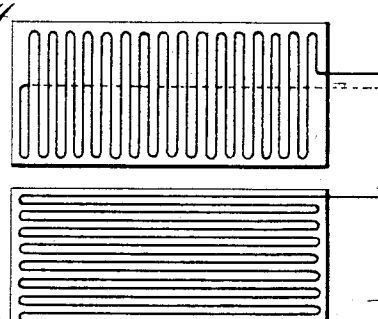
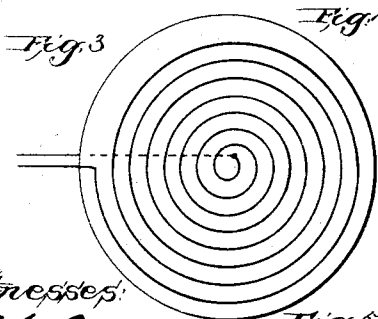
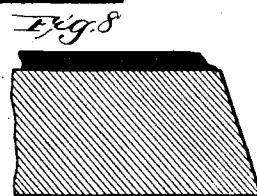
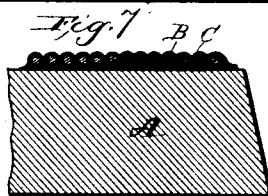
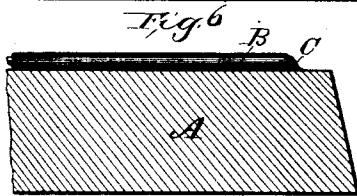
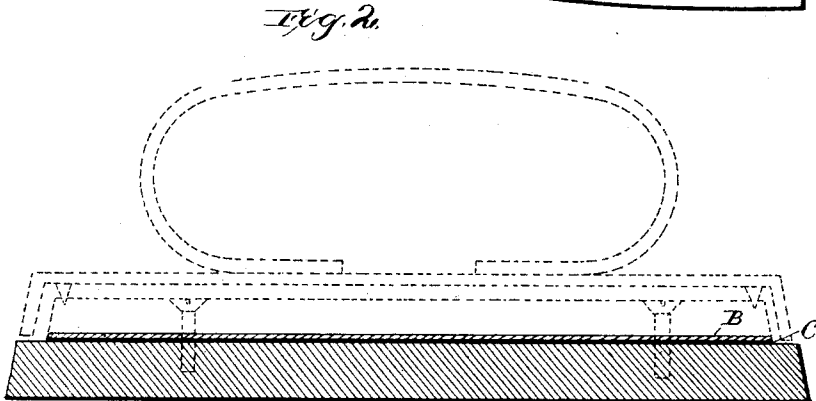
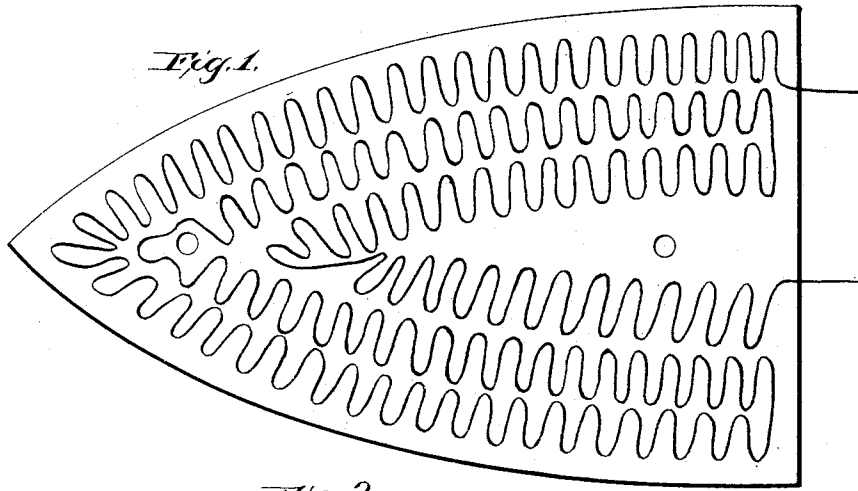


(No Model.)

C. E. CARPENTER.  
ELECTRO HEATING APPARATUS.

No. 447,023.

Patented Feb. 24, 1891.



Witnesses:  
*R. B. Coughlin*  
*W. H. Hartleman*

*Fig. 5.*  
Inventor:  
*Chas. E. Carpenter*  
*Elliott & Coughlin*  
Attys.

# UNITED STATES PATENT OFFICE.

CHARLES E. CARPENTER, OF MINNEAPOLIS, MINNESOTA.

## ELECTRO-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 447,023, dated February 24, 1891.

Application filed September 27, 1890. Serial No. 366,400. (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 Minneapolis, county of Hennepin, and State of Minnesota, have invented certain new and useful Improvements in Electro-Heating Apparatus, of which the following is a specification.

This invention relates to improvements in that class of electro-heating apparatus in which the heating effects of passing a current of electricity through a conductor of high resistance and small capacity is utilized for heating by conduction the surface-plate of the apparatus for use.

Prior to this invention the conductor, or, as it is more commonly designated, the "resistance," which must be insulated from the surface-plate, has usually been held in place either by being embedded in pulverized clay or a similar material, or attached to an asbestos card and confined against the plate under pressure, as in several patents heretofore granted to me, the object being to prevent short-circuiting and consequently fusion of the resistance, to confine the heat as much as possible to the plate to be heated, and to conduct the maximum quantity of heat to the plate. In all these prior forms of apparatus in carrying them in stock it is necessary to make the complete apparatus, because on account of their construction the parts are liable to displacement or loss.

The prime object of this invention is to have the resistance permanently attached to but insulated from the plate to be heated by an adhesive material, which will also withstand the heat to which it will be subjected in use without deterioration.

Another object is to have the adhesive material of such character that its coefficient of expansion will be substantially the same as both the plate and resistance, whereby fracture thereof, due to uneven expansion, will be avoided, and the resistance will at all times be held against displacement either by accident or otherwise.

These objects are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a plan view of a surface-plate of shape adapted for use, as a sad-

iron, showing the disposition thereon of a resistance of the reflex type; Fig. 2, a central longitudinal section therethrough, showing the relative disposition of the resistance and the adhesive insulating material; Figs. 3, 4, and 5, detail plan views of different forms of heated plates and resistances; and Figs. 6, 7, and 8, enlarged detail views more clearly illustrating the disposition and arrangement of the resistance and the adhesive insulating material.

Similar letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A indicates the plate to be heated, B the resistance, and C the adhesive insulating material for attaching the resistance to, and at the same time insulating it from, the plate. This adhesive insulating material I prefer should be the ordinary enamel, such as is applied to the surface of various metals, generally in a plastic condition, which, after being fused and cooled, coats the metal with a hard glazed surface similar in its nature to glass. There are many different methods of manufacturing and applying this enamel, glazing, or coating now known and practiced in the arts, and my invention is intended to comprehend all of them by which an enameled or enamel-like surface or coating can be obtained, and which will withstand the heat to which it will be subjected in the use of the apparatus, my invention not being limited in this respect to what may be commercially known as "enamel," or to any particular metal or substance of which the plate to be heated shall be composed, for this must be regulated by the character of the metal to which the different enamels may be applied, and by the relative coefficients of expansion of the metal of which the heated plate is composed.

In practice I have found the best results produced by first enameling the back of the plate and then laying the resistance upon this enamel, and applying a second or as many additional coats of enamel over the resistance as may be desirable, the first coat applied to the plate serving to insulate the resistance therefrom and also as a base for the application of the remaining coats, which secure the resistance to the plate. If the ad-

ditional coats over the resistance be thin, the finished surface will present a corrugated appearance, as illustrated in Fig. 7; but if a thick coating be applied, or a number of coats exceeding the height or thickness of the resistance, then the finished surface will be flat and smooth, as illustrated in Fig. 8, these details being a matter of choice in the manufacture and not affecting the operativeness of the apparatus. When completed, these plates may be stored or kept in stock in any convenient numbers, and the apparatus in which they are to be used need not be completed until it is desired for delivery or use. These plates may have any desirable form, either circular, square, rectangular, or of a shape suitable for a sad-iron, and may be of any suitable dimensions consistent with the character and uses of the apparatus, and, so, also, may the resistance be of any of the usual types, such as the reflex illustrated in Fig. 1, the spiral illustrated in Fig. 3, or the transverse or longitudinal, as illustrated in Figs. 4 and 5, respectively. The dotted lines in Fig. 2

illustrate the additional elements which I prefer to employ in completing the apparatus as a sad-iron, but which form no part of the present invention.

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

1. In an electro-heating apparatus, the combination, with the heated surface-plate and the resistance, of a coating of enamel or its equivalent securing the resistance to, but insulating it from, said plate, substantially as and for the purpose described.

2. In an electro-heating apparatus, the combination, with the plate to be heated and the resistance, of a coating of adhesive enamel or its equivalent for securing the resistance to, but insulating it from, said plate, substantially as described.

CHARLES E. CARPENTER.

Witnesses:

HENRY PRICE BALL,  
W. S. ANDREWS.