April 19, 1949. E. C. STAUFFER 2,467,410

RADIATOR

Filed Oct. 15, 1946

FIG. 1

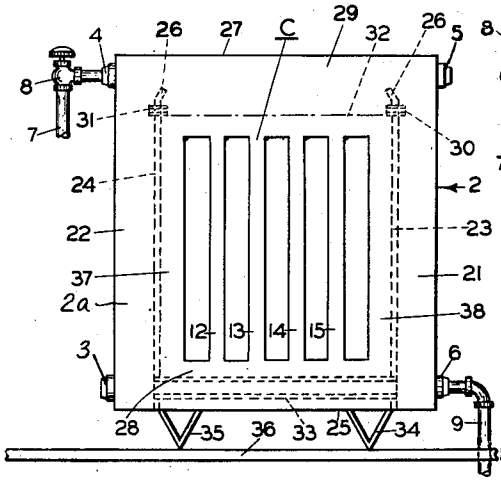


FIG. 2

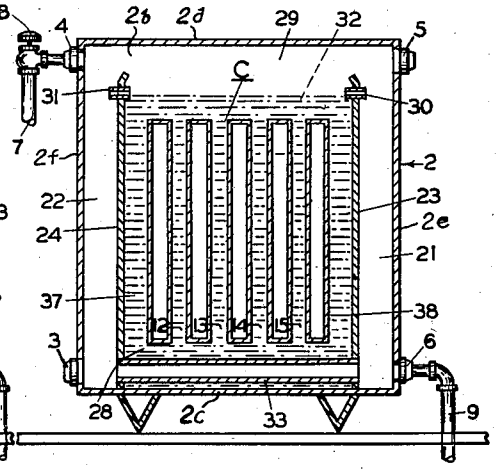
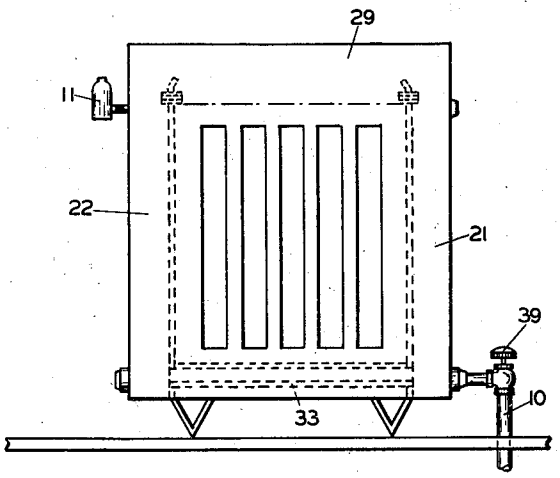


FIG. 3



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RADIATOR

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3 Claims. (Cl. 237—71)

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This invention relates to radiators and more particularly to radiators of the type in which heating is effected by means of steam and provision is made in the radiator for the reception of a heat transfer medium or distribution agent such as water. Such radiators are generally known in the trade as combination steam-hot water type radiators.

It is an object of my invention to provide a radiator structure which may be completely fabricated from sheet steel or steel plate and welded at the joints, although the invention is applicable also to so-called cast iron radiation.

It is a further object of my invention to provide a welded steel radiator construction which may be fitted from the right or the left, as convenient, while providing the major welds in the structure at the back portion thereof so that the same are unexposed to view when the radiator is installed.

A further object of my invention is to provide a radiator structure in which heating will be substantially uniform throughout the whole extent of the radiator, and it will be free of any so-called "dead" areas where poor circulation and concomitant uneven heating normally result.

Another important object of my invention is to provide a steam-hot water type radiator which may be connected to the boiler or other source of steam by a single pipe, without a separate return line to the boiler.

According to my invention, I provide an outer casing which is fluid tight and dispose therein a pair of partitions which extend in sealed relationship with the casing from the bottom to substantially the top thereof to provide a pair of end chambers in open communication with each other adjacent the top of the radiator, with a center chamber for the reception of heat transfer fluid which is also in open communication at the top with said end chambers, and I provide a conduit which is sealed into said partitions at the bottom of the center chamber and opens into the end chambers. This provides for the admission of steam into either one of the end chambers for free passage above the center chamber to effect heating of the water or other heat transfer fluid therein and also provides for free passage of steam downwardly through the opposite end chamber to heat the heat transfer fluid disposed in contact with both of the end partitions. The steam passes through the lower conduit back into the first mentioned end chamber to complete the circuit. The steam passing through the conduit in the bottom effects additional heating of

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the heat transfer fluid which lies in engagement with the conduit. Thus, heat is applied to the fluid adjacent the end partitions, to the fluid in the central chamber which is open to the direct action of the steam, and to the fluid in the central chamber at the bottom thereof in communication with the steam conduit which passes through the lower portion of the radiator at the bottom, connecting the end partitions.

In order that the invention may be more readily understood, I shall describe the same in conjunction with the attached drawings in which:

Figure 1 is an elevational view illustrating a welded radiator of my construction;

Figure 2 is a vertical sectional view of the welded radiator shown in Figure 1; and

Figure 3 is an elevational view illustrating my invention as applied to a single pipe type of radiator.

Referring first to Figure 1, the radiator comprises an outer casing 2 including side walls 2*a* and 2*b*, a bottom wall 2*c*, a top wall 2*d*, and end walls 2*e* and 2*f*, the end walls 2*e* and 2*f* being provided with openings 3, 4, 5, and 6 for the reception of steam inlet and return lines. In a two-pipe system as shown in Figure 1, an inlet pipe 7 may be connected to the opening 4 and controlled by a valve 8 and the return line 9 may be connected to the opening 6 at the bottom of the radiator. If desired, an inlet pipe may be connected to the opening 5 and a return line connected to the opening 3. Also the inlet and return lines may be provided on the same side, the inlet 7 being connected to opening 4 and return to opening 3, for example. Obviously only one set of supply and return lines will be provided and the unused openings may be closed by means of the conventional caps or plugs customarily employed. If a so-called vacuum system or single pipe system be employed as shown in Figure 3, the steam may be led in through a pipe 10 and an air relief valve 11 of conventional construction may be inserted in an opening at the top of the radiator.

The central chamber or container C of the casing 2 is divided into a plurality of sections 12 to 15 inclusive. The number of sections employed will vary depending upon the amount of heat transfer surface desired in the radiator. The casing is also provided with end sections or chambers 21 and 22, each of which is provided with a partition 23 or 24 which extends from the bottom 25 of the casing to a point 26 adjacent the top 27 of the radiator. The partitions 23 and 24 together with the side walls 2*a* and 2*b* and

the bottom wall 2c form the central open-topped chamber C for heat transfer fluid which has been diagrammatically illustrated in Figure 2. This open-topped chamber is confined within said outer casing. The chambers 21 and 22 are disposed between the partitions 23 and 24, and the side walls 2a and 2b, and are in open communication with each other adjacent the top of the radiator over the open top of said central container or chamber C and are adapted for direct contact on one side with heat transfer fluid and on the opposite side with steam, as is clearly shown in Figure 2. As shown in the drawings, the top of each of the partitions may be flared inwardly toward the center of the radiator to form a baffle which serves to prevent the water received within the chamber C from being splashed over the end members or baffles 26 and into the compartments 21 and 22 which would result in so-called priming and the obnoxious noises which accompany it. Preferably the baffles 26 are flared inwardly toward the center of the chamber C so that the steam which passes from the pipe 7 or its counterpart on the opposite side of the radiator will, if it tends to agitate the water in the chamber C cause it to be directed back into the chamber C rather than over the baffles 26.

Below the sections 12 to 15, there is provided a chamber 28 which is in communication with each of the sections 12 to 15, the sections opening directly thereinto. Above the chambers 12 to 15 is a top chamber 29 which is in open communication with the tops of each of the sections 12 to 15 and the end sections 21 and 22.

Pipes 30 and 31 are provided in the end partitions 23 and 24 respectively and serve to limit the height of the heat transfer fluid, indicated at 32 (Figure 2) within the area bounded by the casing 2 and the end partitions 23 and 24.

A conduit 33 is sealed into the end partitions 23 and 24 and is disposed adjacent the bottom of the chamber 28. The conduit 33 opens into the end chambers 21 and 22.

Legs 34 and 35 are provided to support the radiator in spaced relationship to a base such as a floor 36. It is obvious, of course, that such legs may be dispensed with where the radiator is of the wall type or is embodied in a unit heater.

In use, the radiator is connected to a steam boiler or other source of steam supply which in the embodiment illustrated in Figures 1 and 2 is entered into the radiator from the supply pipe 7, through the valve 8, and the opening 4. The steam moves through the top chamber 29 and a portion thereof is condensed and deposited in the central chamber C in which the sections 12 to 15 are provided, and when such center section is completely filled with condensate, the excess flows through the pipes or tubes 30 and 31 and thence downwardly, being discharged through the return line 9. If desired, the system may be filled with water or other heat transfer fluid up to the level of the tubes 30 and 31 at the time of installation of the radiator, but for most practical purposes, it is preferred to permit the steam condensate to fill the system as shown in Figure 2. The steam passing into and through the chamber 29 effects a transfer of heat to the condensate or other heat transfer fluid in the central chamber C and passes downwardly through the end chamber 22, transferring heat to the water disposed in the end section 37 in contact with the partition 24. This heating effects an upward movement of the water in the end section 37 and as heat is transferred to the area to be heated through the sections 12 to 15 as well as the other surface areas of the radiator, there is a downward flow of water in the sections constituting the central chamber C and sections 12 to 15 thereof. Steam also flows continuously through the conduit 33 which is disposed in the lower chamber 28 of the radiator and this effects a transfer of heat to the water which bathes the conduit 33 effecting an upward movement of the water in the sections 12 to 15 as well as the end section chamber 37 and the corresponding end section chamber 38 at the opposite end of the radiator. A portion of the steam also passes downwardly through the chamber 21 and in engagement with the partition 23 of that end chamber, and this likewise transfers heat to the water which bathes the partition 23, inducing an upward rise of the water in the chamber 38. There will be a continuous condensation of the steam within the radiator, some of which will deposit in the top chamber 29 and will flow through the tubes 30 and 31 and thence downwardly in the end chambers 21 and 22 to the return line 9 through the opening 6. Steam which condenses in the end chamber 22 will pass through the conduit 33 prior to entering the return line 9.

The radiator shown in Figure 3 is similar to that shown in Figures 1 and 2 except that it is adapted for use with a so-called single line system where the steam and the condensate return are both carried in the same line. In this system the steam is inlet from a pipe 10 controlled by a valve 39, the inlet being provided at the bottom of the radiator. The steam in this system moves upwardly through the chamber 21 across the top of the radiator through chamber 29 and downwardly through chamber 22. Steam also passes through the conduit 33, thus forming a continuous circulation of the steam in generally the same manner as shown in Figures 1 and 2 and as described above in connection with such embodiments of the invention. The air vent control 11 is positioned in the upper portion of the radiator and serves to bleed air from the system. Corresponding openings for the reception of this air vent and steam lines are preferably provided on the opposite side of the radiator as shown in Figure 3 so that the radiator may be universal in its mounting arrangement and may be connected either on the right or the left-hand side as conditions may necessitate. In this structure, it is not necessary to provide the inwardly extending baffles such as those shown at 26 in Figures 1 and 2, although they may be provided if desired.

From the foregoing description of Figures 1 and 2, it will be clear that in that embodiment also the steam may be inlet either through the opening 4 or 5, for the radiator is symmetrical on each side of the center thereof and the return line may be provided in the openings 3 or 6, as the case may be. It is preferred to have the inlet disposed at the side opposite to the return line, but this is not necessary and both may be provided on the same side if installation conditions necessitate.

By the radiator of the present invention, complete and effective circulation of the heat transfer fluid in the central portion of the radiator as well as in the end sections is obtained and there are no dead areas where heating is ineffective. Since the radiator may be connected at either side, it is possible to provide the major

welds at the back surface, as indicated in the drawings, for it is not necessary to reverse the radiator from front to back in order to meet installation requirements. The radiator may be very inexpensively fabricated and is adapted for all different sizes of radiation as well as for heat exchange units of various sorts, including wall type radiation and unit heaters.

While I have illustrated and described a preferred embodiment of my invention, it is understood that the same may be otherwise embodied and practiced within the scope of the following claims:

I claim:

1. In a radiator, a pair of side walls; a bottom wall; a top wall; a pair of end partitions extending upwardly above the bottom wall, disposed between said side walls, and forming with said side walls and bottom wall a central, open-topped container for heat transfer fluid; a pair of end walls spaced from said partitions and forming with said side, top, and bottom walls an outer container within which said central container is confined; a pair of end chambers for the reception of steam disposed between said partitions and said end walls and being in open communication with each other adjacent the top of the radiator over the open top of said central container, said partitions being adapted for direct contact on one side with heat transfer fluid and on the opposite side with steam; and a conduit passing through said central container, sealed into said partitions at the bottom thereof, and opening into said end chambers.

2. In a radiator; an outer container having side walls, a bottom wall, a top wall, and end walls; a pair of end partitions extending upwardly above said bottom wall and disposed between said side walls; a pair of end chambers for the reception of steam defined by said partitions and said end walls and being in open communication with each other adjacent the top of the radiator; an open-topped central container for heat transfer fluid disposed within said outer container and

defined by said end partitions, said bottom wall, and said side walls, said partitions being adapted for direct contact on one side with heat transfer fluid and on the opposite side with steam; a plurality of heat transfer surfaces forming part of the central container and extending into said side walls to form sealed openings extending through said radiator; and a conduit passing through said central container below said openings, sealed into said end partitions at the bottom thereof, and opening into said end chambers.

3. In a radiator of welded steel construction, a pair of steel side walls; a steel bottom wall; a steel top wall; a pair of steel end partitions extending upwardly from the bottom wall, disposed between said side walls, terminating below the top wall, and forming with said side walls and bottom wall a central open-topped container for heat transfer fluid; a pair of steel end walls spaced from said partitions and forming with said side, top, and bottom walls an outer container within which said central container is confined; a pair of end chambers for the reception of steam defined by said partitions and said end walls and being in open communication with each other adjacent the top of the radiator and over the open top of said central container, said partitions being adapted for direct contact on one side with heat transfer fluid and on the opposite side with steam; and a conduit passing through said central container, sealed into said partitions at the bottom thereof and opening into said end chambers.

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