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A. N. ANDERSON.

ELECTRIC HEATER.

APPLICATION FILED MAY 31, 1906.

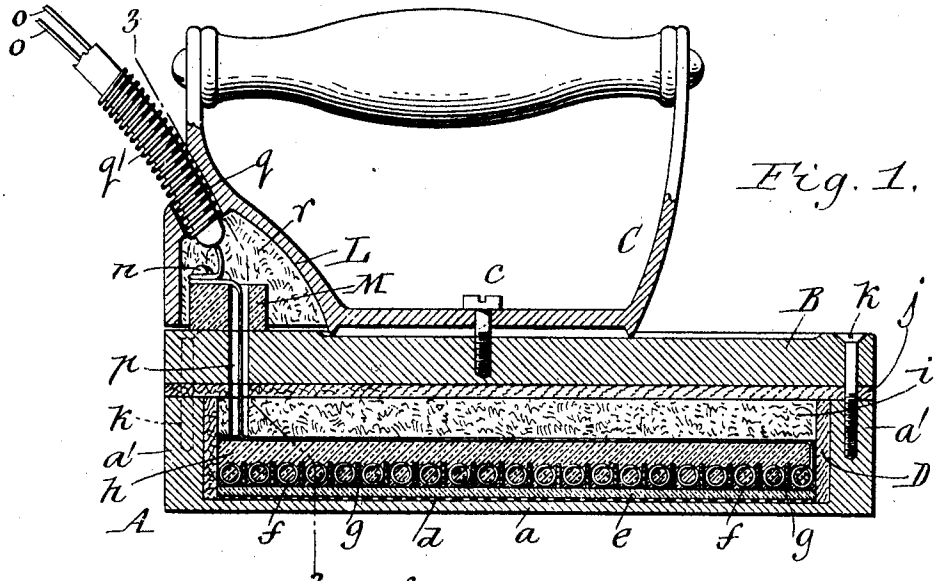



Fig. 1.

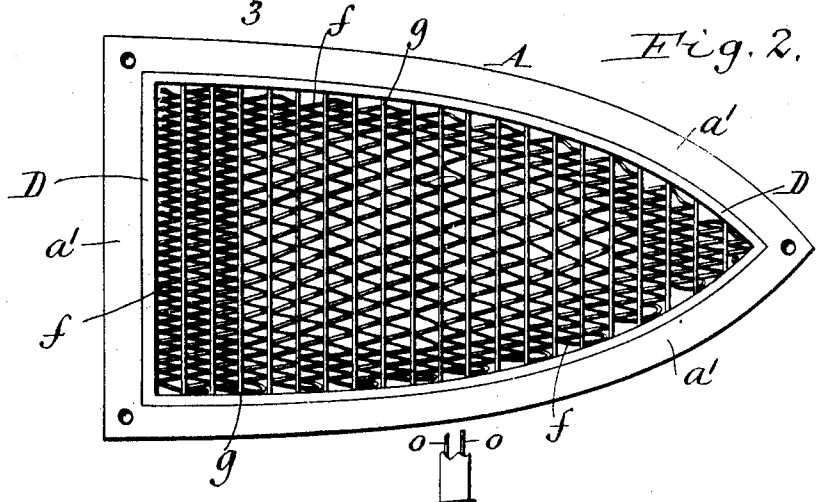



Fig. 2.

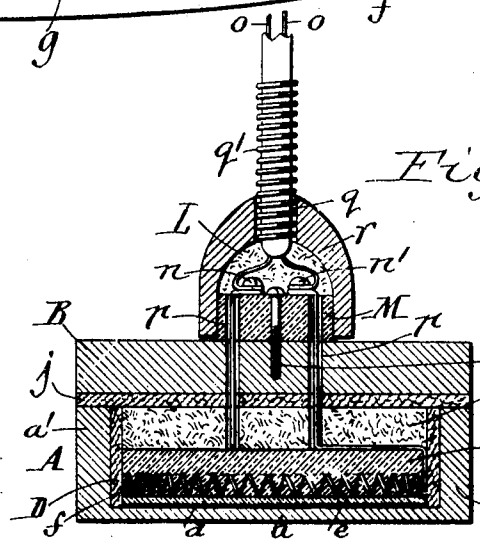



Fig. 3.

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# UNITED STATES PATENT OFFICE.

ARTHUR N. ANDERSON, OF NIAGARA FALLS, NEW YORK.

## ELECTRIC HEATER.

No. 842,849. Specification of Letters Patent. Patented Feb. 5, 1907.

Application filed May 31, 1905. Serial No. 263,117.

*To all whom it may concern:*

Be it known that I, ARTHUR N. ANDERSON, a citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented a new and useful Improvement in Electric Heaters, of which the following is a specification.

This invention relates to an electric heater in which the heat is developed by conducting an electric current through a resistance or coil of wire.

The objects in producing an improved heater of this character are to increase the efficiency of the heater and to reduce the cost of the same, to confine the heat generated and emitted to the desired surfaces, to prevent short-circuiting of the electric conductor within the heater; to avoid oxidation of the electric conductor, to prevent induction or waste currents, to prevent carbonization of the insulating material, and to improve the heater in other respects.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a sad-iron constructed in accordance with my invention. Fig. 2 is a top plan view of the body or shell of the sad-iron, showing the heating or resistance coil and the insulating-strips therein preparatory to being covered. Fig. 3 is a cross-section in line 3 3, Fig. 1.

Similar letters of reference indicate corresponding parts throughout the several views.

The external parts of the electrically-heated flat or sad iron, shown in the drawings as one of the uses to which my invention is applicable, consists, essentially, of a hollow body or shell A, having a bottom *a* and an upright wall *a'* around the margin of the bottom, a cover B for closing the top of the shell, and a handle C, secured to the upper side of the cover by a screw *c* or otherwise.

In constructing my improved electric heater the shell or body of the same is first lined on the inner vertical side of its walls with asbestos or other heat-insulating material D. The bottom of the shell is also covered with a protecting-sheet of mica *d* or similar waterproof non-plastic insulating material, so as to protect the bottom of the shell, which for economy is made of iron, against oxidation, which otherwise would be liable to occur on account of the moisture in the material which is subsequently placed in the shell above the mica protecting-sheet *d*. The mica protecting-sheet also increases the effectiveness of the insulation and prevents shocks when an alternating current of high voltage is used, while at the same time serving as a good conductor of heat to the under side of the sad-iron. A comparatively thin lower plastic layer or filling *e* of siloxicon mixed with gypsum or plaster-of-paris in a moist or plastic condition is next placed over the mica *d*. After this plastic mass *e* is thoroughly dry an electric conductor or resistance member *f* is placed upon the same in the form of a coil which is doubled repeatedly upon itself in zigzag fashion, so as so form a plurality of coil-sections which are arranged parallel and transversely in the shell and connect with each other, so that the current flows through the same in series.

The electric conductor preferably consists of a wire made of an alloy of copper and nickel, as this has proven to give the best results; but wire made of iron or other metal may also be employed, if desired. After the sections of the resistance or coil have been thus placed upon the lower filling or layer *e* the same are insulated from each other by strips *g*, of mica or other insulating material, which are placed transversely between the several coil-sections and extend from one side wall of the shell to the opposite one, as shown in Figs. 1 and 2. An upper layer or mass *h*, composed of siloxicon and plaster-of-paris or gypsum in dry powder form, is next placed over the coil-sections and the insulating-strips, so as to completely embed the same by entering the spaces between said parts and also covering the same. This layer is now moistened and gently packed, so that it is compact, and the same is then dried, forming a hard mass similar to that below the coil-sections and insulating-strips.

By placing insulating-strips between the several sections of the resistance-coil before the upper embedding layer *h* is applied to the coil the sections of the latter are prevented from coming in contact with each other between their ends, thus avoiding short-circuiting of parts of the coil and preventing reduction of its efficiency.

In assembling the parts of the heater the several coil-sections of the resistance or conductor are liable to twist and spring out of place, owing to the resilience of the coils. In order to hold them in place, the opposite

ends of the coil-sections are extended to the side walls of the shell, so as to engage the same. The insulating-strips *g* are fitted tightly in the shell between the coil-sections, so that each strip bears closely on its opposite sides against the sides of the adjacent coil-sections and at its opposite ends against the inner sides of the shell and at one end against the connection between the respective coil-sections, whereby the several sections of the resistance or conductor are reliably held in place while the filling of electric insulating and heat-conducting material is being placed in the shell.

It has been found in practice that the heat is radiated from the edge or marginal part of the shell faster than from the central part thereof. In order to maintain the under side of the iron or other surface to be heated at a uniform temperature, the windings of the resistance member are arranged closer together at the margin or side of the shell than in the central part of the same. For this purpose several of the sections at the opposite ends or extremities of the coil have their windings all arranged close together, while each of the remaining intermediate sections have the windings at their opposite ends arranged close together and those in their central part spread or separated a greater distance than their end windings, as shown in Figs. 2 and 3. It follows from this construction of the coil that the same when traversed by an electric current will develop more heat at the sides than in the center, thus compensating for the difference in radiation and maintaining the heating-surface at a uniform temperature all over.

Siloxicon is the name of a composition made in accordance with United States Letters Patent Nos. 722,792, 722,793, and 787,869. This material when mixed with gypsum or plaster-of-paris as a bond for use in forming the lower and upper layers *e h* produces a hard refractory block when dry which closely embeds the resistance member and is not liable to become carbonized or disintegrated under high temperatures. It further is perfectly waterproof and a non-conductor of electricity, but has the capacity of holding a large volume of heat and readily transmitting or conducting the same. The electric conductor inclosed by this composition is therefore protected against the destructive action of moisture, air, or other elements which would have a corroding or oxidizing effect on the conductor and which are effectually excluded from the same, thereby insuring long life to the heater. Over the block which is thus formed and which has embedded therein the heating-coil a filling or layer *i* of asbestos is placed which extends flush to the top of the shell, as shown in Figs. 1 and 3. By lining the inner side of the walls of the shell with a non-conductor of heat and placing a filling of like character over the heating-block containing the resistance the heat developed by the latter is prevented from radiating upwardly and laterally and is confined to the surface on the under side of the shell where the same is required.

A layer or sheet *j* of asbestos is preferably arranged between the under side of the cover and the top of the side walls *a'*, the asbestos lining D, and asbestos filling *i* to prevent transmission of heat from the shell to the cover and handle of the heater. The cover and shell may be detachably connected in any suitable manner, the means for this purpose (shown in the drawings) consisting of screws *k*, which have only a small heat-conducting capacity.

On the rear part of the handle the same is provided with a chamber L, which opens downwardly. Within this chamber an insulating-block M is secured to the top of the cover by a screw *m* or otherwise. This block is provided with two binding-screws *n n'*, which receive the terminals of the heating-coil and also the ends of the leading-in or current-supply wires *o o*. The terminal wires extend from the extremities of the coil upwardly through coinciding openings or passages *p p*, formed in the asbestos layers *i j*, cover B, and insulating-block M. The leading-in wires are inclosed by an insulating-covering forming a cable, which passes through an opening *q* in the upper rear part of the handle-chamber, said cable being wrapped by a spring-coil *q'* adjacent to the handle to prevent sharp bending of the same.

The chamber in the handle is preferably filled with asbestos *r* to insulate and also to prevent radiation of heat from the exposed electric conductors in the same.

I claim as my invention—

1. An electric heater comprising a shell, a plurality of resistance coil-sections arranged parallel side by side in said shell, insulating-strips arranged between said sections and each strip bearing on its opposite sides against the sections between which the same is arranged and at its opposite ends against the inner sides of the shell, and an electric insulating and heat-conducting filling arranged in the shell and completely embedding said coil-sections and strips, substantially as set forth.

2. An electric heater comprising a shell, a resistance composed of a plurality of coil-sections arranged parallel side by side in said shell and bearing at opposite ends against the opposite side walls of the shell and connected in series so as to form a zigzag-shaped conductor, insulating-strips each arranged lengthwise between two adjacent coil-sections and bearing on opposite sides against the sides of the coils which it separates and

at opposite ends against the side walls of the shell and at one end against that portion of the resistance which connects the coil-sections on opposite sides of the same, and a filling arranged in said shell and embedding said resistance and strip, substantially as set forth.

Witness my hand this 27th day of May, 1905.

ARTHUR N. ANDERSON.

Witnesses:
THEO. L. POPP,
E. M. GRAHAM.