June 10, 1930. W. H. ROBINSON 1,763,328

ELECTRIC RADIATOR

Filed July 16, 1927

Fig. 1.

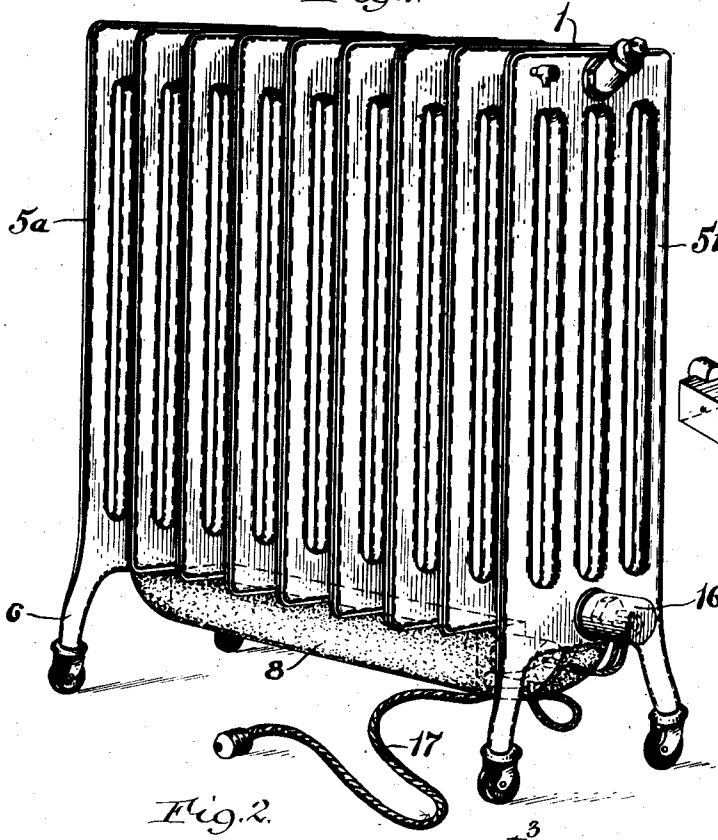


Fig. 4.

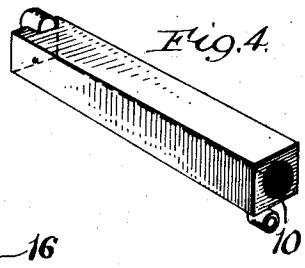


Fig. 3.

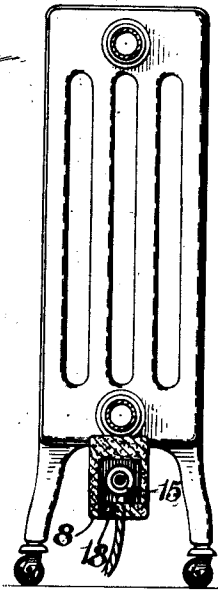
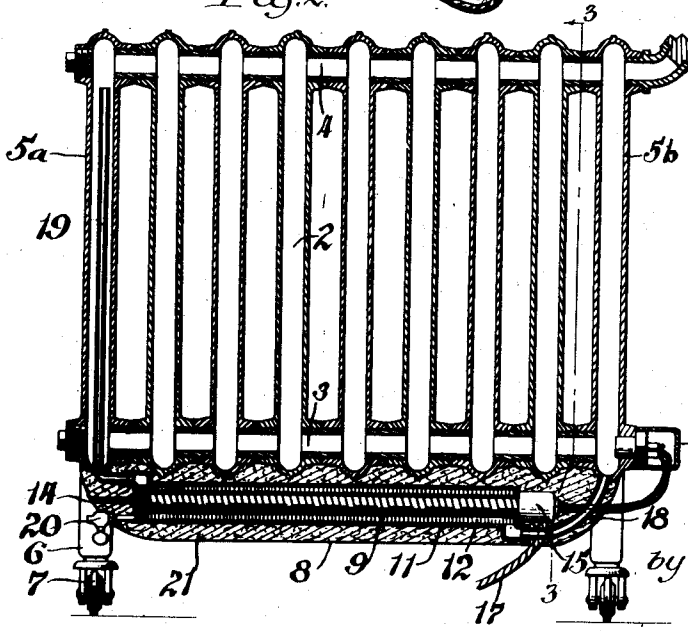


Fig. 2.



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UNITED STATES PATENT OFFICE

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ELECTRIC RADIATOR

Application filed July 16, 1927. Serial No. 206,292.

This invention relates to electric radiators of the water heating type more especially intended for local heating operations such as room heating.

The principal objects are to provide a heater so constructed as to utilize substantially all the electrically generated heat in heating the water, to circulate the body of heated water as a whole from one corner of the radiator rapidly and uniformly along the radiating surface to the diagonally opposite corner, and to eliminate practically all danger of burning out the heating element under normal operating conditions.

Further objects are to provide a heater embodying a hot water radiator of standard construction which will present a symmetrical appearance, operate noiselessly and be easily moved about the room.

A further object is to provide an electric radiator which can be produced at minimum cost.

With the above objects in view the invention consists generally in novel features of arrangement and connection appertaining to the combination of a radiator element having upper and lower longitudinal passages and intermediate passages communicating with them, which element may be, though not necessarily so, a standard radiator casting and an externally located heating element such that in operation a primary circulating path is established, the ends of which path are constituted by the end sections of the radiator element without the employment of external connections. The upper length of the path is constituted by the upper longitudinal passage of the radiator element and the lower length of the path is constituted by a chamber located externally of the radiator element and associated with the electric heating element. The heated water circulates in such primary path causing secondary circulation downward through the intermediate radiator sections and thence outward through the lower longitudinal passage of the radiator element to a point along the primary path. The invention further consists in arrangements of the connections in the primary circulating path for preventing water hammer and in the provision for circulating air around the electric heating element and thus avoiding the destructive effects of condensation.

An embodiment of my invention is illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of the heater.

Figure 2 is a vertical section along the longitudinal center line.

Figure 3 is a sectional view along line 3—3 of Fig. 2.

Figure 4 is a perspective view of the hot water generator.

As before related, this invention essentially includes the combination of a radiator element and an outer heating unit. The radiator element indicated at 1 may consist of a standard radiator casting, as shown, and which is composed of any standard arrangement of vertical sections forming parallel water passages 2, the upper and lower ends of which are connected together by longitudinal passages 3 and 4 respectively. The end sections 5^a and 5^b of the radiator are extended in the usual way to provide supporting legs 6 which are fitted with casters 7 whereby the radiator may be easily moved about the room. The heating unit 8 may be of any suitable shape and is shown herein as having an inner cylindrical shell 9 forming a heating chamber 10, and an outer shell 11 which entirely surrounds and is spaced from the inner shell 9, along its length, to provide a water chamber 12. The heating chamber 10 is open at one end to receive the usual heating element 13 and has an air passage 14 connecting its other end to atmosphere. The heating element 13 is provided with a terminal head 15 which permits access of air to the chamber 13 and thereby cooperates with air passage 14 to set up a circulation of air through said chamber. The purpose of such circulation is to develop a current of heated air which prevents condensation of moisture on the walls of chamber 10 and thus eliminates the danger of grounding or short circuiting and burning out the heating element. The heating element may be electrically connected through a regulating thermostat 16

suitably secured to the radiator casing and plug cord 17 to the source of power.

The chamber 12 in which the water is heated, forms the lower length of the circuitous path along which the water circulates and is provided with inlet and outlet openings on its lower and upper sides respectively. By locating the outlet opening above the inlet opening, the direction in which the water circulates is definitely described and with the outlet opening rising from the upper side of the chamber, formation of steam pockets within the chamber is avoided, thereby preventing water hammer. The inlet opening communicates with the lower portion of the water passage in the vertical section 5^b of the radiator through a conduit 18 which is secured to the lower wall of said section by a sealed connection. A similarly mounted conduit 19 connects the outlet opening of the chamber with the vertical section 5^a of the radiator, and the conduits 18 and 19 may incidentally be used to support the heating unit 8. The conduit 19 is extended upwardly within the water passage of said section to a point near the upper longitudinal passage 3 at which point it discharges into the radiator. The purposes of such extension are to start a definite circulation in as short a time interval as possible, to cause a more rapid circulation to maintain a more uniform circulation at all times and to delimit a primary path of circulation, the ends of which are provided by the end sections 5^a and 5^b. In this manner the time required to heat up the radiator is decreased. Furthermore, by having the extension located within the vertical section, instead of being externally located, the symmetry of the unit is preserved and a relatively short and secure supporting member for the heating unit is formed without requiring additional braces. The lower portion of the water chamber 12 is provided with a suitable drain pipe and valve 20. While the heating unit, as shown, is covered with heat insulating material 21, it is to be understood that such insulation may be dispensed with.

In heaters of this type, circulation of water is caused by a difference in pressure heads, that is to say, with respect to the present heater, when the water is cold throughout the pressure heads in the columns of water at the ends of the water heating chamber are equal, but upon a difference in temperature the colder column overbalances the warmer one and circulation is started, the rate of which depends on the difference in weight which in turn depends on the difference in temperature. By the provision of the conduit 19, the outlet head contains a comparatively small volume of water and upon the application of heat it will increase in temperature relatively fast and thereby cause the water to circulate rapidly in a relatively short time. At the moment circulation begins, the hot water will flow through the passage 3 to section 5^b and the cold water will flow from section 5^b thus establishing a primary outside path of circulation. As this circulation continues, the secondary circulation is started by the pressure in the intermediate columns causing the cold water contained therein to flow downward to passage 4 and toward section 5^b. In this manner the body of water considered as a whole circulates in a mean diagonal path and the heater columns will become heated progressively from the points of contact of their water columns with the water in the primary path.

In my preferred form the heating unit is located as shown in order to preserve the symmetry of the heater. Its location may obviously be changed but in such event the feature of the diagonal flow of the body of water as a whole by reason of the provision for the primary path of circulation is, of course, maintained by any suitable provision therefor.

Having fully described my invention, I claim:

1. In an electric hot water radiator, in combination, a unitary radiator element having end sections and intermediate means of communication and radiation between said sections, an electric heating element, a water chamber located externally of said radiator element and subject to the heat of said heating element and means of communication between the ends of said water chamber and said sections such that the direction of the circulation of water is definitely prescribed and such that the heated water flowing from said chamber passes upwardly through and directly to the upper end of the adjacent end section.

2. In an electric hot water radiator, in combination, a unitary radiator element having end sections and intermediate sections and upper and lower longitudinal passages communicating with said intermediate sections, the upper passage communicating with the end sections, and the lower passage communicating with at least one of the end sections, an electric heating element below said radiating element, a chamber arranged below said radiating element and subject to the heat of said heating element, a communicating connection between an end section of said radiating element and the lower side of said chamber and a communicating connection extending from the upper side of said chamber through the lower wall of the opposite end section, said last named connection being occluded from the lower horizontal passage of said element and providing for the flow of water from said chamber directly to the end section with which said connection is associated.

3. In an electric hot water radiator, in combination, a unitary radiator element having end sections and intermediate means of

communication and radiation between said sections, an electric heating element, a water chamber located externally of said radiator element and subject to the heat of said heating element and means of communication between the ends of said water chamber and said sections, one of said means projecting deeply into a water passage of said radiator element from a point adjacent its connection to the chamber such that it terminates diagonally opposite from the termination of said other means.

4. In an electric hot water radiator, in combination, a unitary radiator element having end sections and intermediate means of communication and radiation between said sections, an electric heating element disposed below said radiator element, a longitudinal chamber disposed below said radiator element and subject to the heat of said heating element, a communicating connection between one end of said chamber and the lower portion of the adjacent end section and a communicating connection between the opposite end of said chamber and the opposite end section, said last mentioned connection projecting upwardly within said section to a point near the top thereof.

5. In an electric radiator, in combination, a radiator element having end sections and intermediate means of communication and radiation between said sections, a heating unit including an inner heating chamber and an outer water chamber, a heating element for said heating chamber, means for causing a flow of air through said heating chamber when said chamber is heated, a communicating connection between an end of said water chamber and an end section of said casting and a communicating connection between the opposite end of said water chamber and the opposite end section of said casting.

6. In an electric radiator, in combination, a radiator element having end sections and intermediate means of communication and radiation between said sections, a heating unit including a heating chamber and a water chamber, said heating chamber being open at one end and having an air passage at its other end, a heating element so disposed within said heating chamber as to permit a flow of air through the same, a communicating connection between said water chamber and an end section of said radiator element and a communicating connection between the opposite end of said water chamber and the opposite end section of said radiator element.

7. In an electric hot water radiator, in combination, a unitary radiator casting having a series of hollow vertical sections with upper and lower longitudinal passages communicating with all of said sections, an electric heating element below said casting, a chamber arranged below said casting and subject to the heat of said element, said chamber having an outlet opening in its uppermost side and an inlet opening below said outlet opening, and communicating connections between such openings and the opposite end sections respectively.

In testimony whereof I hereby affix my signature.

WILLIAM H. ROBINSON.