

(No Model.)

C. E. CARPENTER.
ELECTRIC HEATING APPARATUS.

No. 429,560.

Patented June 3, 1890.

Fig. 1.

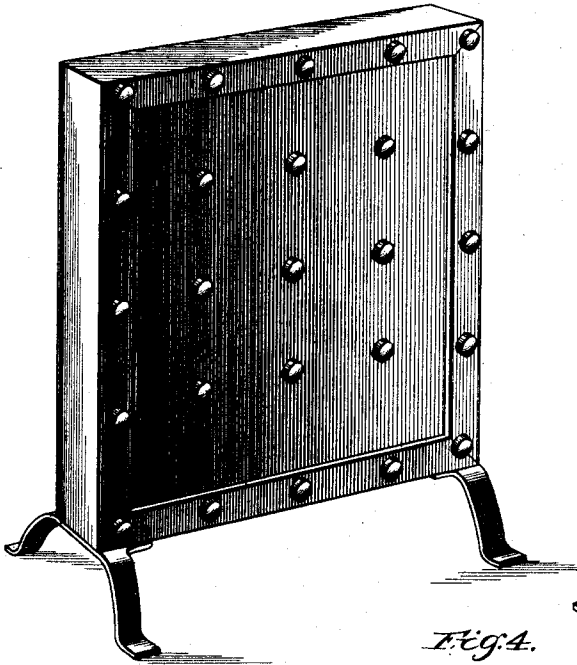


Fig. 2.

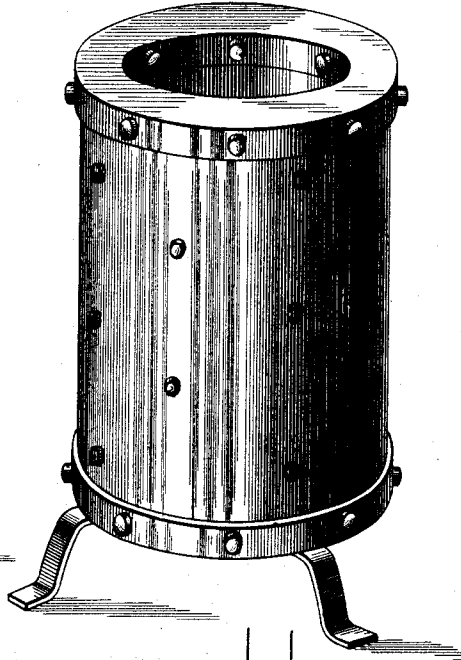


Fig. 4.

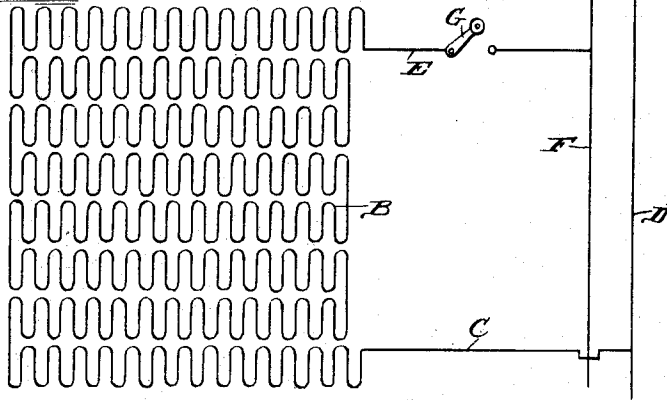
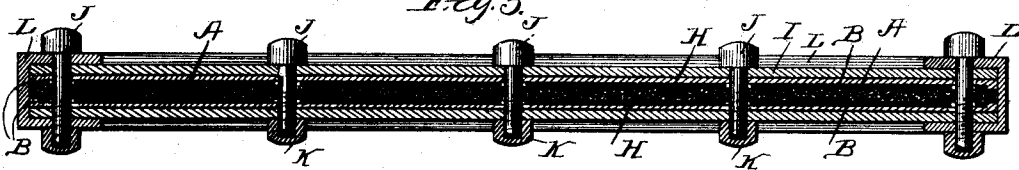


Fig. 3.



Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES E. CARPENTER, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE CARPENTER-NEVENS ELECTRO-HEATING COMPANY, OF SAME PLACE.

ELECTRIC-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 429,560, dated June 3, 1890.

Application filed December 17, 1889. Serial No. 334,126. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. CARPENTER, a citizen of the United States, and a resident of the city of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Electro-Heating Apparatus, of which the following is a full, clear, and exact description.

This invention relates to improvements in electro-heating apparatus for utilizing the heat developed by passing a current of electricity through a conductor of high resistance and small capacity for the purposes of an atmospheric heater, and differs from other apparatus heretofore invented by myself and others, in which the principal feature was the confining of the heat developed to a single surface of the apparatus.

The prime object of this invention, therefore, is to have the heating apparatus of such a character that the heat generated thereby will be dissipated into the atmosphere by radiation, conduction, or convection with the maximum degree of rapidity, whereby great economy in electrical heating is effected and at the minimum expense.

Other objects of this invention are to secure the maximum radiations in all directions from the apparatus; to have the apparatus convenient and durable in form and of light weight and economical construction; to avoid the reaction of the heat upon the resistance and thus avoid danger of fusion or oxidation of the resistance; to subject the resistance to a constant pressure, whereby the heating effects thereof are not only intensified, but the deterioration thereof is prevented, and, finally, to provide certain details in the carrying out of my invention, all as illustrated in the accompanying drawings, in which—

Figure 1 represents a perspective view of one form of electro-heating apparatus embodying my invention; Fig. 2, a perspective view of another form of heating apparatus embodying my invention; Fig. 3, a horizontal section through the heater shown in Fig. 1, illustrating the relation of the elements thereof, and which also represents a section taken at any point through Fig. 2, with the exception of the bolts intermediate the ends, which are not shown, but might be employed in Fig.

2; Fig. 4, a diagram view illustrating the arrangement and distribution of the conductor constituting the resistance for the electric current and the connection thereof with the source of power.

This invention, so far as relates to the character, form, and relation of the elements, and the manner of economically utilizing the heat evolved by the resistance is similar to the apparatus shown in Letters Patent of the United States, No. 415,856, granted me November 26, 1889, and allowed September 14, 1889, the main point of difference being that the object of that invention, generally stated, was to direct and confine the heat generated to the surface-plate of the apparatus or utensil to which the invention was applied, and at the same time prevent the dissipation of the heat by conduction or radiation to other bodies; but this invention has exactly the opposite purpose in view—namely, to dissipate the heat into the atmosphere in all directions and as rapidly as possible, in order that the invention may be applied to all the purposes of an atmospheric heater of convenient form, and as simple in construction as the apparatus heretofore invented.

Referring now to the drawings, let A represent a sheet or card of asbestos, of suitable thickness, or of any other incombustible electrical insulating material, to one or both faces of which is secured, by means of asbestos thread, staples, or other form of fastening, an electrical conductor or resistance B, preferably consisting of wire of high resistance and small capacity, preferably reflexed back and forth over the faces of the asbestos card in substantially the manner illustrated in Fig. 4, with one terminal C of each resistance connecting with one of the line-wires D from the source of electrical energy and the other terminals E with the other line-wire F, there being included in one of these terminals between the resistance and line-wire a switch G, of some suitable form, for making and breaking the circuit through the resistance, so as to control the heating thereof. Against each of these resistances is laid a sheet H, of some electrical insulating material—such as thin asbestos paper, mica, or the like—while they permit the comparatively free passage through them by conduction of the heat

evolved by the resistances, at the same time serve to electrically insulate the resistances from the exterior surface-plates I on each face of the apparatus, which also serve as a means for binding all the elements firmly together in a compact body and under a proper degree of pressure by means of screws J, preferably passing through all of the elements and having ornamental nuts K upon their opposite ends corresponding with the heads of the screws upon the other side of the apparatus. If desired, for further ornament and finish, a binding strap or band L of metal may be secured to the edges of the elements by the outer line of screws, so as to present a finished appearance and furnish a surface capable of any desired degree of ornamentation.

The heating surface-plates I are preferably made of Russia iron, so as to offer as little resistance as possible to the escape of the heat evolved by the resistances and transmitted thereto through the medium of the electrical insulators H, which should be of such a character that they will endure high temperature and be fairly good conductors of heat. For this reason I prefer to use a thin compact asbestos paper as the electrical insulating material, for while mica, and even some forms of insulating-paint which is fire-proof or will endure high temperature, may be employed for this purpose, still, by reason of their rigid unyielding character, they present only a small surface for contact with a wire by reason of the meeting of their plane with the curved surface of the wire, thus reducing their utility as conductors for the heat evolved by the resistance. Asbestos paper or some other flexible and yielding material, on the contrary, will permit the sinking of the wires into the surface thereof under pressure, so that the insulator will press closely around nearly half of the circumference of the wire, and thus furnish the maximum degree of contacting-surface.

Practice has demonstrated that with the structure above described, and illustrated in the drawings, oxidized wires of German silver if subjected to considerable pressure in the relation described by bolting the heating-surfaces together, as shown, or in any other well-known and convenient manner, do not decompose or deteriorate when subjected to high temperature, such as would result from passing heavy currents through them, and are thereby rendered practically indestructible.

Another advantage of this construction of electro-heating apparatus is that a large amount of heating-surface is obtained for a small bulk and weight of material, and that the same wires which would become fused or

deteriorate with use when subjected to heavy currents if placed in any convenient form for use—such as a coil not under pressure—or in any other shape exposed to the atmosphere, do not deteriorate when used in the construction and relation shown.

With this structure of the apparatus various modifications of its appearance and form may be made to suit any requirement. For example, as illustrated in Fig. 1, it may be flat with straight or plane sides, or, as illustrated in Fig. 2, circular or cylindrical in form, with one of the heating surface-plates on the inside of the cylinder and the other outside of the cylinder. Furthermore, the heated surface-plates may have a plain exterior or may be ornamented in any desirable manner and provided with ornamental studded points, some of which may, if desired, be the heads and nuts for the screws; or the surface may be corrugated, angular, or have any other desirable configuration.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electro-heating apparatus, the combination, with an internal layer or card of incombustible electrical insulating material and resistances lying on one or both faces thereof, of a layer of electrical insulating material covering each of said resistances and exterior heating surface-plates, substantially as and for the purpose described.

2. In an electro-heating apparatus, the combination, with the internal layer or card of incombustible electrical insulating material and resistances lying against one or both faces thereof, of a layer of electrical insulating material covering each of said resistances, exterior heated surface-plates between which said elements are confined, and screws or other equivalents for binding all the elements together and maintaining them under pressure, substantially as described.

3. In an electro-heating apparatus, the combination, with an internal layer of incombustible electrical insulating material and resistances consisting of reflexed wire secured to each face thereof, of a layer of electrical insulating material covering each of said resistances, external heated surface-plates covering each of said insulators, and screws passing through said surface-plates, and the intermediate elements detachably securing all of said elements together under pressure, substantially as described.

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Witnesses:

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