Dec. 3, 1929. R. R. GOSHORN 1,738,100

RADIATOR

Filed June 15, 1928

Fig. 1.

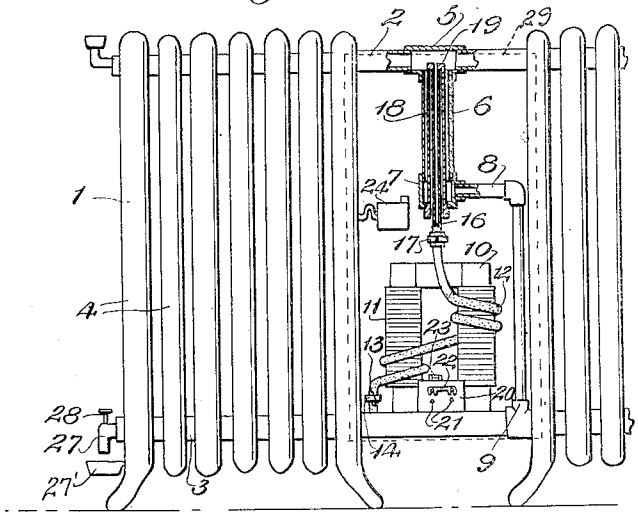


Fig. 2.

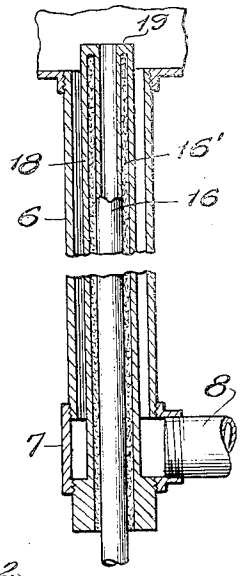


Fig. 3.

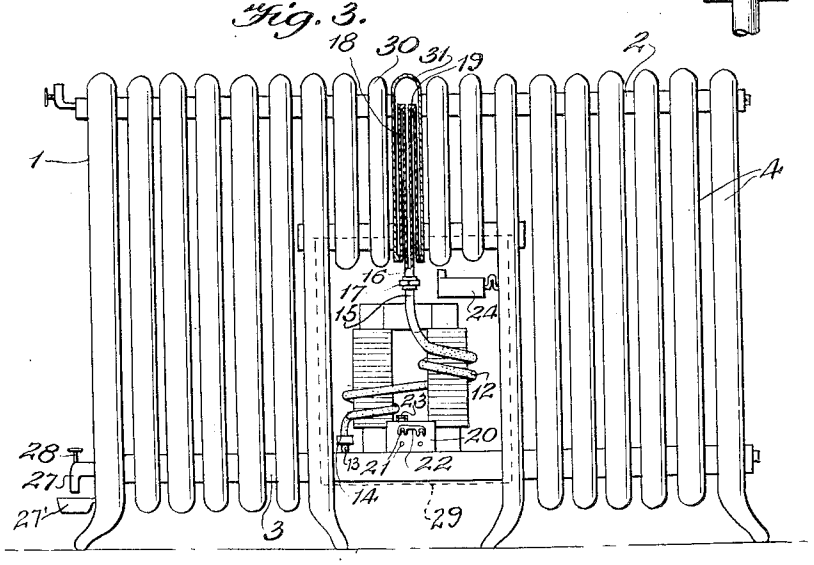
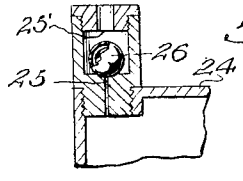


Fig. 4.



INVENTOR.
Robert R. Goshorn.

BY

Eccleston & Eccleston
ATTORNEYS

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UNITED STATES PATENT OFFICE

ROBERT R. GOSHORN, OF JASONVILLE, INDIANA, ASSIGNOR TO THE ALL-WAYS-HOT MFG. CO., OF JASONVILLE, INDIANA

RADIATOR

Application filed June 15, 1926. Serial No. 285,677.

This invention relates to space heaters of the radiator type in which the ordinary house current may be used, and has special reference to such a device in which a transformer is employed to raise the temperature of a liquid to the required degree, and in which outside piping is entirely eliminated.

One of the objects of the invention resides in so designing the transformer and the parts immediately related thereto as to greatly increase the efficiency of such devices.

Another object of the invention consists in arranging a by-pass for part of the heating fluid so as to increase the circulation and thereby provide a more even temperature for the radiator and also to increase its efficiency.

A further object of the invention resides in the provision of a pressure or expansion tank for creating a vacuum in the heating system and thus eliminating evaporation of the liquid used in the system and avoiding the necessity of repeatedly supplying additional liquid to the heater.

Another object of the invention consists in the construction of a radiator of the type specified in which the elements of the secondary circuit are so arranged as to provide a pronounced condenser effect thereby greatly increasing the efficiency of the apparatus.

Other objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawings; in which

Figure 1 is a fragmentary side elevation of a radiator embodying the present improvements.

Figure 2 is an enlarged sectional detail of a portion of the liquid heater.

Figure 3 is a side elevation, partly in section, of a slightly modified form of the invention; and

Figure 4 is an enlarged sectional detail of the expansion tank.

Referring to the drawing in greater detail the numeral 1 indicates generally a radiator provided with upper and lower headers 2 and 3, respectively, and a plurality of vertically disposed heater sections 4. In the specific construction indicated on the drawings it will be apparent that the radiator of Figure 1 is shown as formed of two separate radiators in which the adjacent ends of the headers are connected together to form a single unit.

The upper headers 2 have their adjacent ends connected by a T 5 and depending therefrom is a cylindrical sleeve or tank 6. To the lower end of this tank 6 is connected another T 7 and joined to the latter T is a conduit 8 which is joined at 9 to the lower header 3. By this construction it will be apparent that the heating liquid, preferably water, is provided with a passage directly between the lower header 3 and the upper header 2 between the two sets of heater sections 4 and separate from the passage in the heater coils, which will now be described.

The heating unit which, as already stated, is electrically operated, consists of a transformer which is secured adjacent the base of the radiator by any suitable means. The core of the transformer which is designated by the numeral 10, consists of laminated iron around which is placed the primary coils or windings 11. The secondary winding of the transformer is in the form of pipe coils 12, one terminal of which, 13, is connected to the lower header 3 by means of a union 14. The other terminal 15 of the coils is united to an extension 16 by a union 17. The extension 16 which is preferably copper tubing, extends upwardly through a sleeve 18 which is threaded into the lower end of the T 7. Sleeve 18 is of a substantially greater internal diameter than the external diameter of the extension 16 and, therefore, an annular space is provided between these two elements. In this space I preferably place a cylindrical sleeve of insulating material 16'. The upper end of the extension tube 16 is welded or otherwise electrically connected to the upper end of the sleeve 18 as indicated by the numeral 19, and thus provides for a completion of the secondary circuit in that the current passing up the extension tube 16 will travel downwardly along the sleeve 18 to the T 7 and conduit 8 to the header 3 and back to the other terminal 13 of the pipe coils.

It should also be noted that the cylindrical tank 6 is of substantially greater internal diameter than the external diameter of the

sleeve 18, thereby providing an annular passage for the circulation of water upwardly from the conduit 8 to the upper header 2. It will thus be seen that the extension tube 16, sleeve 18, and tank wall 6 are all slightly spaced apart. This particular construction, in addition to the functions already set forth, is of importance in that it provides in effect a condenser in the secondary circuit of the transformer in that the spaced apart walls of the elements 16, 18 and 6 serve as plates of a condenser in building up the current in this secondary circuit, and thereby greatly increase the efficiency of the radiator as a whole.

It is desirable that the present apparatus be so constructed as to permit its operation over a wide range of voltage and wattage, and for this purpose I have provided a control panel 20. This panel carries a plurality of terminals 21 tapped to the primary windings at a variety of points, and for cooperation with these terminals 21 I have provided a crossbar 22. It will thus be apparent that by placing the bar 22 across the proper pair of terminals 21 the desired amount of voltage and wattage may be readily selected. It is also desirable to protect the apparatus from overheating, and to this end I provide a fuse 23 which is electrically connected to the primary circuit and is in physical contact with the secondary circuit. This fuse 23 comprises a cartridge containing a metal of low melting point which will promptly break the primary circuit as soon as the temperature of the metal is raised above its melting point.

The numeral 24 indicates an expansion tank and in the top thereof is provided an air outlet 25. Associated with the outlet 25 is a hollow ball valve 26 which seats over the passage 25 with a force sufficient to withstand the pressure of a column of liquid extending from the vertical position of the tank 24 to the top of the radiator. Therefore, if the radiator and transformer pipe coils are filled with water at the temperature of the space to be heated and tank 24, previous to the filling of the radiator, contained air at normal atmospheric pressure, then a slight increase of pressure will be produced within the tank; this pressure being equivalent to the weight of a column of water of a height extending from the tank to the top of the radiator. The weight of the air valve 26 should be sufficient to slightly overcome the pressure produced by the column of liquid as just mentioned. Hence, as the water is heated and expands and produces a slightly greater pressure, a certain amount of the air will be forced out past the valve 26. The tank 24 is of a capacity sufficient to accommodate the expansion of the liquid contained within the radiator up to the boiling point with a slight factor of safety. As the water cools and contracts the pressure is relieved within the tank 24 and inasmuch as the valve 26 prevents the admission of outside air into the tank a vacuum will be created within the tank. This elimination of air within the circulatory system avoids the evaporation of the liquid employed and consequently eliminates the necessity of repeatedly supplying additional liquid to the heater. A valve seat 25′ is provided above the ball valve 26 and inasmuch as the ball valve 26 is designed to float in water it will be apparent that in the event of water passing up through passage 25, its escape will be prevented by reason of the valve 26 being lifted into engagement with its seat 25′.

A drain pipe 27 of conventional form and provided with a valve 28 is provided for draining the heater as may be desired. Preferably an overflow basin 27′ is employed in connection with this drain pipe.

In the operation of the form of the invention as just described, the bar 22 is placed across those terminals 21 which will provide the amount of voltage and wattage required; it being understood that the radiator has been filled with water and a slight pressure formed on the air confined in the tank 24. As the current passes through the primary windings 11 a current is induced in the pipe coils 12. This current passes upwardly through the extension 16 heating the same as well as the sleeve 18 which is electrically connected thereto as indicated by numeral 19, and the induced current, as already mentioned, passes down through T 7, through conduit 8 and header 3 back to the lower terminal 13 of the coils. It will thus be apparent that the water gradually heated within the coils 12 will pass upwardly therethrough and will receive additional heat as it passes on up through the extension tube 16 into the upper header 2. Furthermore, water in the conduit 8 and tank 6 will absorb heat from the sleeve 18 and will pass upwardly into the header 2. By means of this auxiliary circuit 8 and tank 6 the circulation of water about the radiator is greatly facilitated, thereby increasing the efficiency of the heater and also providing for a more uniform temperature. As the water becomes heated the air within the expansion tank 24 will gradually become compressed to such an extent as to lift the valve 26, thereby permitting the escape of the air to the atmosphere and providing a vacuum in the system, as already described.

In the modified construction shown in Figure 3 the radiator is provided with upper and lower headers, 2 and 3, heater sections 4, and expansion tank 24 as in the form previously described. This latter form of the invention is also provided with the same construction of transformer and control panel, and the device differs from the form shown in Figures 1 and 2 mainly in the fact that in lieu of the tank 6, I provide an intermediate radiator 30 in which the heater sections extend only a part way toward the base of the radia-

tor. Within the central heater section 31 is placed the sleeve 18 which is welded to the upper end of the extension tube 16, as already described in connection with the previous form of the invention.

The operation of the form of the invention shown in Figure 3 is identical with the operation of the other form of the invention disclosed herein, and need not be further described except to say that a greater radiation of heat is afforded by reason of the intermediate radiator 30.

In both forms of the invention it is desirable to provide cover plates 29 of metal, wood, or other suitable material which serve to conceal the transformer and associated parts and thereby present a more attractive appearance.

From the foregoing description taken in connection with the accompanying drawings it will be observed that I have provided an electrically heated radiator of few parts; that the device is entirely portable and free from outside piping and plumbing; that an auxiliary circulation and heating of water is provided for, thereby greatly facilitating the heating of the water and creating a more even temperature through the radiator; and that by reason of the condenser effect produced by the concentrically arranged elements 16, 18 and 6, the efficiency of the device as a whole is greatly improved.

In accordance with the patent statutes I have described what I now believe to be the preferred forms of the invention, but it is to be understood that various minor changes may be made within the structural details of the heaters without departing from the spirit of the invention, and all such changes are intended to be included in the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A radiator including upper and lower headers, a plurality of heater sections associated with said headers, a transformer including a pipe coil as the secondary winding, a tank communicating with said upper header, a sleeve in said tank and electrically connected thereto, said pipe coil having connection with said lower header and with the upper end of said sleeve.

2. A radiator including upper and lower headers, a plurality of heater sections associated with said headers, a transformer including a pipe coil as the secondary winding, a tank communicating with said upper header, a sleeve in said tank and electrically connected thereto, a conduit in communication with said lower header and said tank, said pipe coil having connection with said lower header and with said sleeve.

3. A radiator including upper and lower headers, a plurality of heater sections associated with said headers, a transformer including a pipe coil as the secondary winding, a tank extending downwardly from said upper header, a metal sleeve electrically connected to the lower end of said tank and extending upwardly therein, a conduit in communication with said lower header and said tank, said pipe coil having connection with said lower header and said sleeve.

4. A radiator including upper and lower headers, a plurality of heater sections associated with said headers, a transformer including a pipe coil as the secondary winding, a tank communicating with said upper header, a sleeve in said tank electrically connected thereto, one end of said coil extended upwardly through said sleeve and connected to the upper end thereof, the walls of said coil extension, sleeve and tank being slightly spaced apart and thereby providing a condenser action in the secondary circuit.

5. In a radiator, a transformer including a water pipe coil as the secondary winding, a cylindrical tank, a sleeve in said tank electrically connected to the bottom thereof, an extension of said coil extending upwardly through said sleeve and electrically connected to the upper end thereof, the diameters of said coil extension, sleeve and tank being such as to space these walls a slight distance apart so as to provide a condenser action in the secondary circuit.

6. A radiator including upper and lower headers, a plurality of heater sections associated with said headers, an expansion tank associated with said radiator, a transformer including a pipe coil as the secondary winding, one end of said pipe coil connected to the lower header and the other end thereof communicating with the upper header.

7. A radiator including upper and lower headers, a plurality of heater sections associated with said headers, an expansion tank associated with said radiator disposed between said top and bottom headers, a transformer including a pipe coil as the secondary winding, one end of said pipe coil connected to the lower header and the other end thereof communicating with the upper header.

ROBERT R. GOSHORN.