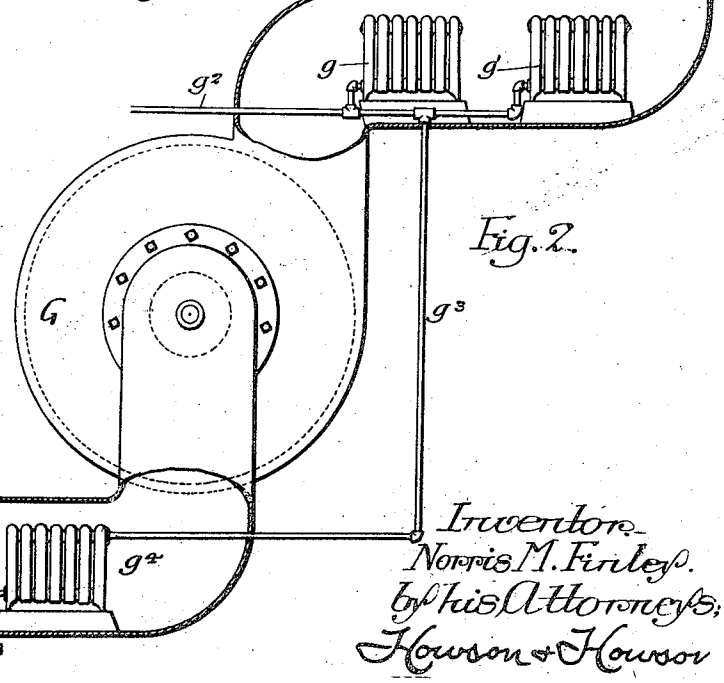


Fig. 2.



Witnesses:-
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2 SHEETS—SHEET 2.

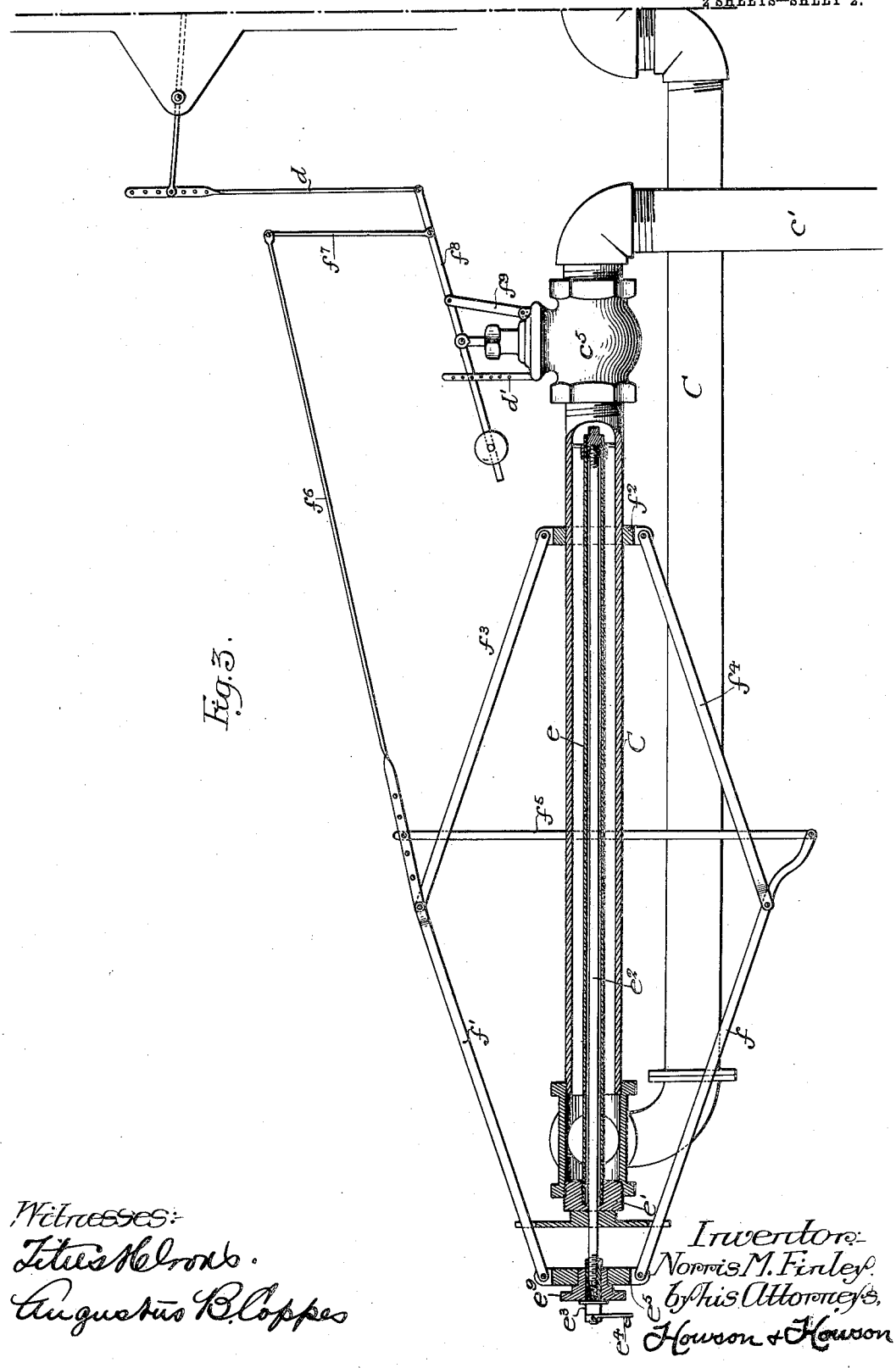

Fig. 3.

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UNITED STATES PATENT OFFICE.

NORRIS M. FINLEY, OF NORRISTOWN, PENNSYLVANIA.

HEATING SYSTEM.

944,183. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed April 29, 1907. Serial No. 370,782.

To all whom it may concern:

Be it known that I, NORRIS M. FINLEY, a citizen of the United States, residing in Norristown, Pennsylvania, have invented certain Improvements in Heating Systems, of which the following is a specification.

One object of my invention is to provide a system of radiators and piping therefor so arranged that certain of said radiators may be used with steam for heating purposes, while the remainder may be supplied with hot water resulting from the condensation of such steam; it being also desired to provide automatically acting regulating means for causing discharge of water from the system when its heating effect is less than is desired.

Another object of the invention is to so arrange the radiators and piping of a heating system that all of the heat contained in a given body of steam shall be efficiently utilized, part in steam radiators, and part in hot water radiators.

I further desire to provide a system, having the above noted characteristics, with automatic means governed by the temperature of the water of condensation, for governing the discharge of water from the radiators at a predetermined temperature, in connection with means whereby such apparatus may be set by hand so as to operate under predetermined conditions.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1, is a diagrammatic view illustrating the apparatus comprising my invention; Fig. 2, is a side elevation, partly in section, illustrating my invention as applied to an indirect heating system, and Fig. 3, is an enlarged side elevation illustrating, partly in vertical section, the automatic regulating means preferably employed by me.

Referring to the above drawings, a represents the inlet of a steam main A supplied with steam from any suitable source and having connected to it at intervals steam radiators a'–a^6. In the present instance, these radiators are shown as connected in a single pipe system and for the purpose of carrying off from them the water of condensation, I provide drip pipes b, b', b^2, connected at intervals into the steam main A; the first entering said main between the radiators a^2, a^3; the second between the radiators a^4 and a^5, and the last connected directly with the end of the steam main. To each of these drip pipes I connect a hot water radiator c and these latter are in turn all connected to a water discharge pipe C, having an outlet at c'. Connected to the water main C at some suitable point I provide a tank c^2, having a gage glass c^3 and a float c^4 connected through a suitable series of levers and links to a stop valve c^5 in the water main.

Under operating conditions, steam is supplied to the system through the main A and flows to the various radiators a', a^2–a^6, which are arranged for direct heating in the ordinary manner, the water condensing in said radiators in the present instance going back to the steam main and thence through one or more pipes b, b', b^2 to the hot water radiators c. The valve c^5 is so connected to the float c^4 that the water is discharged from the system whenever it rises to a predetermined level, so that instead of being discharged to the sewer or hot well while in a warm condition, it is retained and utilized in the radiators. From time to time, as the quantity of water of condensation increases beyond some predetermined height, the float rises and opens the valve c^5, thereby permitting a certain amount of the cold water, which is naturally at the lowest part of the system, to be discharged. As soon, however, as the level of water has fallen sufficiently in the radiators c, the float closes the valve or allows said valve to close, depending on the adjustment of the weight on the rod f^8.

It will be seen that the amount of heat given off by the hot water radiators c depends largely upon the level of the water in them, for the space above said water is filled with steam. If, for any reason, it should become advisable to have more heat delivered by the radiators c than could be supplied by the heat in the normal amount of condensed water coming from the radiators a', etc., the float c^4 may be adjusted at the point of its connection with a link d, so as to open the valve at a lower level of the water. As a consequence, a large part of the radiators c may be then filled with steam.

While I have shown but two steam radiators to each hot water radiator, it will be understood that in practice the size and number of steam radiators is proportioned to the number of hot water radiators connected with them, so that the water of condensation from a given bank of radiators

will be sufficient to supply and properly operate the hot water radiator or radiators connected to it.

In practice, I find it convenient, though not absolutely necessary, to place the steam radiators in the upper floors of a building and the water radiators in the basement or lower floors, as by this means the arrangement of the piping is materially simplified.

Should it be desired that water in the hot water radiators shall be discharged when its temperature reaches a certain point, I provide the device illustrated in Fig. 3, which, under operating condition, is connected to control the valve c^5 and to operate either independently or in conjunction with the float. For this purpose I mount within the water main C any convenient form of thermostat, which, in the present instance, consists of an iron tube e rigidly connected at one end to a plug e' in the end of the main and at the other end supported loosely within the said main. This second end has rigidly connected to it a brass rod e^2, which extends through the plug e' and is threaded into a tubular spindle e^3 having a handle e^4 and so mounted as to be capable of being turned and longitudinally moved in a bearing e^9 mounted in a yoke piece e^5. The longitudinal movement of this spindle in its bearing is limited by a collar as shown in Fig. 3. To opposite ends of this yoke piece are connected a pair of links f and f', while to a clamp f^2 rigidly fastened to the pipe C in any suitable position are pivoted two other links f^4 and f^3. The free ends of the links f' and f^3 are pivoted together and the end of the link f^4 is pivoted to the link f a short distance from the end of the latter. A fifth link f^5 extends between this end and a variable point on an arm of the lever f^6. This latter is pivoted to the links f' and f^3 at their point of junction and connected through link f^7 to the lever f^8, which is directly operative upon the valve rod of the valve c^5. The link d attached to the float rod is also connected to this lever.

With this arrangement of apparatus, if the temperature of water within the main C falls below a predetermined point, there will be a differential change in the length of the thermostat consisting of the tube e and the rod e^2, resulting in a movement of said rod into the pipe. As a result, the yoke e^5 will move toward the end of said pipe and cause such a relative movement of the levers f f', f^3 and f^4 as will move downward the end of the lever f^6, which is connected to the link f^7; this movement being multiplied by the use of a connecting link f^5. As a consequence, the lever f^8 is moved on its fulcrum f^9 and opens the valve c^5, thereby permitting the escape of water from the main C until the steam has so far entered the hot water radiators as to raise the temperature of the water of condensation sufficiently to cause an outward movement of the rod e^2 of the thermostat. Under these conditions, the above operations are reversed and the valve c^5 is closed under the action of the weight on the rod f^8 as well as of the weights of the various rods, levers, etc., thereby permitting the hot water to again accumulate in the hot water radiators. In order to set this device so that it will operate at any predetermined temperature of hot water, I turn the spindle e^3 on the rod e^2 by means of its crank handle e^4 so as to bring the various parts of the apparatus into the desired relations. The various rods and links are connected to each other at a number of points so as to permit of their relative adjustment, as—for example—the link or rod f^5 may be attached to the lever f^6 at any of a number of points. The rod to the float c^4 is adjustably connected to the link d, while in addition the rod d' is provided upon the valve casing c^5, having a number of holes whereby the lever f^8 may be held by means of a suitable pin so that it is fully open or closed; in which case there would be no substantial operation of the thermostat. If when the valve was thus held open there should be an action due to the thermostat which might injuriously affect the apparatus, the link f^7 may be disconnected from the remainder of the mechanism. It is to be noted that the float is normally free to control the valve in the casing c^5 independently of the thermostat, for the parts are not only so adjusted that this is possible, but it will be noted that the yoke piece e^5 is free to move in one direction longitudinally of the thermostat in order to render this possible.

In Fig. 2, I have shown my invention as applied to an indirect system of heating and in this case a fan G for forcing air through the system is provided at its outlet with any desired number of steam radiators g and g' supplied with steam from the main g^2. The water of condensation from these is conducted through a pipe g^3 to a hot water radiator g^4 in which the water level may be maintained at any desired point by means of such an arrangement of parts as is shown in Fig. 1. Under operative conditions, cold air is drawn by the fan over the hot water radiator g^4 and after passing through said fan is forced around the steam radiators g and g', thence passing to the rooms to be heated.

It is to be noted that by means of my system, I utilize for heating purposes the hot water otherwise wasted, employing this in water radiators forming part of the system in which are included the steam radiators from which the condensed water is supplied, the float c^4 preventing more than a predetermined accumulation of water within the radiators, and the thermostat causing the

discharge of such water from the radiators when the temperature thereof has fallen to a point where its heating effect is less than that desired.

I claim as my invention:

1. A heating system including a steam main, a series of steam radiators connected thereto, hot water radiators connected to receive water of condensation from said steam containing elements, means operated by the water and including a discharge valve for preventing rise of water in the system above a predetermined height, and temperature controlled means arranged to also act on said valve for causing discharge of water from said water radiators, when the temperature has fallen to a predetermined point.

2. A heating system including a steam supply main, steam radiators connected thereto, a series of hot water radiators connected to receive water of condensation from the steam radiators, a water main connected to the water radiators, a tank in communication with said water main, a valve in the main for controlling the flow of water therefrom, a float operative in said tank and connected to the valve for preventing rise of water in the system above a predetermined height, and a temperature responsive means placed to be acted on by water of condensation in the system and also operative on said valve.

3. A heating system consisting of a steam supply main, a steam radiator connected thereto, a water radiator connected to the steam radiator, a water main connected to the water radiator, a thermostat therein, a valve controlling the flow of water from said water main, mechanism operatively connecting said valve with said thermostat, with means actuated by changes in the level of the water in the system and also capable of operating said valve.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

NORRIS M. FINLEY.

Witnesses:

J. HALE JENKINS,

MIRIAM M. DYSON.