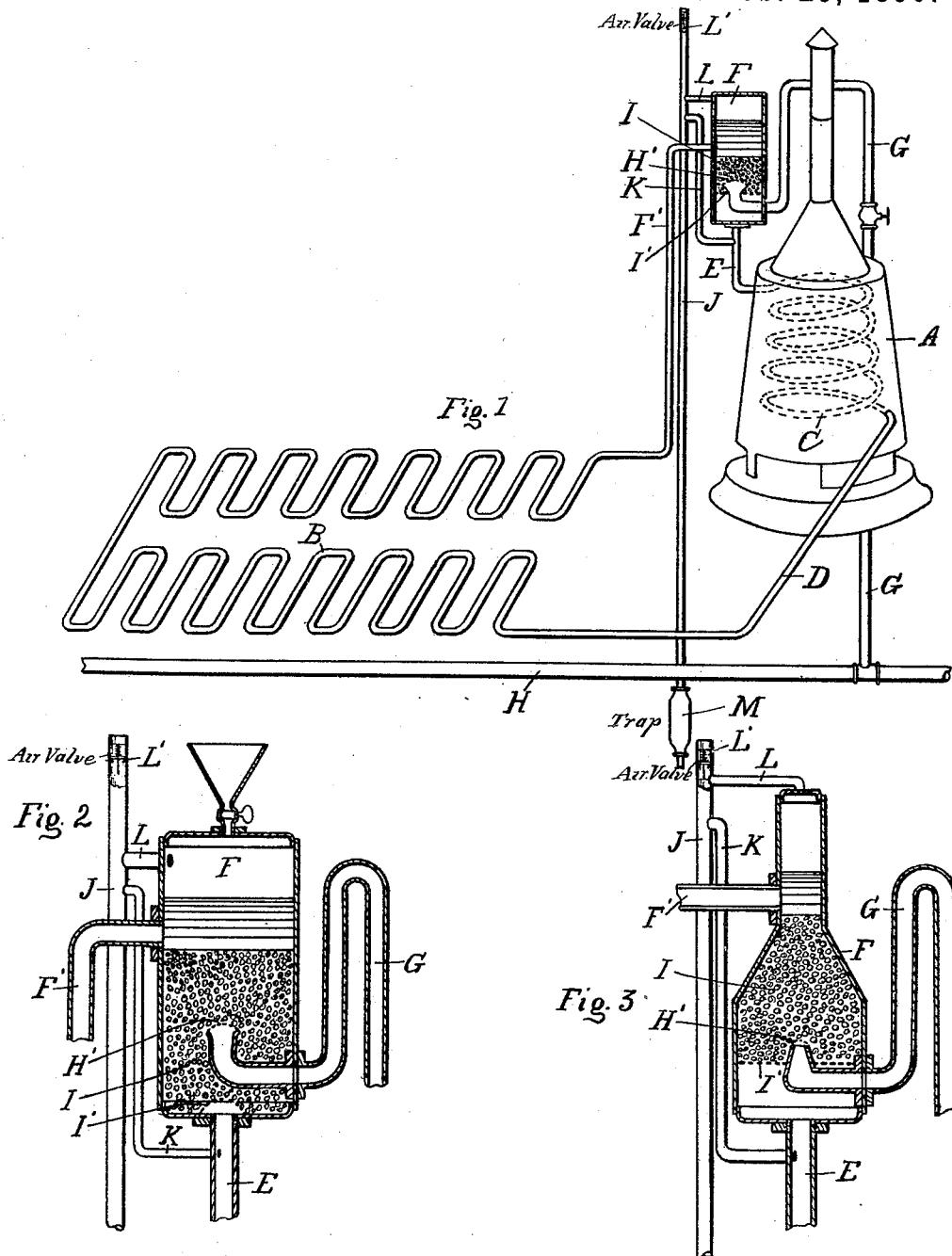


(No Model.)

J. F. McELROY.  
CIRCULATING HOT WATER APPARATUS.

No. 422,312.

Patented Feb. 25, 1890.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## CIRCULATING HOT-WATER APPARATUS.

SPECIFICATION forming part of Letters Patent No. 422,312, dated February 25, 1890.

Application filed July 25, 1887. Serial No. 245,193. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES F. McELROY, a citizen of the United States, residing at Lansing, in the county of Ingham and State of Michigan, have invented certain new and useful Improvements in Circulating Hot-Water Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in circulating hot-water apparatus for heating railway-cars; and the invention consists in the peculiar combination of the ordinary car-heater and its circulating hot-water system as in present use, with an attachment for heating the water by introducing steam from the locomotive directly into it, so that the fire in the car-heater may be dispensed with, except when no steam can be derived from the locomotive.

The object of the invention is to furnish a safer source of heat for heating cars of a railway-train while in transit than is afforded by the car-stove, the dangerous nature of which in cases of railroad accidents is well known.

In the drawings, which accompany this specification, Figure 1 is a detached perspective view of a circulating hot-water heater as in present use for heating a railway-car, and to which my invention is applied. Fig. 2 is an enlarged vertical section of the steam heating-drum, by means of which the steam is introduced into the hot-water circulation. Fig. 3 is a like view with the steam heating-drum in a somewhat modified form.

A is a car-heater provided with a circulating hot-water system, of which B are the usual radiating-pipes near the floor of the car, C the heating-coil in the furnace of the heater, D the return-connection from the radiating-pipes to the heater, and E the hot-water-outlet connection from the heater to the radiating-pipes, all the parts being arranged in the usual known manner.

F is a drum or vessel, preferably of cylindrical shape and placed in proximity to the car-heater, and with this drum the outlet-pipe E from the heater is connected at or near the bottom thereof, while another pipe F' connects with the drum at a higher point and es-

tablishes communication with the radiating-pipes B.

G is a steam-pipe, which takes the steam from a train-pipe H, a portion of which is only shown, but which is supposed to run from car to car by means of suitable flexible connections, and which carries steam from the locomotive to the cars. The pipe G rises to a suitable height to trap the water in the drum to prevent it from flowing out through it, and opens into the drum at or near the bottom thereof, its discharge-opening being provided with a screen H'.

I is a medium preferably formed of a quantity of shot, coarse metal turnings, gravel, or other materials of like nature, adapted to form numerous interstices or channels for the upward escape of steam and water. This medium is only required to surround the mouth of the discharge-opening of the steam-pipe G, and may be supported on a perforated partition I', or fill the whole bottom of the drum, if desired; but its height is preferably below the opening of the pipe F into the drum.

J is an escape-pipe, which connects with the pipe E through the overflow-pipe K and with the drum through the air-pipe L, the former rising to a suitable height to trap the water in the drum to within a short distance from its top, while the latter connects at or near the top of the drum to permit the air to escape through the pipe J, which latter is provided on top with an automatic air-valve L', of any suitable construction, such as used for steam-radiators, to prevent the escape of steam.

M is a hot-water trap placed at or near the lower end of the pipe J, to retain the overflow in the pipe J until it has parted with its heat, or nearly so, when it permits the outflow. As such traps are well known and in use, I may be permitted to omit showing its construction.

In practice, steam being admitted through the pipe G, which is provided with a suitable valve, it will find its escape through the numerous interstices or channels in the medium placed in the drum, where it meets the water of circulation and commingles with it,

thus imparting its heat and sustaining the circulation in the absence of the heat from the car-stove or other source of heat. The main object of the medium I in the drum is to afford both to the water and the steam a large number of channels, wherein they come in intimate contact with each other to readily commingle and impart the heat of the steam to the water. The device is to a certain extent self-regulating, inasmuch as the consumption of steam depends upon the temperature and circulation of the water, and in connection with the valve G the apparatus permits a perfect regulation of the heat. The device operates noiselessly, as the medium prevents any commotion of the water at the point of commingling of the steam and water. The heated water being forced upward by its own tendency as well as by the action of the steam, provided the latter discharges in an upward direction, takes its course through the pipe F' into the radiators, and after circulating through them flows back through the return D, coil C, and pipe E to the drum, thus completing the circulation. It will be noticed that the overflow is taken off where the water of circulation is the coolest—that is, just before entering the drum—and by means of the overflow-trap M it may be retained until it has parted with its entire heat. As the overflow is but small, hardly exceeding one and one-half cubic foot per hour, except when steam is first turned on to cold water, the trap M may be omitted without incurring a detrimental loss of heat. The connection into the top of the drum admits of the escape of air, which will be forced into the circulation, through the steam-pipe, by allowing it to pass into the escape-pipe J and out through the air-valve L'.

My object is to preferably operate the apparatus with a very low pressure of steam, as low as one or two pounds. It will be necessary, therefore, in such a case to introduce the steam at a point as near the water-level as possible, so that the steam in entering the water will have to overcome the least hydrostatic pressure. With high-pressure steam it would be immaterial as to what height the system is tapped by the steam; but by placing such connection relatively high it will evidently be necessary to depend in a more or less degree on the force of the steam to establish the hot-water circulation. This may readily be done by discharging the steam in the form of a jet and contracting the drum, as shown in the modification thereof in Fig. 3, or by adopting the devices in common use with injectors for forcing or lifting the water by the steam. Should the flow of steam into the circulation be greater than the water can use, so that free steam would be present in the top of the drum, the increase in pressure would check the inflow of steam; but, if desired, a more positive shut-off may be obtained by means of a regulating device, which operates automatically a valve in the steam-

pipe by the pressure of the steam in the top of the drum.

It will be seen that in the absence of steam the apparatus will operate in the usual manner by means of a fire in the furnace of the heater, and what enhances its simplicity and practicability is that there need be no operation of valves or other devices in changing the source of heat; and still further, both sources of heat may be used jointly, as there is no interference possible.

The drum F satisfies all the requirements of an expansion-drum as used in connection with the ordinary car-heater, and it may be provided with the usual devices for filling in the water. It is obvious that by placing the drum into the circulating system within the car the radiating heat from the drum is utilized to heat the car; but without special provision the commingling of steam and water would create commotion and noise, and thereby form a serious objection against applying this means of heating cars. The medium in the drum not alone diffuses the steam into numerous channels, but it effects its condensation while it passes through the medium, and thereby not only quiets the noise, but also prevents a commotion in the water of circulation, which otherwise could not be maintained in the system at the required level and would create constant fluctuations in the circulation. The medium facilitates the absorption of a large quantity of steam, reduces the pressure in the system, and checks the inflow of steam when the water is not capable of condensing steam any further.

What I claim as my invention is—

1. The combination, with the circulating system of a circulating hot-water apparatus, including a stove or heater, of a drum or vessel in said system through which the water circulates, a steam-pipe adapted to discharge steam into the body of water in said drum or vessel, and an overflow-pipe communicating with said circulating system to carry away the surplus water of condensation, substantially as described.

2. In combination with a circulating hot-water apparatus and its stove or heater, a drum through which the water circulates on its way from the heater to the radiating system, a steam-pipe adapted to discharge steam into the body of water into said drum, an overflow-pipe communicating with said drum, and an air-escape pipe, all arranged to operate, substantially as described.

3. In combination with a circulating hot-water apparatus and its stove or heater, a drum through which the water circulates vertically on its way from the heater to the radiating-pipes, a steam-pipe into said drum, arranged to discharge the steam in an upward direction from near the bottom thereof into the body of water in said drum, a medium of gravel or equivalent material surrounding the discharge-opening of said steam-pipe, and an overflow-pipe communicating

with said drum and discharging below the floor of the car, substantially as described.

4. In a circulating hot-water apparatus, the combination of a stove, a radiating system, 5 a drum inserted between the radiating system thereof and the stove or heater, whereby the water is caused to circulate through said drum, a connection from the top of the heater into the bottom of the drum, a connection 10 from the top of the drum to the radiating system, and a steam-pipe entering said drum to discharge steam in an upward direction into the body of the water in said drum, substantially as described.

15 5. The combination of a circulating hot-water apparatus, arranged within a car and independently operative by means of a stove, a drum in the vertical riser of the circulating system of said apparatus, whereby the 20 water of circulation circulates through said drum in a vertical direction, a main steam-pipe connecting the car with the locomotive or other source of steam, a branch steam-pipe connecting the main steam-pipe with the drum 25 and entering into said drum, a valve in said branch pipe, a medium of gravel or equivalent material within the drum and surrounding the discharge-opening of the steam-pipe in said drum, and an overflow-pipe to carry 30 off the surplus water of condensation, substantially as described.

6. In a car-heating apparatus of the kind described, an expansion-drum and a steam-pipe entering said expansion-drum, whereby

a combined heating-chamber and expansion-drum is formed, substantially as described. 35

7. In a car-heating apparatus consisting of hot-water-circulating-pipes and an expansion-drum, a steam-pipe entering said circulating system, an overflow-pipe connecting with the 40 return-pipe near the heater, whereby the overflow is taken from the coldest point in the system, substantially as described.

8. In a car-heating apparatus consisting of hot-water-circulating pipes and an expansion-drum, a steam-pipe entering said system, an 45 overflow-pipe connected with the return-pipe near the heater, and a pressure-regulating pipe *e*, connecting with the expansion-drum and the overflow-pipe, substantially as described. 50

9. In a car-heating apparatus consisting of hot-water-circulating pipes and an expansion-drum, a steam-pipe entering said system, an 55 overflow having an air-valve at the top and extending above the water-level in such drum, a connection with said overflow-pipe and the return-pipe, the pressure-regulating pipe *e*, and an air-valve on said overflow-pipe, the 60 parts being arranged to operate substantially as and for the purpose described.

In testimony whereof I affix my signature, in presence of two witnesses, this 13th day of July, 1887.

JAMES F. McELROY.

Witnesses:

J. CORNELL,

E. O. KELLEY.