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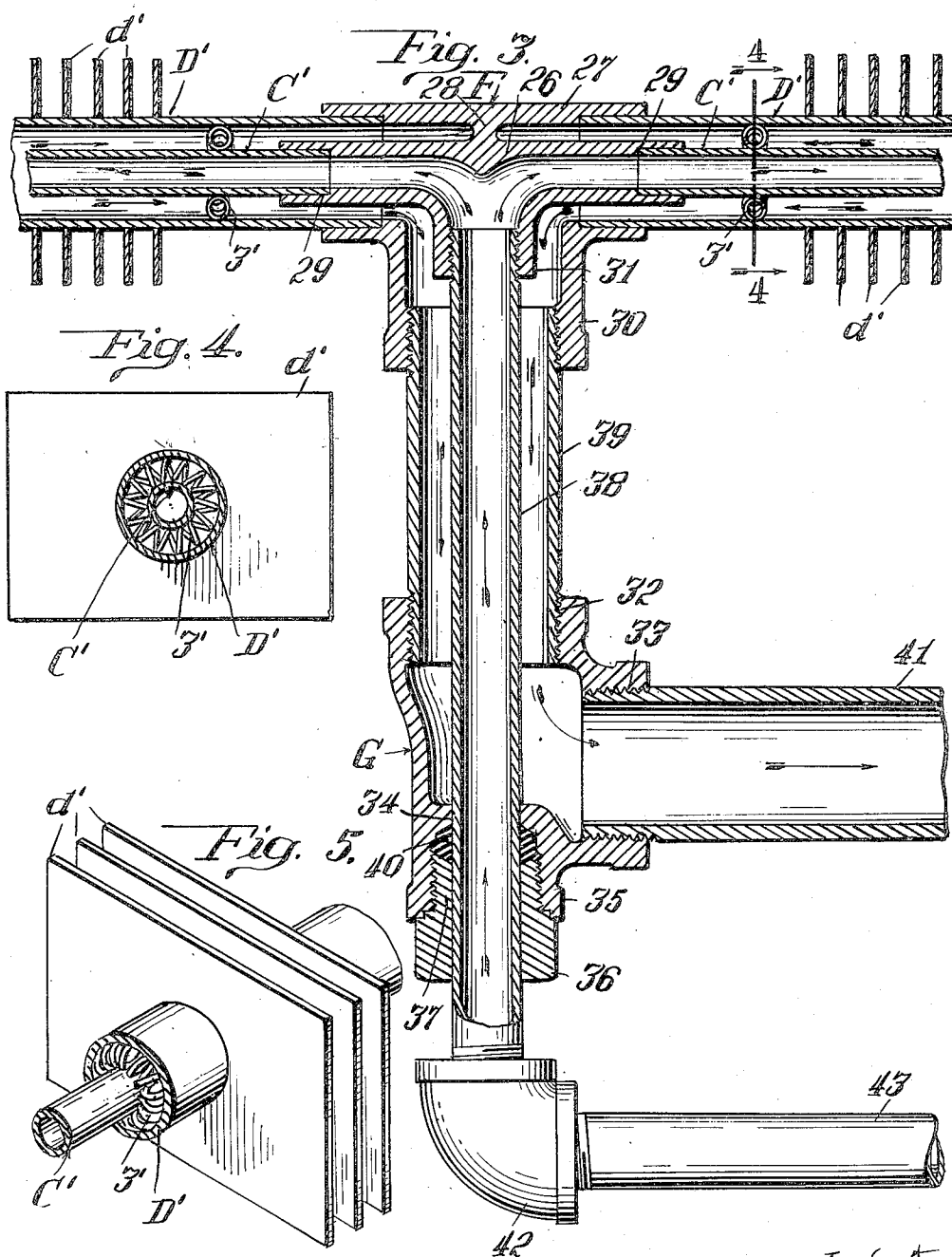
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HEATING APPARATUS

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HEATING APPARATUS

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5 Claims. (Cl. 237—6)

This invention is directed to new and useful improvements in heating apparatus and more particularly to unit radiation apparatus for use in railway cars.

5 The apparatus herein shown and described is particularly adapted for use with steam or vapor systems of the type operating at substantially atmospheric pressure in which the discharge end of the system is always open to the atmosphere
10 and is of the type utilizing an inner feed pipe and a surrounding radiating pipe which leads the steam back to the discharge end of the apparatus.

The primary object of this invention is to provide apparatus that will more uniformly heat the
15 inside of railway cars and may be more easily assembled and installed in the cars for operation.

Another object is to provide a novel means for mounting the feed pipe within the outer pipe so that the feed pipe may expand and contract with-
20 out injury to the apparatus and will also be cushioned against rattling or jarring when the car is in motion.

Still another object is to provide novel means for automatically effecting equal distribution of
25 the heating medium throughout the system.

A further object is to provide a substantially central feed for the apparatus whereby the ends of the car in which the apparatus is installed will be more effectively heated.

30 Still a further object is to provide novel fittings and pipe arrangements that will facilitate the construction and operation of the apparatus.

Other objects and advantages will be apparent from an examination of the following description
35 and drawings in which:

Fig. 1 is a perspective view of heating apparatus embodying the invention herein described and claimed.

40 Fig. 2 is a longitudinal sectional view of the apparatus shown in Fig. 1.

Fig. 3 is a longitudinal sectional view of a portion of another form of heating apparatus embodying these inventions.

45 Fig. 4 is a section taken along line 4—4 of Fig. 3 showing the novel means for supporting the inner pipe within the outer pipe. This feature is common to both.

Fig. 5 is a perspective view of a portion of the heating arms of either form of apparatus showing
50 the same novel supporting means of Fig. 4.

In general, see Figs. 1 and 2, the apparatus consists of a source of steam supply (not shown), a vapor regulator A, a magnetic control valve B, inner feed pipes C, radiating return pipes D surrounding said feed pipes C and thermostatically
55 operated valves or radiation balancers E positioned in the return lines for the purposes hereinafter explained in detail.

The vapor regulator A is of the usual well known
60 type and therefore the details thereof are not

shown. It comprises thermostatically operated means for automatically closing a valve to shut off the supply of steam passing through it to the heating unit whenever the heating medium returning to it from the unit is in the form of steam. 5 The lower portion *a* is the discharge end of the heating system and is always open to permit the condensing steam or water to escape. The efficient operation of the system depends only upon keeping steam in the pipes so when steam is being
10 lost through the discharge vent *a*, the means above mentioned closes the feed line and will open it when the temperature within the return end of the regulator drops below that of steam.

The control valve B is actuated automatically
15 also and is well known to the art. It is used to control the temperature of the space being heated by magnetically actuating valves therein to short circuit the steam so that it does not enter the radiators when the desired temperature has been
20 reached in the space being heated and to direct the steam to the radiators when the temperature drops below that desired.

The control valve B comprises a casing in which is a rotatable valve part controlled by rockshaft
25 44 on which is secured the operating lever 45. When the valve is in the position shown in the drawings it is closed and the steam flows from vapor regulator A to valve B, where it is by-passed back to vapor regulator A. When lever 45 is
30 thrown over to a corresponding position inclined toward the right at its upper end the valve B will be opened and the steam can flow from the supply into and through the radiators, the steam flowing in from the vapor regulator A through
35 pipe 25, thence through valve B, and out through pipe 1 to the radiators D from which the steam and condensate return through pipe 22 to the valve B and thence back to the vapor regulator
40 all in a well known manner.

When the space to be heated has reached the desired temperature the thermostat 46 will function to de-energize magnet 47, thereby permitting
45 armature 48 to move to the position shown so as to complete circuit which will energize solenoid 49 to move lever 45 to the position shown which
50 shuts off the supply of steam to the radiators. When the temperature surrounding thermostat 46 drops below that desired the circuit running through the thermostat is broken and magnet 47
55 is again energized to move armature 48 to its other position, which will complete the circuit to energize solenoid 50 to move valve to open position.

As is shown the steam is directed from its source through the shut-off valve within the vapor regulator A to the control valve B.

A feed pipe 1 leads from the control valve B to the inner feed pipes C through a T connection
60 2 from which the inner feed pipes C extend in

opposite directions. The inner feed pipes C are mounted within and spaced from the radiating pipes D by means of a plurality of coil spring spacers 3.

5 The outer ends of inner feed pipes C terminate short of the outer ends of pipes D which are closed by caps 4 which may be secured to pipes D by thread connections or soldered joints, the exact method used being immaterial.

10 The coil spring spacers 3 are shown in detail in Figs. 4 and 5 and permit expansion of the inner feed pipes longitudinally and laterally, cushion the pipes against rattling, and at the same time provide openings for the heating medium to pass through after discharge from the inner feed pipes into the return pipes D.

Pipes D are provided with radiating fins d substantially throughout their length.

Adjacent each side of the T connection 2 there are mounted on and surrounding pipes C, L fittings 5 to which the inner ends of pipes D are secured by means of slip joints 6 that are soldered. The inner ends of these L's 5 are provided with openings 7 substantially the size of the pipes C so that they may be mounted therein. Extending inwardly therefrom are threaded shanks 8 spaced from the outer surface of pipes C to provide room for packing 9. Nuts 10 having glands 11 are threaded on the shanks 8 with the glands 11 bearing against the packing 9. Outlets 12 in the L's 5 extend downwardly and are joined by pipes 13, elbows 14 and pipes 15 to the valves E.

Each valve or radiation balancer E comprises a casing 16 provided with an inlet 17 and an outlet 18. Mounted therein is a bellows 19 of the usual expansion and contraction type adapted to expand upon being subjected to a predetermined temperature, for example, 212° Fahrenheit. The free end of the bellows 19 comprises a valve 20 adapted to be seated in the outlet 18 to close the outlet when the bellows is expanded.

Suitable pipes 21 lead from the outlets 18 to return pipe 22 by means of standard fittings such as elbow 23 and T 24. Return pipe 22 leads to the cut-out valve B, heretofore described and pipes 25 join the cut-out valve and the vapor regulator A.

Operation.—Steam is admitted to the unit through the vapor regulator A in the direction shown by the arrows in the drawings, passes through the cut-off valve B and into pipe 1. It then passes through the T 2 from whence it is directed into the outer ends of the inner feed pipes C emerging therefrom to the caps 4 which force the steam back through the finned radiating pipes D to effect a heating of the space in which the unit is positioned.

The pipes C and D are anchored only at their inner ends and may therefore expand longitudinally as they become heated. The spring spacers 3 permit relative movement between pipes C and D and resiliently support and space the inner pipes from the outer pipes. The slip-fittings 5 allow for unequal longitudinal expansion of the inner and outer pipes C and D.

It can be clearly seen from the above description that in using this unit the heat radiation first occurs at the outer ends of the unit, usually the far ends of the railway car, which are generally more in need of heat because of the location of the entrance doors at the ends.

After heating the pipes D the steam is directed by L's 5 to the valves E.

Valves E are used for the purpose of equalizing the heat in both ends of the unit or in other words

to insure even distribution of the steam as will now be described.

If one arm of the unit should be shorter than the other arm the steam would tend to pass almost entirely through the short arm with the result that only one end of the space to be heated would be brought to the desired temperature. Such an action is termed a "short circuiting" of the system. Other circumstances may be present that would tend to cause such an action of the steam and the valves E are positioned in the return lines to obviate such an occurrence.

Assuming such a short circuiting, for example through the left end of the system, it is obvious that the steam passing through valve E would rapidly raise the temperature therein to a point adapted to effect an operation of the bellows 19. The expansion of the bellows 19 would seat valve 20 to close outlet 18. Thereupon the left end of the unit being full of steam and closed, the steam would naturally find its way into the right end of the system to effect the proper heating action. As no more steam enters the left end the temperature drops, the bellows valve contracts opening outlet 18 and steam again passes into the left end. Of course the valve acts similarly in the right end and it can readily be seen that steam is thereby maintained in both ends to efficiently heat the desired space. In the structure shown in Figs. 1 and 2 the left arm is the shorter and in the absence of a thermostatically operated valve in the return end of that arm the steam would merely circulate through the short arm. In such a structure it is obvious that under usual conditions a complete distribution of steam through both arms will be effected by using only one valve positioned in the return end of the short arm.

The operation of the vapor regulator A and the cut-out valve B have been explained heretofore and it is unnecessary to now repeat their functions as their operation is deemed apparent.

An alternative form of this invention is shown in Fig. 3. Therein the inner feed pipes C' are mounted within the return pipes D' by spacers 3' in the same manner as the structure shown in Figs. 1 and 2. Pipes D' are likewise provided with fins d' and the outer ends of pipes C' terminate short of the ends of pipes D' which are capped as heretofore described in detail.

In this form of the invention a cast fitting comprising a double walled T F is provided and positioned substantially in the center of the heating unit whereby the steam is directed into the unit and returned therefrom through a single connection. This structure is in reality a T within a T, the smaller one 26 being supported by and within the larger one 27 by means of a web 28 so that the corresponding openings of each are substantially concentric. The two arms of the T 26 extend a small distance beyond the corresponding arms of T 27 and are rabbeted as at 29 so as to receive the inner ends of pipes C' in a slip joint connection. The arms of T 27 are similarly rabbeted to receive the inner ends of pipes D'. The stem 30 of the larger T 27 extends past the stem 31 of the smaller one and both are threaded internally.

Another connecting member in the form of an L casting G is provided, having an internally threaded opening 32 to correspond to the threaded opening 30 of member F, a threaded opening 33 at right angles thereto and an opening 34 aligned concentrically with 32 and of substantially the size of a pipe adapted to be threaded

into the stem 31 of member F. Casting G extends beyond 34 in the form of an internally threaded flange portion 35 of slightly larger diameter than 34. There is also provided a nut 36 having gland 37 threaded to cooperate with threads of flange 35.

A feed pipe 38 is threaded into the stem 31 of fitting F and a shorter pipe 39 of larger diameter is threaded into stem 30. Connecting member G is threaded onto the other end of pipe 39 with feed pipe 38 extending through opening 34 and beyond flange portion 35. Appropriate packing material 40 is positioned around pipe 38 within flange portion 35 and nut 36 is threaded into the flange portion to seal the joint but permit longitudinal expansion of pipe 38 when heated. A return pipe 41 leads to the control valve (not shown in Fig. 3) and is threaded into opening 33 and necessary connections such as elbow 42 and pipe 43 connect the end of feed pipe 38 that extends from member G with the control valve.

In this embodiment of the invention the steam is directed to the vapor regulator and control valve in the same manner as heretofore described in detail and shown in Figs. 1 and 2.

Operation.—In this alternative form the operation is the same as heretofore described, the steam moving in the direction of the arrows from pipe 38 through the smaller T 26 to each of inner feed pipes C' and back through return pipes D' through the larger T 27, pipe 39, member G, into pipe 41, control valve B, vapor regulator A to the atmosphere.

While this form of the structure does not contemplate the use of steam traps to overcome a "short-circuiting" condition, it is obvious that if found necessary thermostatically controlled means can be inserted within each of the return pipes D to close valves positioned in the feed pipe C' to stop the flow of steam into one end of the system until the other end is properly heated.

I claim:

1. Heating apparatus for use in a steam heating system operable at substantially atmospheric pressure comprising, a vapor regulator for shutting off the supply of steam when the apparatus is full of steam, a control valve for regulating the steam admitted to the radiating means by short-circuiting the steam when the space to be heated has reached the desired temperature, inner feed pipes open at their outer ends, a T fitting supporting the inner ends of said feed pipes, a supply pipe leading from said control valve to said T, radiating pipes surrounding said feed pipes and extending past their open ends, closures on the outer ends of said radiating pipes, spacers mounted around said feed pipes and supporting said radiating pipes and permitting relative movement of said feed and radiating pipes, return pipes leading from the inner ends of said radiating pipes to the control valve, independent steam responsive thermostatically operated valves positioned in each of said return pipes, supply and return pipes leading from said vapor regulator to said control valve and a pipe leading from the source of steam supply to said vapor regulator.

2. Heating apparatus for use in a steam heating system operable at substantially atmospheric pressure comprising, a vapor regulator for shutting off the supply of steam when the apparatus is full of steam, a control valve for regulating the steam admitted to the radiating means by short-circuiting the steam when the space to be heated has reached the desired temperature, in-

ner feed pipes open at their outer ends, a T fitting supporting the inner ends of said feed pipes, a supply pipe leading from said control valve to said T, radiating pipes surrounding said feed pipes and extending past their open ends, closures on the outer ends of said radiating pipes, spacers mounted around said feed pipes and supporting said radiating pipes and permitting relative movement of said feed and radiating pipes, return pipes leading from the inner ends of said radiating pipes to the control valve, a steam responsive thermostatically operated valve positioned in the return pipe leading from the radiating pipe of least steam resistance, supply and return pipes leading from said vapor regulator to said control valve and a pipe leading from the source of steam supply to said vapor regulator.

3. Heating apparatus for use in steam heating system operable at substantially atmospheric pressure comprising a vapor regulator for shutting off the supply of steam when the apparatus is full of steam, a pair of radiators positioned in the space to be heated, a control valve for regulating the steam admitted to the radiators by shutting off the supply of steam thereto when the desired temperature is reached in the space to be heated, a common supply pipe leading from said control valve to said radiators, return pipes leading from said radiators to the control valve, a steam responsive thermostatic valve positioned in the return pipe leading from the radiator of least steam circulating resistance adapted to close said return pipe in the presence of steam to cause steam to circulate through the other radiator, supply and return pipes leading from said vapor regulator to said control valve and a pipe leading from the source of steam supply to said vapor regulator.

4. Heating apparatus for use in steam heating system operable at substantially atmospheric pressure comprising, a vapor regulator for shutting off the supply of steam when the apparatus is full of steam, radiating pipes of different lengths positioned in the space to be heated, a common supply pipe leading from said vapor regulator to said radiating pipes, return pipes leading from each of said radiating pipes, a common pipe joining said return pipes to said vapor regulator and a steam responsive thermostatic valve positioned in the return pipe leading from the shorter radiating pipe adapted to close said return pipe in the presence of steam.

5. A vapor heating system comprising a pair of radiators, one of greater steam capacity than the other, a source of steam, a vapor regulator adapted to cut off the flow of steam from the source to the radiators when steam is returned from the system to the regulator, a control valve, supply and return pipes connecting the regulator and valve, a feed pipe leading from the valve with branches leading to the respective radiators, a return pipe leading back to the valve with branches leading from each radiator, the valve in one position directing the steam flow from the regulator first through the radiators and then back to the regulator and in a second position shunting the steam flow from the regulator directly back to the regulator and a steam responsive thermostatically operated valve positioned in the return pipe branch leading from the radiator of lesser capacity to close said return pipe in the presence of steam.