June 19, 1928. 1,674,131

E. A. RUSSELL

RADIATOR FOR RAILWAY CAR HEATING SYSTEMS

Filed April 6, 1925 2 Sheets-Sheet 1

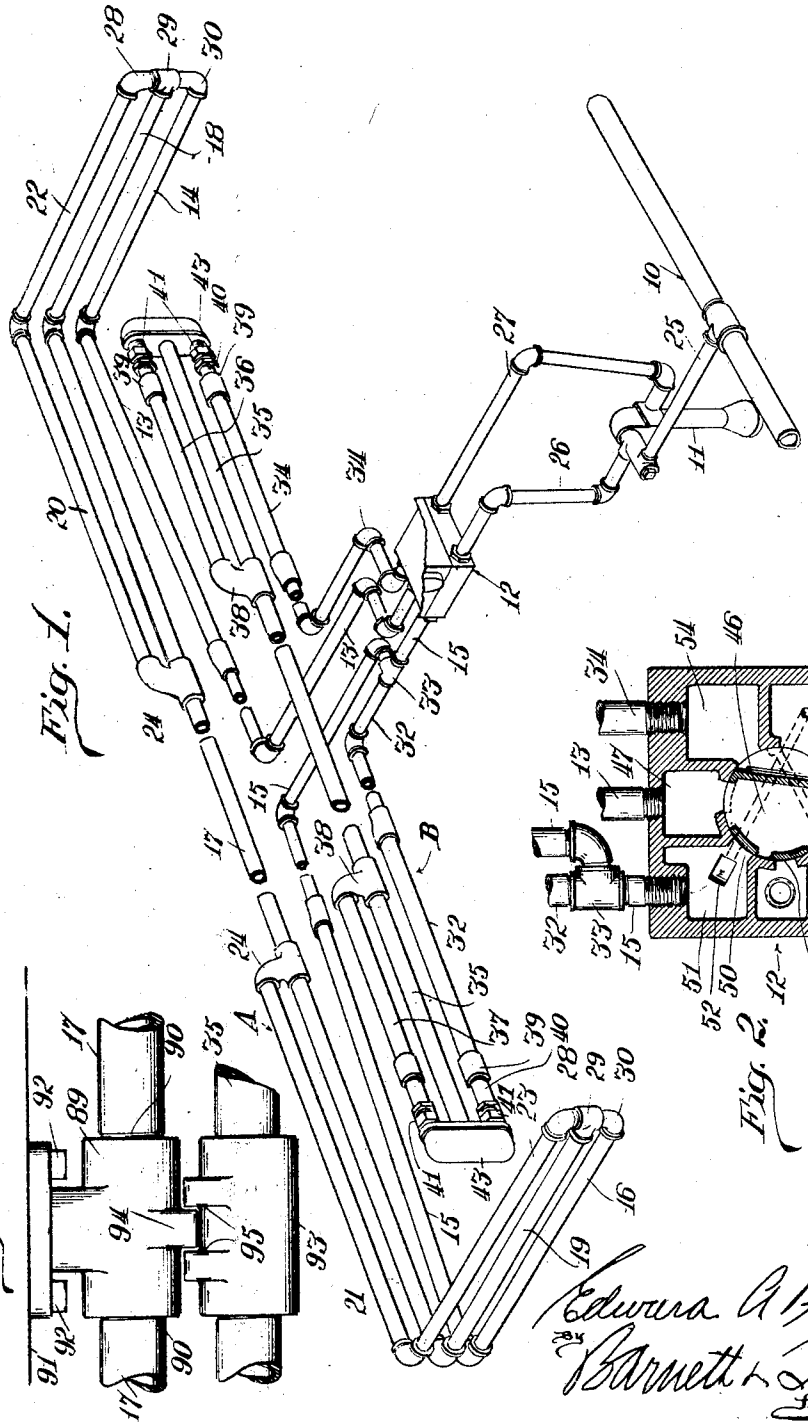


Fig. 1.

Fig. 2.

Fig. 3.

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Fig. 4.

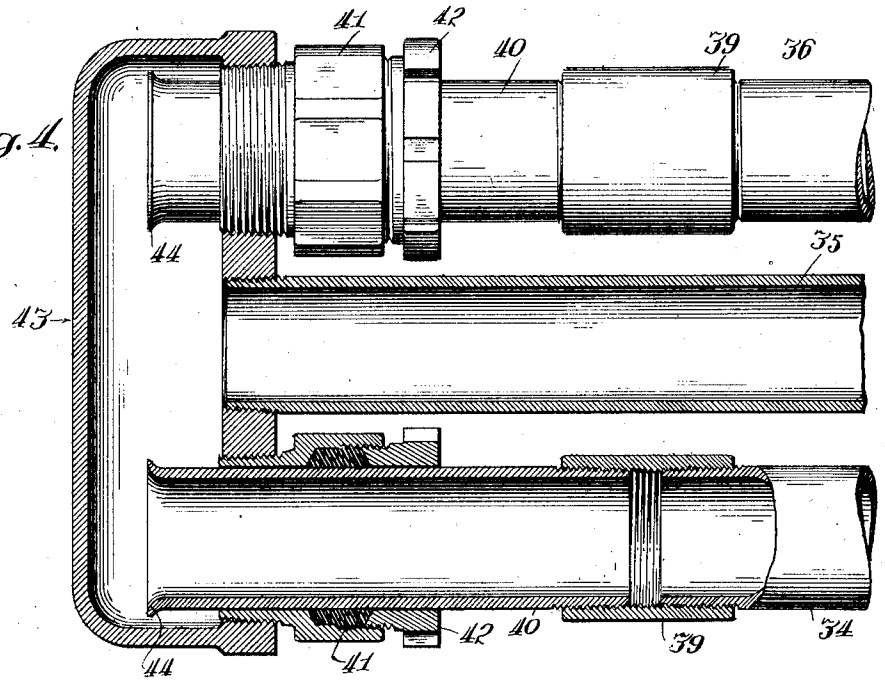
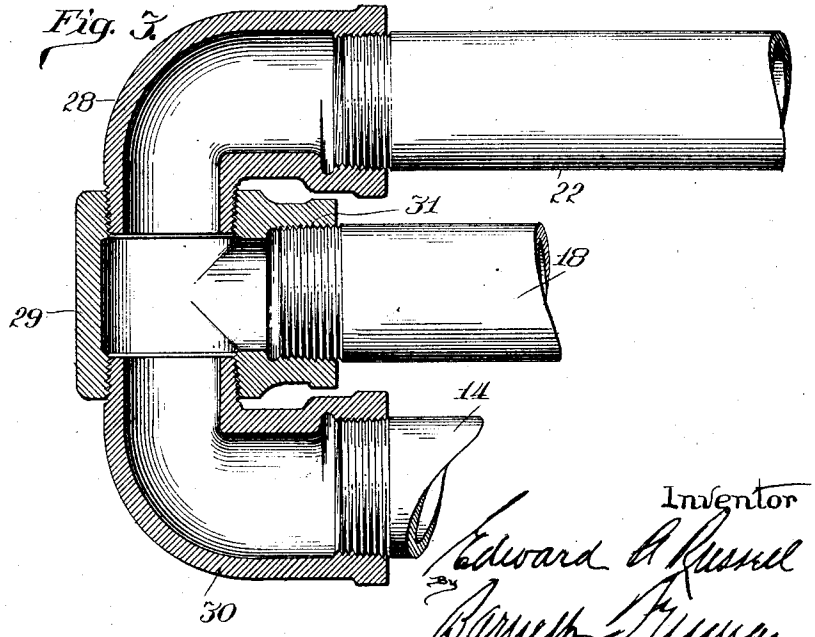


Fig. 3.



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Patented June 19, 1928. 1,674,131

UNITED STATES PATENT OFFICE.

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RADIATOR FOR RAILWAY-CAR-HEATING SYSTEMS.

Application filed April 6, 1925. Serial No. 21,115.

My invention relates to steam heating systems for railway cars in which the radiating elements are composed, in part or wholly, of pipe coils extending along the side walls of the car for substantially the length of the car; and the principal object of the invention is to provide certain novel and improved constructions relating to the radiators which will give the joints between the pipe sections, headers or other parts or elements of the radiator, a certain amount of flexibility so that the unequal expansion and contraction of the pipes incident to the heating up and cooling of the radiator will not bend to an undesirable extent or break the pipes or their connections or produce leaks at the joints. A radiator so constructed is of advantage especially where the control of the steam is automatic dependent upon temperature fluctuations in the control, since such control involves intermittent heating and cooling of the pipes at relatively frequent intervals and at places along the coil possibly quite remote from each other. It is also very desirable, in case the radiator is constructed, as shown for example in the application of Egbert H. Gold Serial No. 654.229, filed July 27, 1923, now Patent No. 1,602,224, granted October 5, 1926, so as to have a larger number of parallel pipes at the ends of the car than at the middle, which construction my present invention has more particularly in view, to give certain of the joints of the structure the above stated flexibility since inequality of contraction and expansion is more pronounced in a radiator coil so constructed. The type of radiator having a larger number of coils at the ends than at the middle of the car is of particular utility in a heating system controlled through temperature fluctuations in the car because it is convenient to locate the controlling thermostat in the middle of the car, whereas the end portions of the car are likely to be cooler than the middle unless the ends are provided with additional radiation surface. My present invention contemplates two ways of increasing the radiation at the ends of the car. One way, as stated, is by providing a pipe coil which will have a larger number of parallel pipes at the ends of the car than at the middle. The other way is to provide a box-like radiator at the ends of the car. In each case the connections between the end sections of the radiator, which are preferably at right angles to the longitudinal inlet and outlet pipes are flexible connections for the reasons given.

A further object is to prevent the radiator from being shifted bodily through expansion or contraction. If the whole radiator is shifted when one end expands, for example, the forces subsequently acting in the opposite direction are insufficient to move it back to its original intended position.

In the drawings,

Fig. 1 is a view, in perspective, of a railway car radiator (with associated parts of the heating apparatus shown fragmentarily), constructed in accordance with my present invention.

Fig. 2 is a sectional plan of the radiator controlling valve.

Fig. 3 is a fragmentary longitudinal sectional view of one extremity of the primary coil of the radiator showing the flexible connections between the pipes and their connecting header.

Fig. 4 is a similar view of one end of the auxiliary coil.

Fig. 5 is a fragmentary plan view to illustrate an expedient which may be used for preventing bodily shifting of the whole radiator under temperature changes.

Reference will be made first to the form of the invention illustrated in Figs. 1 to 4 inclusive, which shows a radiator adapted particularly for automatic control; details showing the controlling means, however, being omitted since this mechanism (such as disclosed in the patent to Edward A. Russell No. 1,440,701, granted January 2, 1923, for example), forms no part of my present invention. Obviously the radiator construction as shown in Figs. 1 to 4, might be employed in connection with a hand controlled heating system.

In the drawings, 10 designates the steam train pipe, 11 the vapor regulator, the construction of which is illustrated in the Russell patent above referred to, and 12 the radiator controlling valve. The radiator consists of two pipe coils A and B, which, however, constitute, in a sense, a single coil since they are simultaneously controlled, in the form of the apparatus shown, by the single radiator valve 12. Coil A consists of an inlet pipe or length of pipe 13 which extends to one extreme end of the car and comprises a transversely arranged section 14 at

the end of the car; a return pipe or length of pipe 15 extending to the other end of the car and provided with a transverse section 16; a pipe 17 connecting the extremities of the inlet and return pipes comprising transverse sections 18 and 19, and preferably two additional pipe lengths 20, 21 with transverse sections 22, 23. These pipes are arranged in substantial parallelism with each other, except that pipes 13 and 15 slope downwardly toward the valve 12, and one above the other, and may be supported by pipe hangers of any desired type. These hangers are intended to allow movement of the pipes when expanding or contracting. Pipes 20 and 21 are rigidly connected with pipe 17 by Y fittings 24, 24. 25 is a pipe leading from the train pipe 10 to the high pressure chamber of the vapor regulator and 26 is a pipe leading from the low pressure chamber of the vapor regulator to valve 12. 27 is a pipe leading from the valve to the thermostat chamber of the vapor regulator.

The three pipes at each end of coil A are connected in the manner shown in Fig. 3 which represents the right hand end of the coil as shown in Fig. 1. The upper pipe 22 has a threaded connection with an elbow union 28 which is threaded into the upper end of a T fitting 29 into the lower end of which is threaded an elbow union 30 on the end of the lower pipe 14. The intermediate pipe 18 has a threaded connection with the lateral tap 31 of the T fitting 29. With this arrangement unions 28 and 30 can swivel on a vertical axis and if need be T fitting 29 may rotate slightly on a horizontal axis giving the connections at the end of the coil a certain degree of flexibility to compensate for unequal expansion and contraction of the pipes of the coil, particularly the pipes extending longitudinally of the car, these pipes being ordinarily of considerable length, say 60 or 80 feet.

The coil B is composed, preferably, of an inlet pipe 32 connected by a T-fitting 33 with pipe sections 15; a return pipe 34 connected with valve 12; a pipe 35 substantially parallel with and above pipes 32 and 34 and two additional pipes 36, 37 at the ends of the coil and arranged above and connected with pipes 35 by Y fittings 38, 38. The three pipes at each end of coil B are flexibly connected by the devices shown in Fig. 4 which, specifically, illustrates the structure at the right hand end of the coil as shown in Fig. 1. The lower pipe 34 is connected thereto by union 39, a short pipe section 40 which extends through a two-part stuffing box 41, 42 into a header 43 with which the member 41 of the stuffing box has a threaded connection, the inner end of pipe section 40 being preferably flared as indicated at 44 to provide a stop preventing the pipe from being pulled out of the header. The upper pipe 36 is provided with a similar slip joint, the parts of which are given the reference numerals used in connection with the slip joint of pipe 34. The intermediate pipe 35 has a threaded connection with the header between the slip joints above referred to.

Operation.

Steam passes from the train pipe 10 through pipe 25 where its pressure is reduced and through pipe 26 to chamber 45 of the controlling valve 12. With the valve open, as shown in Fig. 2, the steam passes across the central chamber 46 of the valve into a chamber 47, the webs 48, 49 and 50 preventing the steam from entering the other valve chambers. From chamber 47 steam passes into pipe 13 and passing through this pipe and its transverse section 14, flows to the opposite ends of the car through pipe sections 18—22, 20—17, 21 and transverse sections 23—19, and is returned to the center of the car by pipes 15—16. The water of condensation is discharged into chamber 51 of valve 12 and passing through the water sealed duct 52 in the base of the valve casing below the central chamber 46 enters valve chamber 53 and from there is discharged through pipe 27 to the thermostat chamber of vapor regulator 11. The steam, however, which is at a low enough pressure so that its outflow through the valve is prevented by the water in the sealing duct 52, passes into pipe 32 of coil B, is reversed in the header and passes to the other end of the coil through pipes 35, 37 and 36, whence this medium either as steam or water of condensation, is returned to the valve through pipe 34 and passing through chamber 54 of the valve and through the central valve chamber 46, but on the other side of web 48 from the ingoing steam, enters chamber 53 of the valve and from thence goes to the vapor regulator through pipe 27. If the medium is in the form of steam the vapor regulator is actuated to throttle inflow.

Referring now to the action of the medium on the pipes of coil A, obviously it will require some little time for the steam to equally heat all parts of the coil particularly as the longitudinal pipes of the coil are of very considerable length and may contain some trapped water of condensation and will necessarily become filled to a greater or less extent with water resulting from the rapid condensation following contact of the steam with the cold surfaces. Thus pipe 13 is likely to expand, when the system is first started up, to a much greater extent than the other pipes. This expansion is taken care of by the swivel connection between the elbow 30 and T fitting 29. As the medium passes into pipe sections 18—20, the expansion of the upper and lower pipes is not likely to be equal. The steam will naturally pass through the upper pipe and the cooler water

of condensation through the lower pipe. The unequal expansion which takes place is taken care of by the swiveled connection between elbow fitting 28 and the T fitting 29. It will be understood that similar distortions take place, or are likely to take place, at the other end of the radiator and that when the radiator cools the resulting contraction will also be unequal for different parts of the radiator. All of these conditions are taken care of by the flexible connections described between the ends of the pipes at each extremity of the coil.

As steam enters coil B through pipe 32 this pipe is expanded and slides into the header 43 through the stuffing box 41, 42. The return of the medium through pipes 35—37 brings about greater expansion in pipe 37 than in pipe 35. Under these circumstances pipe 37 can slide in its stuffing box relative to pipe 35. The expansion of one end of the coil as a whole before the other end has been warmed up is possible through the provision of the slidable connections at each end of the coil. All conditions, in fact, of differences in expansion and contraction as between the different pipes of the coil are provided for.

It will be understood that to shut off steam from the radiator the valve body is rotated so as to bring webs 48, 49 and 50 into the dotted line position indicated in Fig. 2 so that steam from pipe 26 passes through chambers 45 and 53 to pipe 27 of the vapor regulator, the radiator being short circuited. Drainage openings are provided through the valve for water of condensation from pipes 13, 15 and 34.

In Fig. 5 I have shown an expedient which may be utilized for preventing bodily movement of the whole radiator under changes of temperature. Inasmuch as one end of the radiator, the inlet end, heats up more than the other, and, particularly, before the outer end, the forces tending to move the radiator to opposite ends of the car are never balanced. Hence the whole radiator may shift in one direction without being subsequently moved back to its normal position. This is particularly apt to be the case when certain types of pipe hangers are used which tend to bind on the pipes when the latter are heated up. To prevent this bodily shifting of the radiator coil or pipes, I purpose to anchor the radiator to the car at a central point so that expansion and contraction will take place in opposite directions from and to this point. Referring to Fig. 5, pipe 17 of coil A (of the radiator of Fig. 1) is divided at a point opposite valve 12 and a fitting 89, is interposed between the ends of this pipe section which are directed into the fitting as indicated at 90, 90. The fitting is secured fixedly to the wall 91 of the car by bolts 92. To anchor the coil B pipe section 35 is provided with a fitting 93 which may be anchored to the car in any preferred manner. Preferably it is interlocked with fitting 89, one fitting having a tongue 94 and the other a groove 95.

As other modifications than those shown will be possible without departure from the principles of my invention, I wish to be understood as intending to cover by a patent all forms of the invention within the scope of the appended claims.

I claim:

1. A radiator for a railway car heating system comprising two lengths of pipe provided with bends whereby the radiator has two sections at an angle to each other, and a fitting joining the extremities of said pipe lengths with which one of them is connected, rotatably, on an axis at substantially right angles to the longitudinal axes of the pipes.

2. A radiator for a railway car heating system comprising two lengths of pipe provided with bends whereby the radiator has two sections at an angle to each other, and a fitting with which the extremities of said pipe lengths have threaded connections, the axes of which are substantially at right angles to each other.

3. A radiator for a railway car heating system comprising two lengths of pipe provided with bends whereby the radiator has two sections at an angle to each other, an elbow union on the end of one of said pipes, and a fitting with which said elbow union and the end of the other pipe length have threaded connections.

4. A radiator for a railway car heating system comprising three lengths of pipe provided with bends whereby the radiator has two sections at an angle to each other, and means for joining the extremities of said pipe lengths providing pivotal connections for two of said pipes with respect to the other pipe having an axis at substantially right angles to the longitudinal axis of the other pipe.

5. A radiator for a railway car heating system comprising three lengths of pipe in substantial parallelism and one above the other provided with bends whereby the radiator has two sections at an angle to each other, and means for joining the extremities of said pipe lengths providing pivotal connections for the upper and lower pipes having an axis at substantially right angles to the longitudinal axis of the intermediate pipe.

6. A radiator for a railway car heating system comprising three lengths of pipe in substantial parallelism and one above the other provided with bends whereby the radiator has two sections at an angle to each other, a T-fitting with which the intermediate pipe is connected, and elbow fittings on the ends of the other pipes rotatably

connected with the opposite ends of said T-fitting.

7. In a radiator for railway car steam heating system, the combination of a controlling valve located centrally of the car, a radiating coil comprising inlet and return pipes connected with said valve and extending lengthwise of the car in opposite directions from the valve, a pipe above the aforesaid pipes, another pipe at one end of the coil above and connected with the last named pipe at an intermediate point thereof, the three pipes at this end of the coil having substantially right angle bends, and a fitting with which the ends of the upper and lower pipes have a swivel connection on a vertical axis and with the side of which the intermediate pipe is connected.

8. In a radiator for railway car steam heating system, the combination of a controlling valve located centrally of the car, a radiating coil comprising inlet and return pipes connected with said valve and extending lengthwise of the car in opposite directions from the valve, a pipe above the aforesaid pipes, another pipe at one end of the coil above and connected with the last named pipe at an intermediate point thereof, the three pipes at this end of the coil having substantially right angle bends, and a fitting with which the ends of the upper and lower pipes have a swivel connection on a vertical axis and with the side of which the intermediate pipe has a swiveled connection on a substantially horizontal axis.

9. In a radiator for railway car steam heating system, the combination of a controlling valve located centrally of the car, a radiating coil comprising inlet and return pipes connected with said valve and extending lengthwise of the car in opposite directions from the valve, a pipe above the aforesaid pipes, another pipe at one end of the coil above and connected with the last named pipe at an intermediate point thereof, the three pipes at this end of the coil having substantially right angle bends, a fitting with which the ends of the upper and lower pipes have a swiveled connection on a vertical axis and with the side of which the intermediate pipe is connected, and a second coil comprising inlet and return pipes, a pipe above the aforesaid pipes, another pipe at one end of the coil above the last named pipe, and a fitting with which one extremity of said intermediate pipe is rigidly attached and with which said upper and lower pipes have sliding connections.

10. A railway car radiator comprising two lengths of pipe, each comprising aligning sections, fittings between said sections which are interlocked, and means for anchoring one of said fittings to the car body.

11. In combination, a pair of fittings having threaded openings at opposite ends, pipe sections screwed into said fittings, one of the fittings having a tongue and the other a groove for interlocking the fittings, and means for anchoring one of the fittings to the car body.

12. A railway car radiating coil comprising pipes extending from the middle of the car toward opposite ends thereof, a pipe for connecting the aforesaid pipes, the pipes at one end of said coil being formed with angular bends, means for connecting the extremities of the pipes beyond said bends so that one of the pipes is capable of a swivelling movement on an axis transverse to the length of the pipes, and means for anchoring said connecting pipe at a middle point thereon to the car body.

13. In a railway car, a radiator comprising three pipes extending longitudinally of the car provided with end pipe sections respectively extending transversely of the car, through one of which pipes the heating medium is adapted to pass in one direction and through the other two of which pipes the medium is adapted to pass in the opposite direction, and flexible connections between the extremities of said end sections composed of coengaging relatively movable elements which yield, one with respect to the other, to compensate for unequal expansion and contraction of said longitudinal pipes.

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