No. 654,948. Patented July 31, 1900.

J. COLLIS.

VACUUM STEAM HEATING APPARATUS.

(No Model.) (Application filed Mar. 14, 1899.)

Fig. 1.

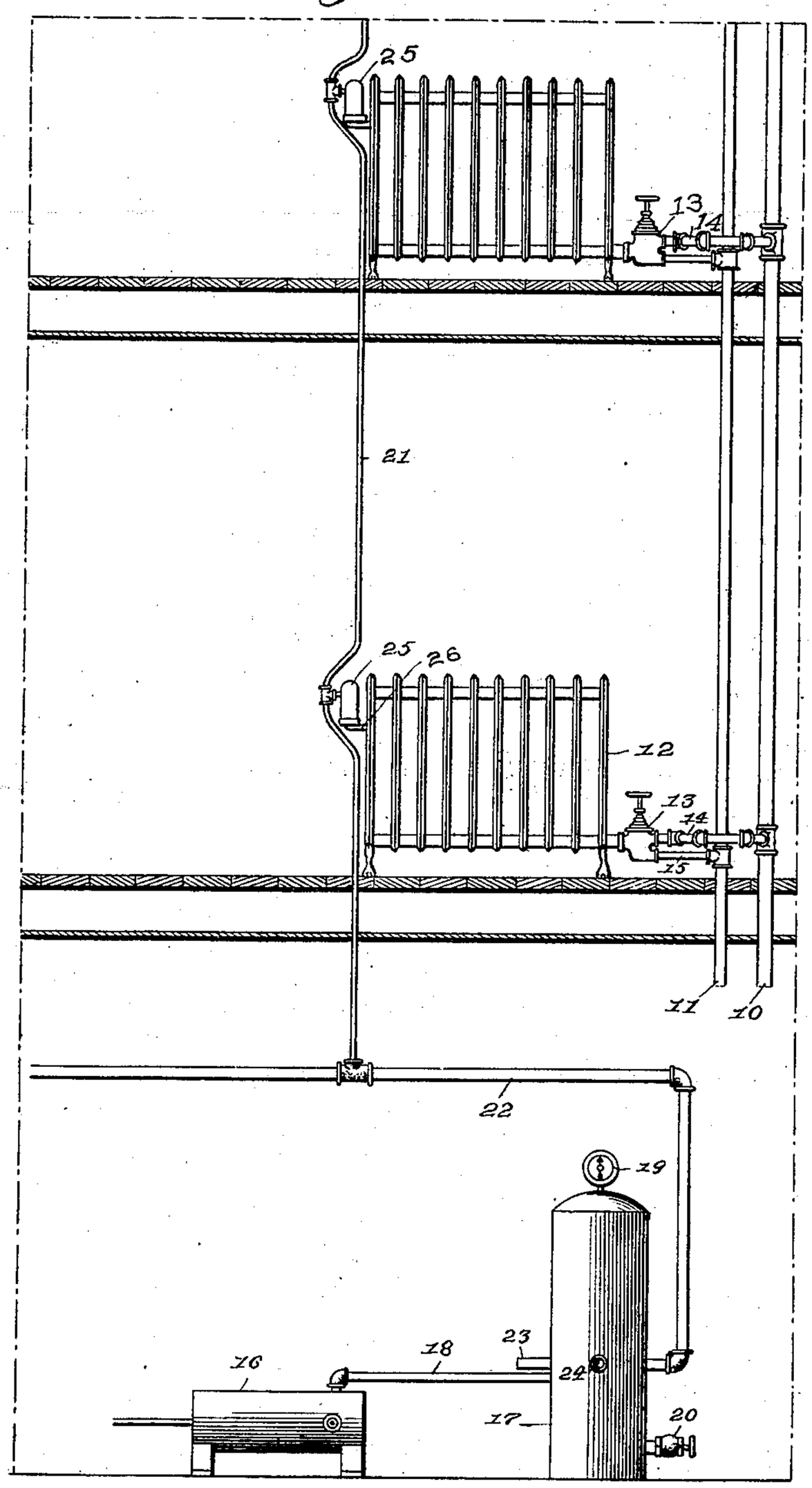
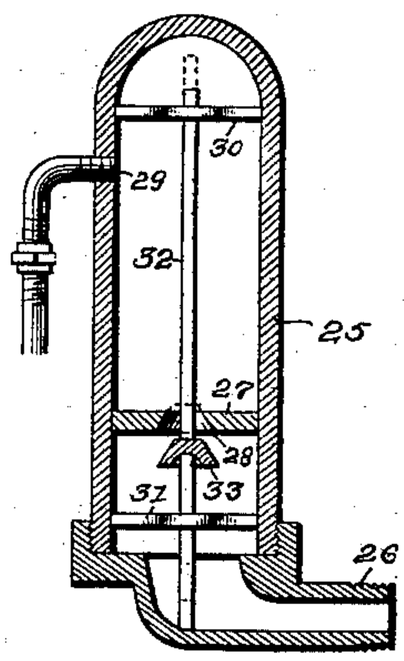


Fig. 2.



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VACUUM STEAM HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 654,948, dated July 31, 1900.

Application filed March 14, 1899. Serial No. 709,024. (No model.)

To all whom it may concern:

Be it known that I, JOHN COLLIS, a citizen of the United States, residing at Des Moines, in the county of Polk and the State of Iowa, have invented a new and useful Vacuum Steam Heating Apparatus, of which the following is a specification.

In starting a steam-radiator it is always necessary to first remove the air that is contained in the steam pipes and radiator before the steam can enter the radiator and heat the building. Heretofore it has been customary to provide automatically-operating thermostatic valves so arranged as to be normally open, and hence when the steam-pressure was applied to the radiators the force thereof would gradually expel the air. Then when the steam came in contact with the valve the heat would cause the valve to close and thus the escape of steam cut off. Heating systems have been provided heretofore with means for exhausting the air from the pipes through thermostatic valves to produce a partial vacuum therein to aid the flow of steam into the system; but in all systems in which a thermostatic valve is relied upon to cut off the outflow of steam obviously the steam must engage the valve before it can operate it, and on account of the fact that the water of condensation usually travels with the steam some of this water may pass through the thermostatic valves before they can close. Moreover, with such devices it has been found that frequently the water of condensation would be forced ahead of the steam and would of course pass through the thermostatic valves before they were closed by contact with the steam. It is highly objectionable that any water pass through these valves, as the discharge is either into the room being heated or into the pipes designed to carry off the air only. In all thermostatic valves the air-vents are of necessity very small, and hence much time is occupied after the steam is turned on in getting heat to remote parts of the building, and, furthermore, with such systems, and in the event that exhaust-steam is used for heating, the force necessary to expel the air through these slow-working thermostatic valves produces a reactionary back pressure upon the engine which is highly objectionable.

The object of my invention is to provide an improved system of steam-heat distribution whereby the steam is placed very rapidly in the most remote parts of the system and the water of condensation is prevented from passing through the radiator vent-valves and the reactionary back pressure upon an engine caused by the forcing of its exhaust-steam into a heating system filled with air is prevented; and, furthermore, to provide a heating system that does not require that careful attention and accurate adjustment necessary when thermostatic valves are used.

My invention consists, essentially, in the arrangement and combination of the various devices necessary to the successful operation of the vacuum steam-heating system, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows a sectional elevation of a building having my improved heating system applied thereto. Fig. 2 shows a vertical central sectional view of my improved valve.

Referring to the accompanying drawings, I shall first describe the various features of my heating system and afterward the construction of the valve.

The numeral 10 is used to indicate the steam-supply pipe, and 11 the return. At each of the steam-radiators 12 throughout the entire system I have used one of the "Collis circulating-valves," indicated by the numeral 13 and fully shown and described in Letters Patent No. 610,873, issued to me September 13, 1898. A pipe 14 connects the pipe with the steam-supply pipe 10, and a pipe 15 connects it with the return 11. By this means it is obvious that a circulation of steam through the radiators is always maintained.

In the basement of the building or at some convenient point I have located a vacuum-pump 16, and adjacent to the pump is a vacuum-tank 17, having a pipe 18 connecting it with the pump. A vacuum-gage 19 is attached to the tank, and an air-valve 20 is also provided for purposes hereinafter made clear.

Attached to each radiator is one of my improved vacuum-valves, hereinafter described,

and a pipe 21 connects one or more of them with a pipe 22. This pipe 22 is preferably run horizontally around the top of the basement to provide convenient means whereby a number of these pipes 21 may be collected and made to connect with the vacuum-tank. The pipe-sections 23 and 24 are for the same purposes as the pipe 22. Obviously, when the pump is operated a more or less complete vacuum will be formed within the tank 17, and this tank will of course draw all the air from the complete heating system until the valves at the radiator close. Then the pump is stopped or run slowly, as required, to maintain the vacuum to the degree desired. When the steam is turned on, it will of course rapidly flow through the entire system, and the water of condensation cannot pass through the valve into the air-discharge pipes. In use the pumping of air is started a short time before the heat is desired and continued until the desired amount of vacuum is produced. Then when the steam is turned on the impact caused by the flow of steam will close every valve immediately, before the water of condensation could reach the valves, and when exhaust-steam from an engine is used the puffing of the steam will furnish the impact necessary to close the valves, even if the said exhaust is below atmospheric pressure. Inasmuch as the vacuum need only be maintained within the air-pipes to the radiators, it is obviously not difficult to do this, and hence the pump need only be run a short time at full capacity to form the vacuum and then very slowly to maintain same and compensate for leakage. The air is pumped out of the system, preferably, only just when the steam is turned on for each day, and then so much of a vacuum is maintained in the pipes leading to the vent-valves as is necessary to hold the valves closed. It is not essential that the partial vacuum be maintained at the same degree in the system after the steam has been turned on.

Assuming that the valves were so constructed as to automatically close when the vacuum-pressure reached a certain predetermined number of inches, it may be seen that the vacuum-gage on the tank will indicate when all the valves have been closed, and if any valve should remain open the vacuum-pressure will rapidly diminish, so that the pumping may again be started until a sufficient pressure is attained to close every valve in the system. When the steam is turned off for the night, the air-valve 20 is opened, and thereupon the air will open the valves 25 and enter the radiators, thus forcing the water of condensation back through the return steam-pipes, so that each time the system is started it will be entirely free from water.

The construction of the vacuum-valves is as follows: The numeral 25 is used to indicate a cylinder having at its base a connection 26, by which it may be screwed to the radiator to communicate therewith. A short distance below the center of the cylinder 25 is a horizontal diaphragm 27, having a round valve-seat 28 therein. A pipe 29 leads from the top of the cylinder to connect with the air-pipe 21, before described. Above and below the diaphragm are the two guides 30 and 31, and mounted in these guides for vertical movement is a rod 32, having formed on or fixed thereto a valve 33 to engage the said valve-seat. The parts are so arranged that when the vacuum-pressure reaches a certain predetermined number of inches the valve will be forced up in contact with the valve-seat, and thus the air-vent shut off. As soon as this vacuum is destroyed the valve will of course drop by gravity without the aid of a spring.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States therefor, is—

1. A steam-heating system, comprising one or more radiators, pipes for conducting steam to and from the radiators, a vent-valve for each radiator, exhaust-pipes connected with the valves, said valves tending to close when the velocity of the fluid passing therethrough from the radiators exceeds a predetermined rate, and adapted to open upon a rise in pressure in said exhaust-pipes, and exhausting means connected with said exhaust-pipes, whereby the air may be exhausted from the entire heating system.

2. A steam-heating system, comprising one or more radiators, pipes for conducting steam to and from the radiators, a vent-valve for each radiator, an exhaust-pipe connected with each valve, said valve tending to close when the velocity of the fluid passing therethrough from the radiators exceeds a predetermined rate, and adapted to open upon a rise in pressure in said exhaust-pipes, means for admitting air to the exhaust-pipes, whereby said valves may be opened, and exhausting means connected with the said exhaust-pipes, whereby the air may be exhausted from the entire heating system.

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