(No Model.)

H. R. BUTTERFIELD & W. MITCHELL.

ELECTRIC RADIATOR.

No. 424,047. Patented Mar. 25, 1890.

Fig. 1.

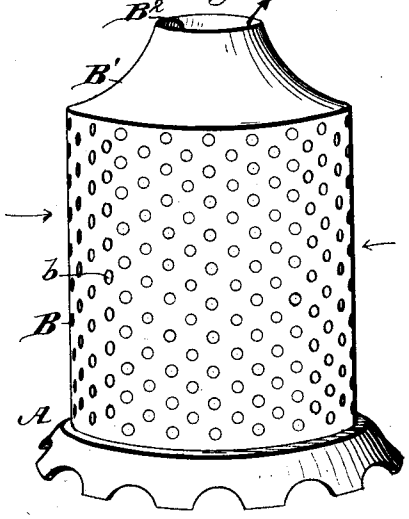


Fig. 2.

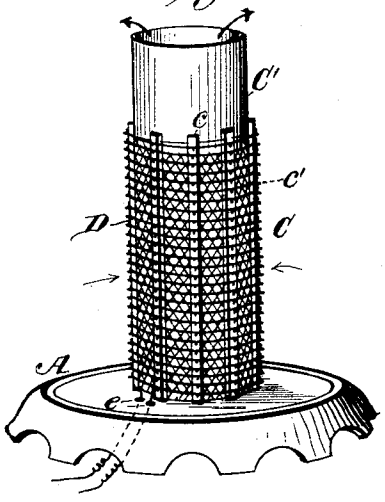


Fig. 3.

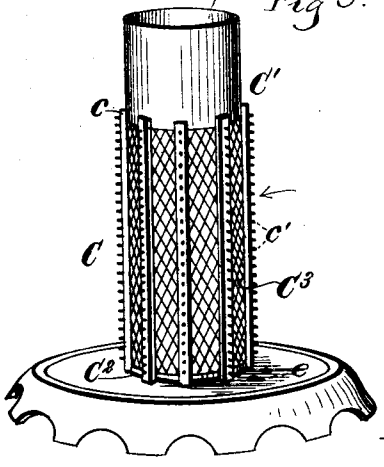


Fig. 4.

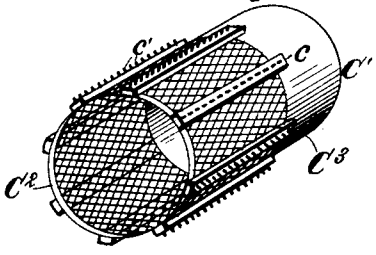
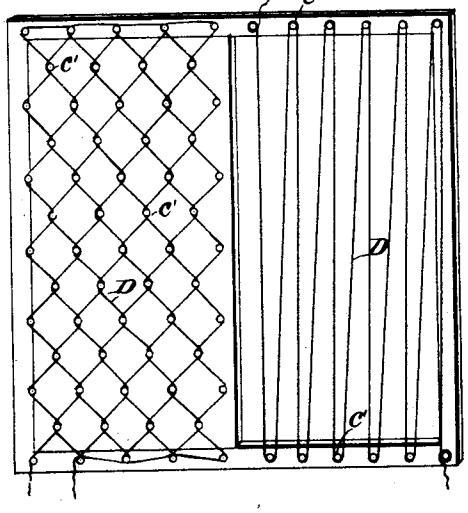


Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY RICE BUTTERFIELD AND WILLIS MITCHELL, OF WATERVILLE, MAINE, ASSIGNORS TO THE BUTTERFIELD & MITCHELL ELECTRIC COOKING AND HEATING COMPANY, OF SAME PLACE.

ELECTRIC RADIATOR.

SPECIFICATION forming part of Letters Patent No. 424,047, dated March 25, 1890.

Application filed November 1, 1889. Serial No. 328,889. (No model.)

To all whom it may concern:

Be it known that we, HENRY RICE BUTTERFIELD and WILLIS MITCHELL, citizens of the United States, residing at Waterville, in the county of Kennebec and State of Maine, have invented certain new and useful Improvements in Electric Radiators; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide an improved electric heater and radiator suitable for warming rooms, halls, and other spaces. To this end we wind the electric wires on studs, rings, frames, or other supports in such a way as to form a wire network, allowing the passage of air through it, but in circuit as a continuous conductor, and offering a considerable degree of resistance to the electric current.

The details of our invention will be hereinafter particularly set forth as embodied in the preferred constructions, and the said invention will be defined in the appended claims.

In the accompanying drawings, Figure 1 represents a perspective view of a radiator embodying our invention, the same being ready for use. Fig. 2 represents the said radiator in perspective, the exterior casing being removed. Fig. 3 represents the base and interior frame in perspective. Fig. 4 represents a detail perspective view of the interior frame detached from said base, and Fig. 5 represents a side elevation of a modified form of our radiator having a rectangular or flat casing, one side of the latter having been removed.

In said drawings, A designates the base of the radiator, which may be of any convenient ornamental form, preferably circular in general outline, and B designates a cylindrical casing upright thereon. The top B′ of this casing slopes inward and upward, preferably with a neat curvature, leaving a central opening B^2 as a draft-outlet. This top is imperforate, except said draft-opening B^2; but the cylindrical body of said casing is provided with a great number of perforations *b*, allowing the free passage of air through it everywhere. For this body of the casing any other form of open-work may be employed—such as braided strips or stout wire—and the material may be either metallic or non-metallic, insulating or non-insulating. On said base A a smaller cylinder C, concentric with and inside of casing B, is erected, the same constituting at once a draft-flue and a frame for the heating-wire. The upper part C′ of this flue C is solid for perhaps a third (more or less) of the entire length. From this ring several strips *c* extend downward to a wire ring C^2, which forms the base of the said cylindrical flue or frame. A net-work C^3 of braided wire covers these strips from the solid part C′ of said cylinder to the base-ring C^2 thereof. This solid part C^2, the base-ring C′, and the strips *c* are provided with outwardly-extending studs *c′* or equivalent fastenings or supports, on which the heating-wire is wound. This wire (marked D) forms part of an electric circuit, and is either insulated throughout or separated by insulating material from all metallic parts of the radiator, the various crossing parts of said heating-wire, if it is so wound as to cross, being also insulated from each other. The said wire is a continuous conductor, but wound either as a spiral, as shown, or back and forth in obliquely-crossing lines, so as to constitute an open wire cylinder or net-work inclosing the open part of frame C. The length of wire thus wound insures a considerable amount of resistance and a corresponding degree of heat, so that the air passing through the radiator will be warmed effectually when the electric current is at its maximum. The heat may of course be regulated by decreasing and increasing the current as required. The air passes in from all sides through perforations *b* of the outer casing into contact with the electric heating-wire D and through interstices in the same, thence through the wire net-work C^3 of the inner cylindrical frame C to the interior of the latter, and finally out through the outlet-opening B^2 in the top of the casing B. On the drawings arrows indicate the course thus taken.

The cylindrical form is decidedly the best

for radiators of this kind; but of course other forms may be used without departing from our invention. Thus, as in Fig. 5, the casing B may be rectangular and provided with inwardly-extending studs or pins c', similar to those already described, or equivalent devices, in its top, bottom, ends, and sides, or some, if not all, of these inner faces; or, instead of a casing, there may be merely a frame, as in the right-hand part of said figure. The heating-wire D is passed from one to another of these studs in crossing lines, forming a net-work. The same precautions against short-circuiting are taken, the heating-wire being either coated throughout with insulating material or separated by this from all metallic parts and from contact with itself at all points where such contact may occur.

This form of radiator may be used without a base. Indeed, a base is not indispensable to any form, though very desirable and convenient. When used it is preferably provided with small openings e, as shown in Figs. 2 and 3, allowing the ends of heating-wire D to extend down through it.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. An electric radiator having its heating-wire in the form of spiral or other open-work, but constituting a continuous conductor in an electric circuit, and insulated wholly or wherever necessary to avoid short-circuiting, said radiator being provided with inlet and outlet draft-openings, permitting the passage of air through said wire open-work, substantially as set forth.

2. In combination with an inner open frame, an electric conductor wound thereon and forming part of an electric circuit, both of said parts allowing the passage of air through them, for the purpose set forth.

3. In combination with an inner open frame, a wire open-work surrounding the same and insulated to guard against short-circuiting, the wire of said open-work forming part of an electric circuit as one continuous conductor and allowing the free passage of air through it, substantially as set forth.

4. In combination with a perforated exterior casing and an inner open frame, an interposed continuous conductor forming an open spiral or net-work which will allow the passage of air, said conductor being in an electric circuit and insulated against short-circuiting, substantially as set forth.

5. The exterior casing B, having perforations b and outlet-opening B^2, in combination with an interior frame C and an interposed spiral or net-work of wire constituting a continuous conductor in an electric circuit, said net-work casing and frame allowing the air to pass freely from said perforations to said outlet through the radiator, substantially as set forth.

6. The interior flue or frame C, consisting of a solid upper part, a base-ring, strips connecting them, and a wire spiral or netting on said strips, and provided externally with studs c', in combination with a heating-wire wound over said studs and around said frame and forming open-work, which allows the passage of air, but constituting a continuous conductor in an electric circuit and insulated against short-circuiting, substantially as set forth.

7. An electric radiator having its heating-wire wound to form spiral or other open-work and inclosed within a casing, said radiator being provided with studs or equivalent fastenings for supporting said wire at its angles and holding it in position, said wire constituting an open net-work which allows the free passage of air through it, though being a continuous conductor in an electric circuit and insulated against short-circuiting, substantially as set forth.

8. The combination of base A with casing B, frame C, and wire open-work D, arranged concentrically thereon, said parts B C D allowing the passage of air freely through them, and the said net-work constituting a properly-insulated continuous conductor in an electric circuit, for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

HENRY RICE BUTTERFIELD.
WILLIS MITCHELL.

Witnesses:
J. T. CLARKSON,
A. A. PLAISTED.