April 26, 1927. 1,625,989

A. M. DUFFIE

ELECTRIC HEATER

Filed Dec. 26, 1923 4 Sheets-Sheet 1

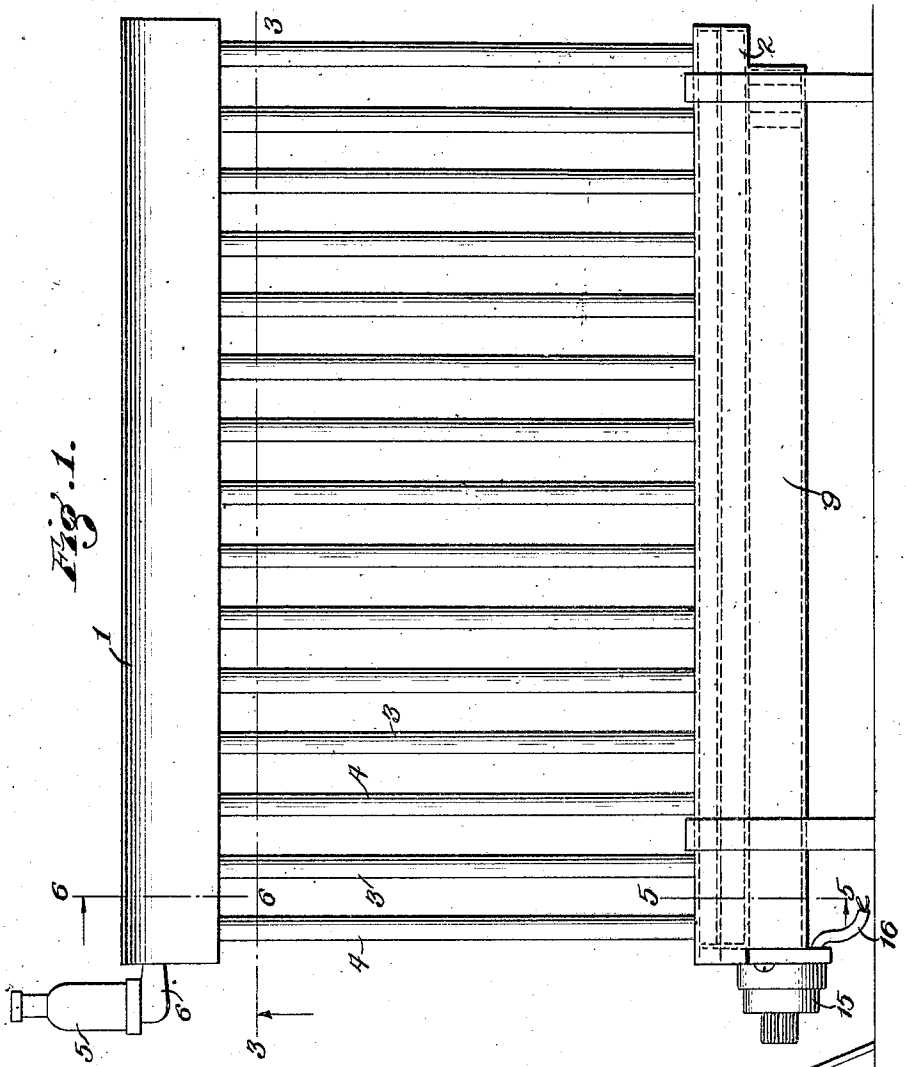


Fig. 1.

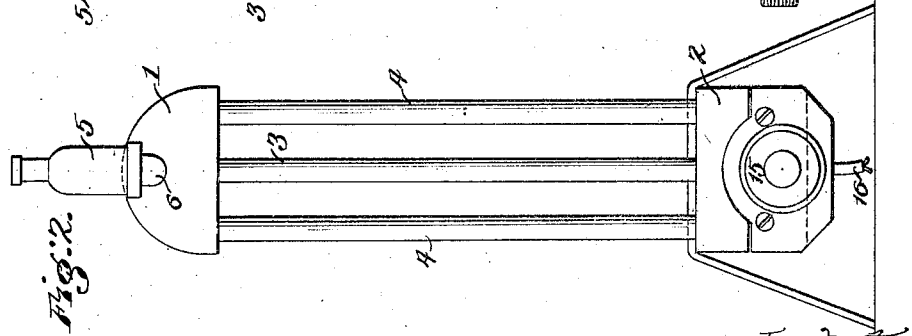


Fig. 2.

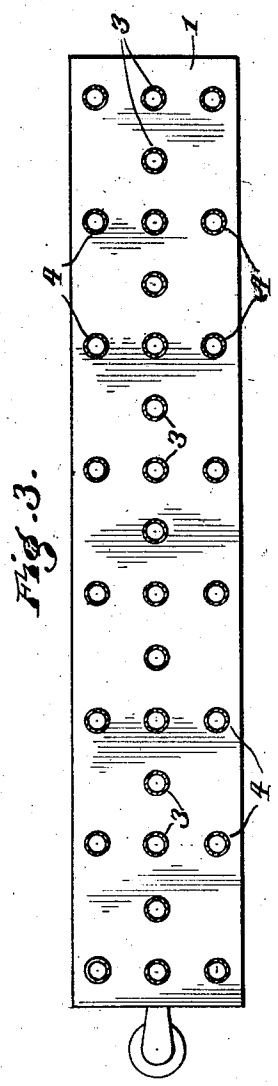
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Allen M. Duffie
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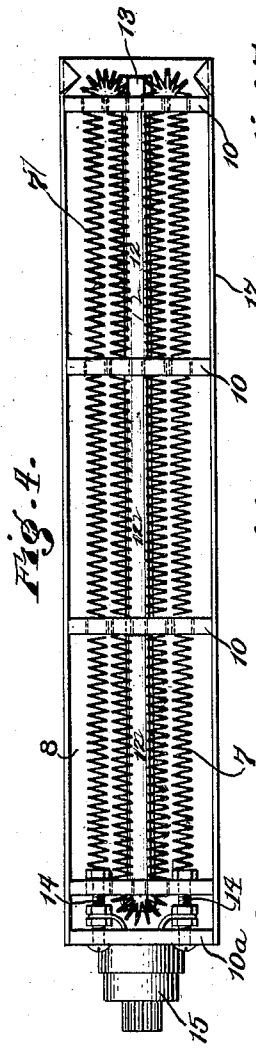
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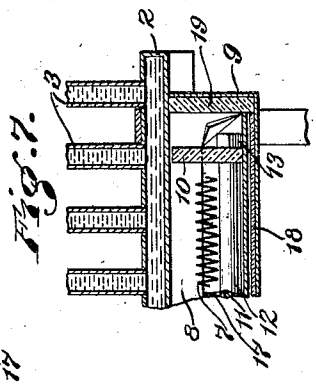
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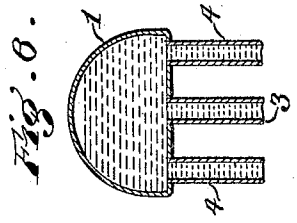
ELECTRIC HEATER

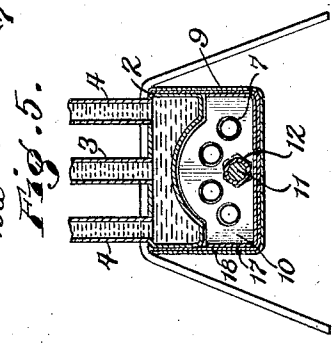
Filed Dec. 26, 1923 4 Sheets-Sheet 2











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ELECTRIC HEATER

Filed Dec. 26, 1923 4 Sheets-Sheet 3

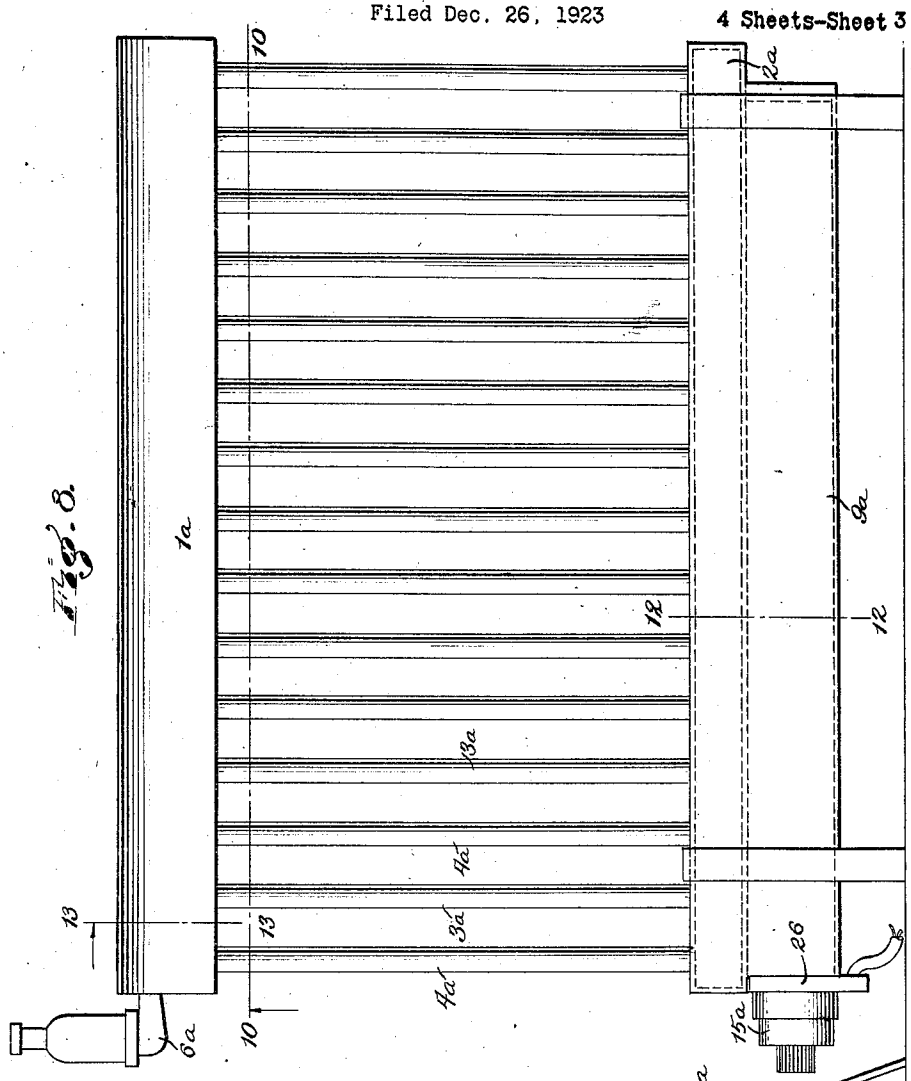


Fig. 8.

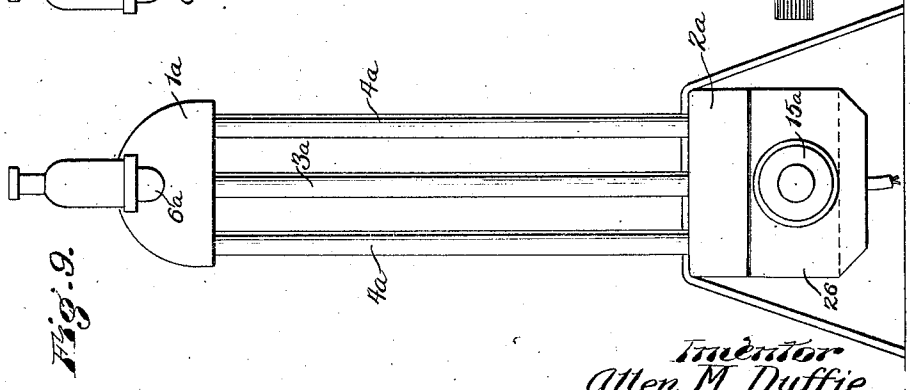


Fig. 9.

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ELECTRIC HEATER

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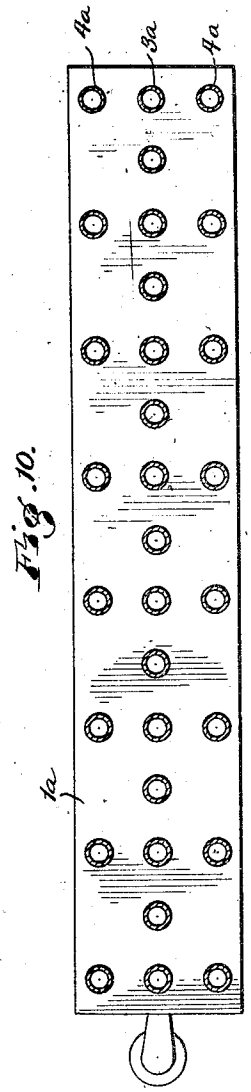


Fig. 10.

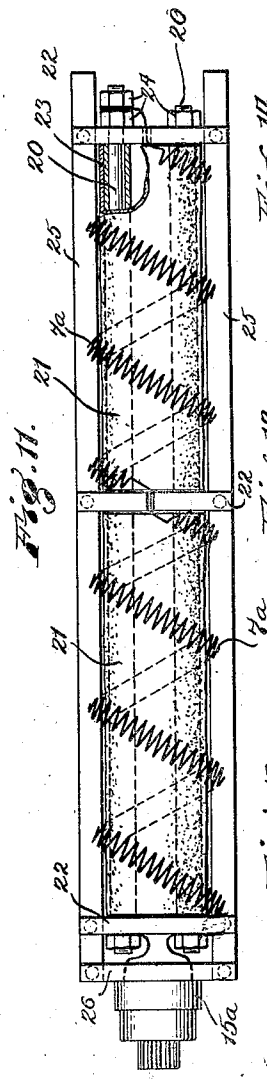


Fig. 11.

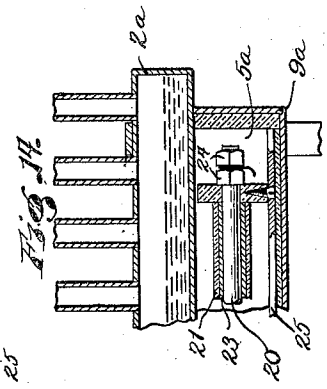


Fig. 14.

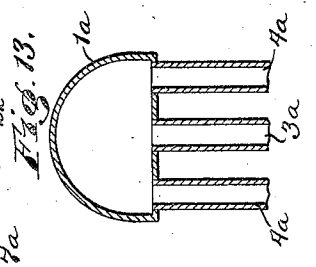


Fig. 13.

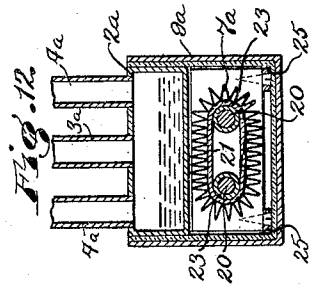


Fig. 12.

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Patented Apr. 26, 1927. 1,625,989

UNITED STATES PATENT OFFICE.

ALLEN M. DUFFIE, OF BUFFALO, NEW YORK, ASSIGNOR TO WILLIAM H. ROBINSON, OF BUFFALO, NEW YORK.

ELECTRIC HEATER.

Application filed December 26, 1923. Serial No. 682,796.

This invention relates to improvements in electric heaters of the type which embodies a radiator operating with hot water or steam.

The principal object of the invention is to provide an electric heater of the type indicated which shall be readily portable, in which provision is made for ready access to the heating element, which is simple and economical in its structural assembly, which will not be liable to derangement, and which will be economical in operation.

The invention consists generally in the novel organization of the heating element with reference to the lower head of the radiator and in novel details of structure and arrangement appertaining to the heating element and its associated parts, all of which novel features have in view the advantages above generally set forth.

The invention is illustrated in the accompanying drawings wherein forms applicable to hot water and steam, respectively, are disclosed.

In said drawings:

Figure 1 is a side elevation of a heater having a hot water radiator.

Figure 2 is an end view thereof.

Figure 3 is a sectional view on the line 3—3 of Figure 2.

Figure 4 is a plan view of the heating element as removed from the radiator.

Figures 5 and 6 are sectional views on the lines 5—5 and 6—6, respectively, of Figure 1.

Figure 7 is a detail longitudinal sectional view of the lower portion of the radiator at one end thereof.

Figure 8 is a side elevation of a heater having a steam radiator.

Figure 9 is an end elevation thereof.

Figure 10 is a sectional view on the line 10—10 of Figure 8.

Figure 11 is a plan view of the heating element employed with the radiator of Figure 8.

Figures 12 and 13 are sectional views on the lines 12—12 and 13—13, respectively, of Figure 8.

Figure 14 is a detail longitudinal sectional view of the lower portion of the radiator of Figure 8 at one end thereof.

Referring to Figures 1 to 7:

The radiator may be of any suitable form and arrangement but preferably comprises an upper head 1, a lower head 2 and circulating tubes extending between the heads. The circulating tubes are preferably arranged in three series, a middle series 3 through which the water flows upward and two outer series 4 through which the water flows downward. All of the tubes may be of the same diameter but the tubes of the middle series which carry as much water as the tubes of both of the outer series are provided in suitably greater number than the tubes of either of the outer series. The upper head 1 is provided at one end with a suitable air vent 5 which is removably fitted to the filling nipple 6.

The heating element 7 is arranged below the head 2 in a chamber or compartment 8 extending substantially the length of said head. The lower wall of the head 2 serves as the upper wall of the chamber 8 and is arched in cross section (as shown in Figure 5) whereby the head 2 is of less depth in its central longitudinal portion, that is to say immediately below the tubes 3, then elsewhere. The heating element being arranged whereby heat is delivered uniformly to the lower wall of the head 2, the water in the reduced central longitudinal part of said head is heated more quickly than the water in the parts below the tubes 4; and in this way the water is caused to have a relatively rapid upward circulation through the tubes 3.

The chamber 8 is provided by a casing 9 having side walls, a bottom and a rear end wall. The casing 9 is suitably supported in relation to the head 2 whereby the lower wall of said head serves as the upper wall of the chamber 8. The side walls of the casing 9 are preferably extended upward to lie at the sides of the head 2 and along their upper edges are secured to said head by welding.

The means of support for the heating element 7 is preferably organized whereby it may be fitted in the casing 9 or removed therefrom in the manner of a drawer. The heating element preferably consists of coiled resistance wire bent into parallel convolutions and is supported by a suitable number of rigid transverse plates 10 of any suitable compressed composition insulating material, said plates having openings through which the parallel convolutions of the heating element are passed and serving to space said

convolutions from one another and from adjacent metal parts. The plates 10 are mounted upon a connecting rod 11 and are spaced from one another by sleeves 12 fitted upon said rod, the assembly of said plates and sleeves being maintained by nuts 13 fitted upon the ends of the rod 11. A plate 10^a of similar insulating material is arranged somewhat in advance of the foremost plate 10 and serves as the front wall of the chamber 8. The plate 10^a is included in the unit composed of the heating element and its means of support and is preferably connected to the adjacent plate 10 by bolt fastenings 14. A switch 15 for the control of the heating element is preferably mounted at the front side of the plate 10^a and is connected to the lead wires arranged in the usual manner in a cord 16, carrying a suitable plug (not shown) for engagement in a wall socket or equivalent part. The bolts of the fastenings 14 are used for the electrical connection of the terminals of the heating element and the terminals of the switch 15. The heating element 7 is arranged above a reflector which preferably is combined with the removable unit composed of the heating element and its supporting parts. As shown the reflector consists of a member 17 of channel cross section which has a close sliding fit in the casing 9 and within which the plates 10 and 10^a are arranged, the member 17 being secured to said plates in any suitable manner and having its surfaces adjacent the heating element highly polished. The bottom and side walls of the casing 9 are preferably lined with suitable heat insulating material 18 and the end wall of said casing is lined with a heat insulating plate 19.

It will be observed that the heating element is mounted externally of the radiator and that direct and reflected heat acts on the lower radiator head which provides a wall of the chamber in which the heating element is arranged. The radiator part of the heater is thus structurally independent of the heating element and its associated parts. The heating element and its means of support are assembled to constitute a self contained unit which can be instantly detached or removed from the radiator for the purpose of giving access to any of its parts and which can be as quickly replaced. In the construction shown, using the knob of the switch 15 as a drawer pull, the reflector 17 fits in the manner of a drawer in the casing 9 and as removed or inserted carries with it the heating element and its supporting parts.

Referring to Figures 8 to 14:

The radiator is similar structurally to the form above described and consists of the upper head 1^a, the lower head 2^a and the tubes 3^a and 4^a. The lower head supports a casing 9^a which provides a chamber 8^a below said head in which the heating element 7^a is arranged, the bottom wall of the head 2^a providing the top wall of the chamber 8^a.

The heating element is wound spirally upon a core-like support which includes a pair of parallel rods 20 and wrappings 21 of insulating material encircling said rods. The rods 20 are supported by transverse plates 22 of rigid insulating material, said plates having openings through which the rods extend and serving to separate the rods from one another. Spacing sleeves 23, preferably of insulating material, are provided on the rods 20 between the plates 22. The assembly of the heating element, rods 20, sleeves 23 and plates 22 is maintained by nuts 24 fitted on the ends of said rod. The plates 22 are mounted upon parallel supporting strips 25. A plate 26 of similar insulating material is mounted in front of the foremost plate 22 and upon the strips 25. The plate 26 carries the switch 15^a, one terminal of which is connected to an end of the element 7^a and the other terminal of which is connected to one of the rods 20 which is used as a return path. The supporting strips 25 have slidable engagement upon the bottom of the casing 9^a whereby the unit composed of the heating element and its supporting parts can be removed from or inserted into said casing in the manner of a drawer and in the same way and for the same purposes as in the construction first described.

The head 2^a is filled with water up to a determined level, the water being poured in through the nipple 6^a and being converted into steam as the operation proceeds.

Having fully described my invention, I claim:

1. In an electric heater, the combination with a radiator having fluid circulating tubes and a lower head of a casing arranged below said head and providing a chamber, the upper wall of which is provided by the lower wall of said head, a heating element in said chamber, and means of support for said heating element including transversely arranged plates of insulating material and means to provide for the unitary assembly of said plates and element whereby said element and its supporting means may be removed and replaced as a unit with reference to said head.

2. In an electric heater, the combination with a radiator having fluid circulating tubes and a lower head of a casing arranged below said head and providing a chamber, the upper wall of which is provided by the lower wall of said head, a heating element in said chamber, means of support for said heating element including transversely arranged plates of insulating material and means to provide for the unitary assembly of said plates and element, and means connected to said plates and having a close

sliding fit in said casing whereby said element and its supporting means may be fitted in or removed from said casing as a unit and in the manner of a drawer.

3. In an electric heater, the combination with a radiator having fluid circulating tubes and a head of a casing arranged adjacent said head and providing a chamber, one wall of which is provided by a wall of said head, the walls of said chamber, except for the wall provided by said head being lined with heat insulating material, a heating element in said chamber, and means of support for said heating element, the latter and its supporting means being removable and replaceable as a unit with reference to said head.

4. In an electric heater, the combination with a radiator having fluid circulating tubes and a lower head of a casing arranged below said head and providing a chamber, the upper wall of which is provided by the lower wall of said head, a heating element in said chamber, means of support for said heating element, and a reflector for said heating element and connected to its supporting means, the reflector having a drawer-like sliding fit in said casing and being available to effect the removal or replacement in unitary fashion of said heating element and its supporting means.

5. In an electric heater, the combination with a radiator having a middle series of fluid circulating tubes, two outer series of fluid circulating tubes, an upper head and a lower head of a casing arranged below said lower head and providing a chamber, the lower wall of said lower head serving as the upper wall of said chamber and being arched whereby said lower head has less depth below the tubes of the middle series than elsewhere and a heating element fitted in said chamber.

In testimony whereof I affix my signature.

ALLEN M. DUFFIE.