E. H. GOLD.

STEAM HEATING SYSTEM.

APPLICATION FILED JUNE 10, 1910.

1,008,325.

Patented Nov. 14, 1911.

3 SHEETS—SHEET 1.

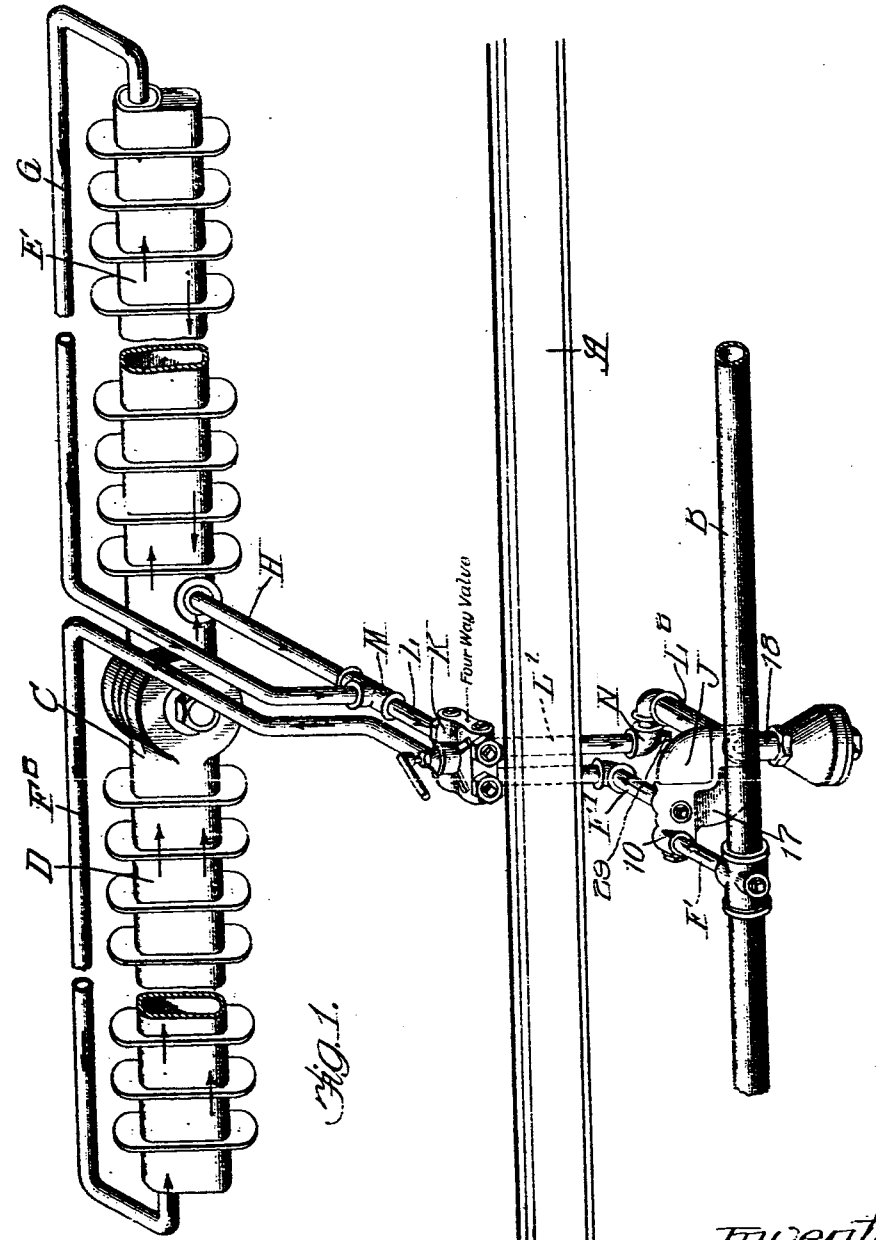

Fig. 1.

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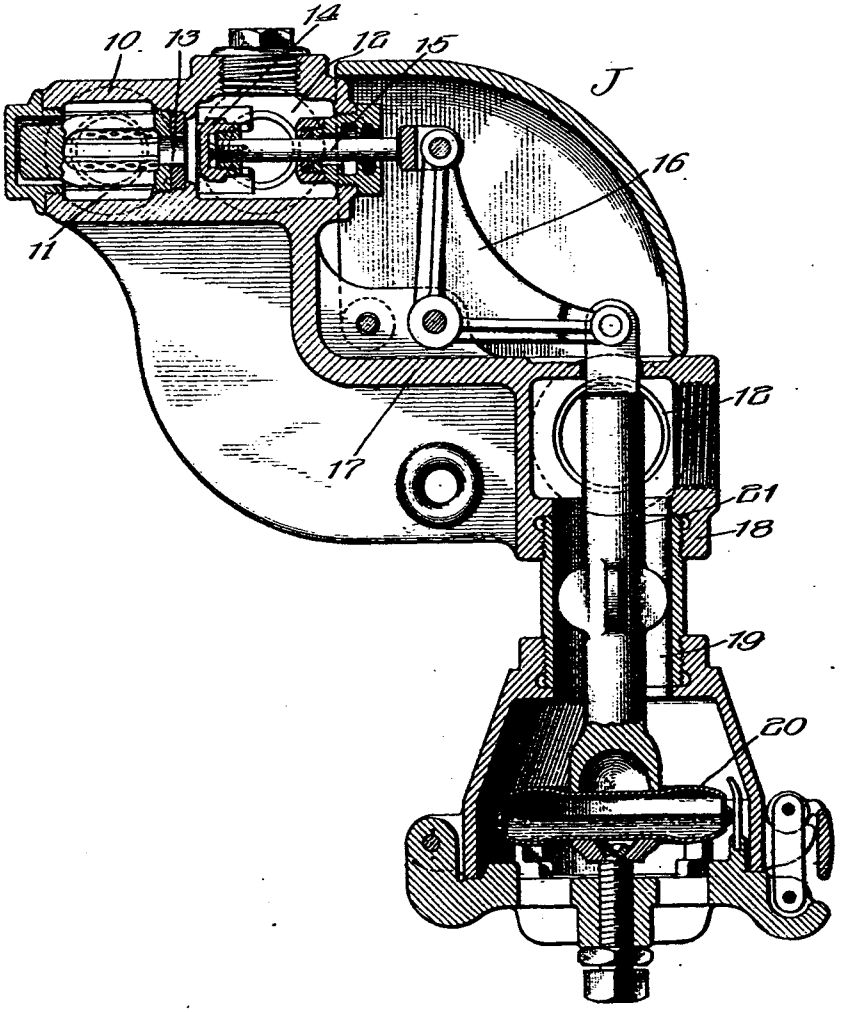
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

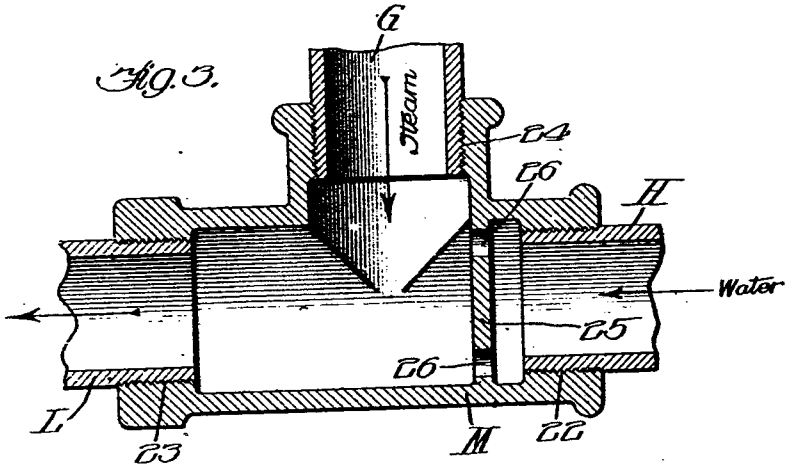
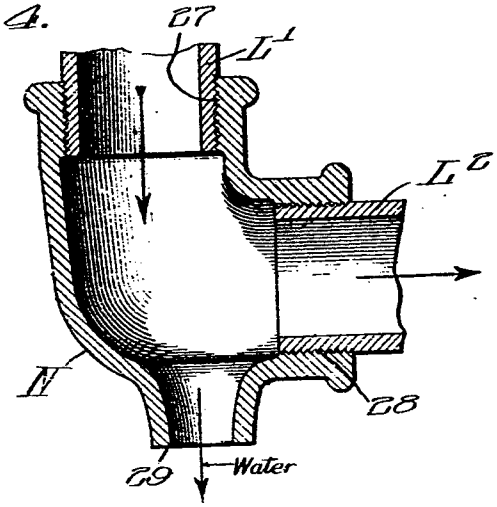


Fig. 4.



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UNITED STATES PATENT OFFICE.

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STEAM-HEATING SYSTEM.

1,008,325. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed June 10, 1910. Serial No. 566,147.

To all whom it may concern:

Be it known that I, EGBERT H. GOLD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Heating Systems, of which the following is a specification.

My invention relates to a steam heating system, and has for its object to provide the certain new and useful improvements in steam heating systems which will be hereinafter described and claimed.

The invention relates particularly to a car heating system employing as a radiating element a receptacle, vessel or conduit, the cross sectional area of which is considerable in comparison with its other dimension, that is, in comparison with the dimension along the path of the steam, such a radiating element, for example, as the cast iron extended surface radiator commonly used on some railway cars; and the principal object of the invention is to provide a certain novel arrangement of the inlet and discharge pipes for such a radiator and certain novel and improved devices associated therewith, which will adapt such radiator to be used for the circulation of steam at low pressure, and particularly for the circulation of steam at atmospheric pressure.

Where it has been attempted to employ a radiator of this sort in an atmospheric pressure system, for example, in a system in which a thermostat for controlling the inflow is located in an open outlet, and, following the usual practice, the inlet pipe is connected to one end of the radiator and the discharge pipe let out from the other end, difficulty is experienced in completely freeing the radiator from air when the steam is turned on. Because of the low pressure of steam there is a tendency of the air to pocket; and therefore, before all of the air has been driven out of the radiator a certain amount of steam escapes to the controller and actuates it to throttle the supply. Once initiated, this condition continues because the outflow of steam keeps the thermostat warm and consequently the pressure in the radiator at a point hardly above atmospheric pressure. My present invention provides an arrangement which will obviate this disadvantage, making it practical to use steam at atmospheric pressure with a radiator of this sort, either by way of adapting existing installations to the atmospheric system of heating, which can be done, according to my invention, by a few comparatively simple changes in the apparatus, or by installation of new systems with radiators of this sort. A radiator of the sort above described may be aptly termed a drum radiator as distinguished from a radiating element consisting of a coil of pipes providing a passageway for the steam which is of relatively small cross sectional area in comparison to its length. It will be obvious, however, that the arrangements constituting my invention may be advantageously used with radiators somewhat different in form and construction from that shown herein.

The system of my invention by preference employs a thermostat located in communication with a pipe which serves as a common discharge conduit for the steam and water outflowing from the radiator, which thermostat is designed to control the inflow of steam to the radiator or radiating system in accordance with the thermostatic condition of the medium in the portion of the discharge pipe adjacent thereto. With this arrangement in view it is a further object of my invention to provide means for withdrawing the water of condensation from said common discharge pipe before the thermostat is reached so that such thermostat is subjected only to the influence of steam. By this arrangement the liability that the thermostat, under influence of commingled steam and water, will shut off or check the inflow of steam to the radiator before the radiator has been completely filled with steam and the air completely driven therefrom, is obviated.

The invention is illustrated in a perferred embodiment, which, of course, might be modified in many respects that will be obvious to those skilled in this art, without departure from my invetnion, in the accompanying drawings, wherein—

Figure 1 is a perspective view of the system as a whole, shown as applied to the heating of a railway car, the flooring of the latter alone being shown. Fig. 2 is a longitudinal sectional view of a common form of thermostatic controller suitable for a system of the sort in question, and Figs. 3 and 4 are sectional views illustrating fittings

used in carrying out my invention in the illustrated form herein shown and described.

Like characters of reference indicate like parts in the several figures of the drawings.

Referring to the drawings, A designates the flooring of a railway car, B the steam train pipe which runs the length of the train, ordinarily below the cars, and is supplied with steam from the locomotive, or other source of supply, at high but ordinarily variable pressures; C designates as a whole a radiator located in the car which is shown as comprising two sections or units D and E; the radiator C being provided with a steam inlet pipe F, F', F^2 which leads to unit D, a steam and air outlet pipe G which leads from the upper corner of unit E, and a water discharge pipe H which leads from the lower portion of the radiator between sections D and E. The radiator shown is a common form of cast iron radiator or drum. The steam from the train pipe in entering the radiator section D passes through a controlling device or vapor regulator J and, preferably through the four-way valve device K, which is interposed between sections F', F^2 of the steam inlet pipe and also between sections L and L' of a common discharge pipe, to which are connected the steam and air outlet pipe G and the water outlet pipe H, the section L^2 of which discharge pipe leads to the thermostat chamber 19 of the controller J, as will be hereinafter described. The four-way valve may be any suitable form of four-way valve. For example I may employ the construction of valve shown in my Patent No. 925,692, granted June 22, 1909. As this device performs no novel function in the present system it is not shown nor described. A fitting M is preferably utilized to connect pipes G and H with pipe L. A fitting N is interposed between sections L', L^2 of the common discharge pipe.

The construction of the controller J is shown in Fig. 2. A casing 10 provides a high pressure chamber 11 connected with the train pipe by the pipe F and a low pressure chamber 12 from which leads pipe section F', chambers 11 and 12 communicating by a port 13 which is closed by a valve 14 having a stem 15 pivoted to a bell crank 16 mounted on the web 17 which supports casing 10. A casing 18 provides a thermostat chamber 19 in which is located the thermostatic member 20 supporting a rod 21 which is pivoted to bell crank 16. Section L^2 of the discharge pipe leads to thermostat chamber 19. It will be understood that when port 13 is open, steam will be admitted from the train pipe B into the radiating unit D. Port 13 is closed or throttled by valve 14 when thermostat 20 is expanded by contact with the outflow from the radiator when such outflow has a sufficiently high temperature.

Fitting M is shown in Fig. 3. It is formed with a tap 22 for pipe H, a tap 23 for pipe L and a tap 24 for pipe G. The fitting is formed with a partition 25 having a perforation or perforations 26, the partition intervening between taps 22 and 24.

Fitting N is shown in Fig. 4. It is formed with a tap 27 for pipe section L', a tap 28 for pipe section L^2 and with a water discharge 29 which is of small cross sectional area relative to the cross sectional area of the steam passage through the fitting.

The operation of the system above described is as follows: The steam flows from the train pipe B through pipe section F, chambers 11 and 12 of the controller J, supposing valve 14 in its open position, and through pipe sections F' and F^2 into the radiating unit D. In flowing through radiator section D the steam pushes the air contained therein ahead of it, a small amount of air escaping through pipe H, but most of it being forced through the radiator section E and out of pipe G, thence through the common discharge pipe L, L', L^2 to the atmosphere. The water of condensation collecting in the radiating unit D flows out through pipe H and through the perforations 26 in the partition or dam 25, in fitting M, into the common discharge pipe. As the introduction of steam into the radiating unit D continues the steam therein will be forced into radiating unit E until the latter is filled with steam and all of the air theretofore contained therein expelled through the pipe G. After this, steam will flow through pipe G and through the discharge pipe L, L', L^2 to the thermostat 20 of the controller J, causing the thermostat to expand to shut off or throttle the further inflow of steam to the radiator. It will be observed that the air and steam from radiating unit E has an unobstructed outflow through pipe G and fitting M, whereas the escape of any great amount of steam through the water discharge pipe H is prevented by the relatively small cross sectional area of the openings 26 in dam 25; these openings, however, being made large enough so as to conveniently take care of the condensation. As a result of this arrangement, supposing the inflow of steam to the radiator to be continued by the maintenance of the inlet valve 14 in its open position, all of the air will be driven from the radiator and the radiator filled with steam without the necessity of maintaining a sufficient steam pressure to compel the water of condensation to follow the same course as the steam. It will be understood that the water of condensation from both radiating units D and E, discharges by gravity through the pipe H. It

will be seen that the water of condensation is not trapped at any point in the system, specifically is not trapped at partition 25, but may freely escape. Traps are objectionable in car heating systems because of the likelihood of their freezing in severe weather. The proper operation of the system is, however, conditioned upon keeping the inlet valve of the thermostat open long enough and keeping it sufficiently wide open, to insure the complete expulsion of air from the radiator and the filling of the same with steam. The water of condensation flowing from the radiating units is likely, in the system as above described, to be relatively warm, since it does not flow through the whole length of the radiator, and moreover as its temperature is somewhat increased by the slight escape of steam through openings 26 and such small amount of steam as may escape through the pipe G before the radiator sections are completely filled with steam. From these circumstances it may happen that the water of condensation, when it reaches the thermostat chamber, will be warm enough to actuate the same or partially close the inlet valve 14 so as to shut off or throttle the inflow of steam to the radiator sections before the same are completely filled with steam. To obviate this difficulty, which it will be seen is inherent in a system such as the one here shown, the fitting N is interposed in the discharge pipe which fitting discharges the water of condensation from the pipe, through its water discharge 29 before the water, or any appreciably amount of the same, reaches the thermostat chamber. The thermostat is, therefore, subjected only to the influence of the steam, and with the apparatus properly constructed, steam will not reach the thermostat chamber in sufficient amount to materially affect the thermostat until the radiating units have been completely filled.

As obvious modifications in the form, construction and arrangement of the various elements constituting my system will suggest themselves to those skilled in the steam heating art, I do not limit myself to these particulars except so far as the same are made specific limitations on certain of the claims herein.

I claim:

1. In a steam heating system for railway cars, the combination with a source of supply of steam, of radiating means comprising a drum adapted to extend lengthwise of the car, a steam inlet pipe leading from the source of supply of steam to one end of said drum, an air and steam outlet pipe leading from the other end of said drum, a water discharge pipe leading from the center of the drum at the bottom, a common discharge pipe, a fitting which connects said outlet pipe and said water discharge pipe with the common discharge pipe, said fitting being formed with a perforated partition back of the point of connection of the steam and air outlet pipe with said fitting, which partition is arranged so as to check the outflow of steam without trapping the water of condensation, and means for controlling the flow of steam through the inlet pipe comprising a thermostatic member arranged so as to be influenced by the medium discharged from said common discharge pipe.

2. In a steam heating system for railway cars, the combination with a source of supply of steam, of a radiator, a steam inlet pipe leading from the source of supply of steam to one end of said radiator, an air and steam outlet pipe leading from the other end of the radiator, a water discharge pipe leading from the center portion of the radiator, a common discharge pipe, and a fitting which connects said outlet pipe and said water discharge pipe with the common discharge pipe, said fitting being formed with a perforated partition back of the point of connection of the steam and air outlet pipe with said fitting, which partition is arranged so as to check the outflow of steam without trapping the water of condensation.

3. In a steam heating system for railway cars, the combination with a source of supply of steam, of a radiator comprising a drum adapted to extend lengthwise of the car, a steam carrying pipe communicating with said source of supply and leading to said drum, an air and steam outlet pipe leading from a point of said drum above the bottom thereof, means actuated by the steam flowing through said air and steam outlet pipe, for maintaining the steam in said drum at substantially atmospheric pressure, a water outlet pipe leading from the lower portion of the drum between its ends and adapted to drain the drum, said water outlet pipe having therein means for restricting the escape of steam therethrough while permitting the escape of water.

4. In a steam heating system for railway cars, the combination with a source of supply of steam, of a radiator comprising a drum adapted to extend lengthwise of the car, a steam inlet pipe communicating with said source of supply and leading to one end of said drum, an air and steam outlet pipe leading from the other end of said drum above the bottom thereof, a water outlet pipe leading from the lower portion of the drum between its ends adapted to drain the portions of the drum on both sides thereof and having therein a restriction to restrict the escape of steam while permitting the escape of water, a common

discharge pipe into which the water from the water outlet pipe is delivered after passing the restriction and with which said air and steam pipe communicates, said drum being of greater cross sectional area than said pipes, and means actuated by the steam flowing through said common discharge pipe for maintaining the steam in said drum at substantially atmospheric pressure.

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