

C. E. CARPENTER.
METHOD OF MAKING ELECTRICAL HEATING APPARATUS.

APPLICATION FILED NOV. 20, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1,

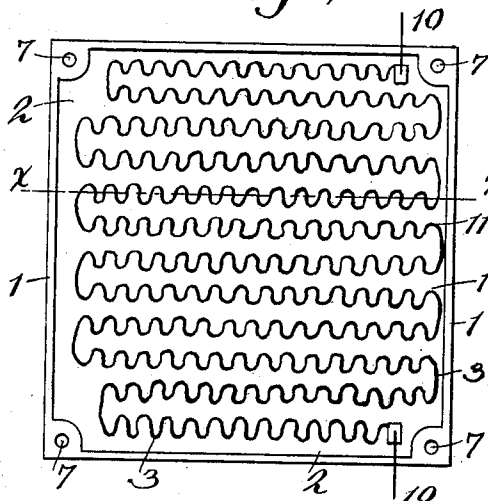


Fig. 5,

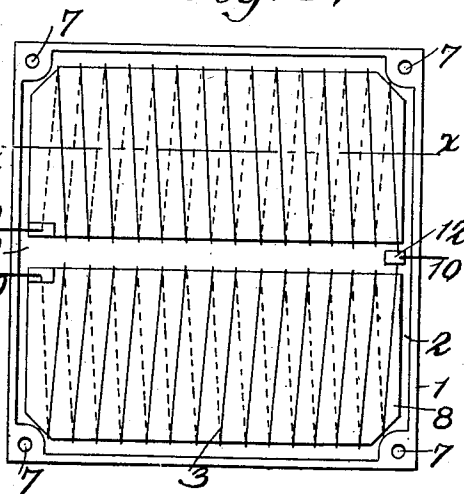


Fig. 2,

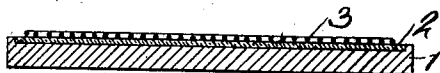


Fig. 6,

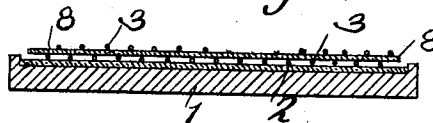


Fig. 3,

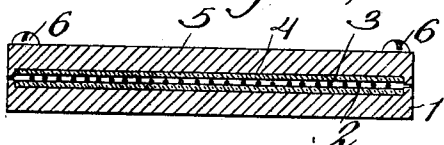


Fig. 7,

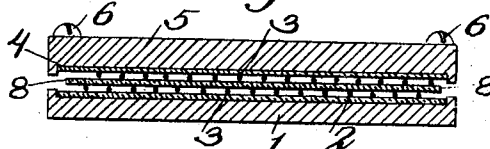


Fig. 4,

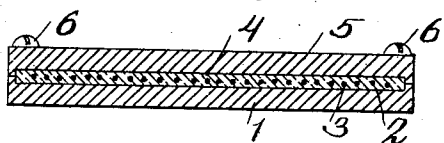
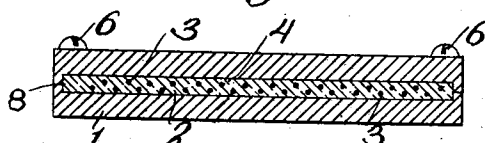


Fig. 8,



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No. 761,204.

PATENTED MAY 31, 1904.

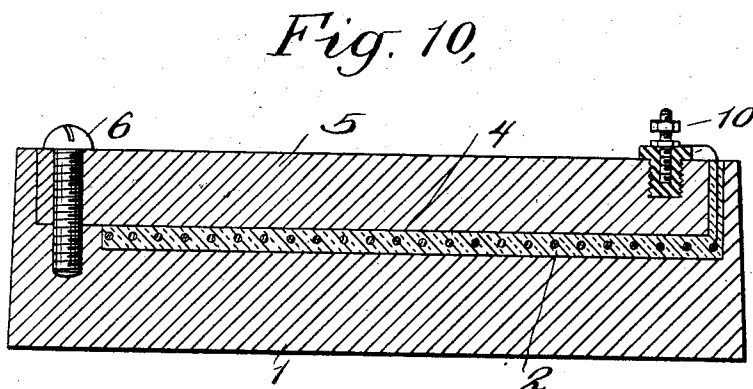
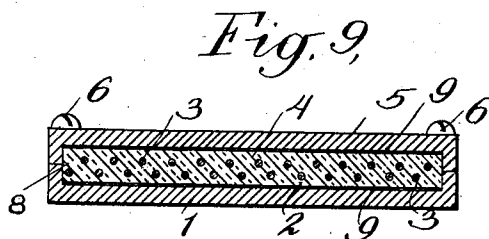
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UNITED STATES PATENT OFFICE.

CHARLES E. CARPENTER, OF NEW YORK, N. Y., ASSIGNOR TO CUTLER HAMMER MANUFACTURING COMPANY, A CORPORATION OF WISCONSIN.

METHOD OF MAKING ELECTRICAL HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 761,204, dated May 31, 1904.

Application filed November 20, 1902. Serial No. 132,098. (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 New York city, in the State of New York, have invented certain new and useful Improvements in Methods of Making Electrical Heating Apparatus, of which the following is a specification, reference being had to the accompanying drawings, which form a part hereof.

My invention relates to certain new and useful improvements in the method of making that class of apparatus in which the resistance or conductor is heated by the passage of an electric current and in which the heat is transmitted largely by conduction to an outer or surrounding shell, plate, or body which is in close mechanical relation to, but electrically insulated from, the resistance or conductor by suitable fireproof insulating material.

The object of my invention is to improve the construction of the apparatus generally, to make it simpler and more economical, to provide a very intimate mechanical contact between the conductor and the insulating material and between the insulating material and the plates or exterior shell of the apparatus, while at the same time thoroughly insulating the conductor from the plates, to hold the conductor and the insulating material firmly in place and to prevent their being broken or cracked or distorted, and to simplify the method of manufacture.

Another object of my invention is to incase or perfectly seal the resistance or conductor in a fireproof vitreous material and also to place the same with reference to the plate or plates to be heated so as to provide for the rapid conduction of heat through the insulation to the said plate or plates.

Another object is to protect the conductor or resistance mechanically, so that excessive flow of current through the same, such as would be produced by the overloads incurred in commercial service, shall not dislodge, fuse, or distort the resistance or conductor.

To this end my invention consists, first, in the method of making such apparatus by plac-

ing a suitable resistance or conductor on vitreous insulating material, heating the insulating material, and pressing it while hot between the plates which are to be heated in the heating apparatus, so as to form an intimate contact between the insulating material and the plates. In the best form of my invention the parts are then fastened together and allowed to cool in this condition.

My invention also consists in the method of making such apparatus by placing a suitable resistance between two layers of vitreous insulating material, then placing the layers of insulating material, with the resistance between them, between the plates of the heating apparatus, then heating the layers of insulating material or the entire device, so as to fuse these layers, and pressing the layers while heated or while in molten condition between the plates and around the resistance, so as to unite the layers and make intimate contact between all the parts. In the best form of my invention I use layers or plates of cold glass, such as ordinary window-glass, as my insulating material.

Another feature of my improved method consists in allowing the parts already mentioned to cool while securely fastened together and forcing the plates closer together from time to time as the insulating material cools and contracts.

My invention also consists in making the insulating material of a thin layer of vitreous material and in making it incase and protect the resistance, while at the same time insulating it from the plates, the insulating material being pressed between the plates while in a molten or hot state, so that it entirely fills the space between said plates and being cooled in said position in contact with said plates.

My invention also consists in so shaping the plates as to make them adapted to form a mold in which or between the parts of which the insulating material is pressed into shape, the insulating material being cooled in said mold under pressure and having as a result of this an intimate mechanical contact with the conductor or resistance as well as with the

plates and being held firmly in place against distortion or breakage.

My invention also consists in certain other steps and features hereinafter described and claimed.

My improved method is illustrated and my improved apparatus shown in the accompanying drawings, in which—

Figures 1 to 4 illustrate one form of my improved method of making such apparatus, Fig. 4 showing the completed apparatus thus produced. Figs. 5 to 8 show a modification of my improved method and apparatus. Figs. 9 and 10 show further modifications.

Referring to Figs. 1 to 4, 1 is a metal support or plate, preferably a sheet of cast-iron. A top or plan view of this plate is shown in Fig. 1, and Figs. 2, 3, and 4 show sectional views of the same on the line X X of Fig. 1. The plate 1 is provided with a recess, as shown, adapted to receive a sheet of ordinary window-glass 2. This sheet of ordinary window-glass is placed in the recess of plate 1, and then a resistance wire or conductor 3, preferably of the reflexed type, is laid over the surface of the sheet of glass 2, as illustrated in Fig. 1. A second sheet or layer of glass 4 is then placed on top of the conductor 3, as illustrated in Fig. 3, and then another metal plate 5 is placed on top of the sheet of glass 4, as shown in said figure. 6 represents screws or other fastening devices placed at the corners or in any suitable position and are adapted to screw into threaded holes 7 in the lower plate 1. By means of these screws the upper and lower plates are fastened or bound together, and thus the parts of the device are held firmly in place. The apparatus is then substantially in the condition shown in Fig. 3. In this condition the parts are then submitted to a high temperature sufficient to bring the glass to a molten or soft condition, and when in this condition the plates 1 and 5 are forced together by any suitable means, thus pressing the sheets of glass around the conductor 3 and causing the two layers of glass to unite and incase the interposed conductor. The glass fills up the space between the plates and between the different parts of the conductor and forms a thin homogeneous compact and solid layer of insulating material holding the conductor in place while insulating it from both plates and at the same time making intimate mechanical contact with both the conductor and the metal plates. The device is then cooled in this condition, and while being cooled the screws or other fastenings are tightened so as to hold the parts firmly together and maintain the intimate contact. The apparatus is then as shown in Fig. 4.

A modification of my invention is illustrated in Figs. 5 to 8, in which Fig. 5 is a top or plan view of the device with the upper metal plate and the upper glass plate removed, and Figs. 6, 7, and 8 are cross-sections on the line

xx of Fig. 5. In the method which is illustrated in these figures a third or interior sheet of glass 8 is employed, as clearly shown in Fig. 6, around which the resistance 3 is wound. The lower plate 1 is made in the same form as already explained, and a sheet of ordinary window-glass 2 is placed in the recess in said plate. The resistance-wire 3 is wound around the glass plate 8 and is then placed in position, as shown in Fig. 6. Then the upper sheet of glass is laid on top of the resistance and the upper metal plate placed on top of this and the parts secured together by means of fastenings, as represented in Fig. 7. The apparatus in this condition is then submitted to a temperature sufficient to soften the sheets of glass and the metal plates are pressed together while the glass is in this condition, as a result of which the glass is compressed around the resistance, so as to fill up completely the space between the metal plates and so as to form an apparatus such as is illustrated in Fig. 8.

In Fig. 9 I have illustrated another modification of my invention, in which a sheet of mica 9 or similar material is interposed between the vitreous insulating material and each of the metal plates. This does not materially affect the intimate mechanical contact between the insulating material and the plates, and if in any way the resistance-wire 3 should be displaced at any point in the insulating material, so as to lie close to the metal plate, the sheet of mica would still serve to insulate the resistance from that plate. In other words, the mica sheet would serve to prevent the grounding of the resistance-wire. In other respects the modification illustrated in Fig. 9 is exactly like that shown in Fig. 8.

In Fig. 10 I have shown another form of apparatus made in substantially the same way. In this case the lower metal plate 1 is made very thick and is provided with a deep recess into which the upper plate 5 is adapted to fit. This form of apparatus is very useful in an electric sad-iron, the flange of the plate 1 operating to prevent the influx of water into the resistance and insulation when, as often happens in the use of such sad-irons, they are dipped in water by operators to reduce their temperature. The inleading wires for making internal connections to the resistance may consist of any suitable metal of larger cross-section or better electrical conductivity than the resistance-conductor and may be brazed or firmly clamped in any suitable way to the same. These terminals, which are marked 10 in the drawings, may be of any convenient number, depending upon the character and the purpose of the apparatus. In Fig. 1 a pair of terminals 10 10 are shown coming out from the opposite corners of the plate; but terminals may also be placed at intervening points, such as 11 11.

In Fig. 5 the intervening glass plate 8 is

represented as being made in two parts, around which the resistance is separately wound, the two parts of the resistance being connected at 12. A terminal may be inserted at 12, if desired, as represented in this Fig. 5.

Heretofore in some types of heaters it has been deemed essential that the insulation should adhere to or become a part of the plate to be heated—as, for example, where porcelain enamel or glaze has been used. In my invention it is not essential that the glass adhere to the metal; but, on the contrary, it is better that it should not so adhere, and to accomplish this result I treat the surface of the iron or metal plates 1 and 5 before heating with a thin coat of graphite or powdered soapstone or powdered mica or similar material to prevent the adhesion of the glass to the metal during the process of manufacture, or, as already explained, I insert between the insulating material and the plates a sheet of mica or similar material, as illustrated in Fig. 9. As a result of this the apparatus can be more readily repaired or altered if it becomes necessary to insert another resistance while using the same plates, for the parts can be readily unscrewed or disconnected, and as the glass or insulating material does not adhere to the metal plates they can be taken apart and a new resistance and insulation substituted in the manner already explained.

The outer shell or casing or plate may consist of one or more pieces, which may vary in thickness and shape, as best suited to the requirements. For example, in an atmospheric heating apparatus the surface of the plates may be extended in corrugations for increasing the surface for dissipating heat, or in an electric sad-iron one of the plates may be comparatively thick, so as to form the ironing-surface or bottom of the iron, while the other plate would form the top of the iron.

By forming recesses in the plates and thereby providing flanges along their edges I prevent the overflow of the molten glass while it is under pressure and at a high temperature during the process of manufacture. In this way I also prevent the running or spreading of the glass when it is hot, which might destroy the resistance or cause its displacement and which might also thin out the insulation, especially at the edges. In this way, also, the glass is prevented from falling out around the edges of the apparatus in case of a fracture of the glass at these points due to heavy overloads in service or to rough usage or any other such cause.

It will be seen that in the apparatus so constructed the resistance-wire is not only completely sealed from the atmosphere, but a thin wall of highly electrical insulating material results, while at the same time the glass being pressed against the surface of the plates while molten makes intimate mechanical contact therewith, allowing of a ready conduction of

heat. Such an apparatus is very strong and very durable. It has been known to run in actual use for days at a temperature of at least 1,300° Fahrenheit without alteration of resistance or showing any weakness.

It is evident that two or more resistances, with or without intervening layers of metal, may be embraced between the outside casing or plates, according to requirements. It is also evident that instead of metal other material may be employed in certain cases to form the outside shell or plates. Also flat metal ribbon or even carbon may be employed as a resistance instead of wire.

What I claim as new, and desire to secure by Letters Patent, is—

1. The method of making an electrical resistance or heating apparatus which consists in placing a suitable resistance on vitreous insulating material, heating the insulating material, pressing it while hot between the plates to be heated in the completed apparatus so as to form an intimate contact between the insulating material and the resistance and the insulating material and the plates, substantially as described.

2. The method of making an electrical resistance or heating apparatus which consists in placing a suitable resistance on vitreous insulating material, heating the insulating material, pressing it while hot between the plates to be heated in the completed apparatus so as to form an intimate contact between the insulating material and the resistance and the insulating material and the plates, fastening the parts securely together, and allowing them to cool in this condition, substantially as described.

3. The method of making an electrical resistance or heating apparatus which consists in placing a suitable resistance between two layers of suitable vitreous insulating material, placing the layers of insulating material and the resistance between the plates of the apparatus, heating the layers of insulating material so as to fuse them and pressing them while hot between the plates and around the resistance so as to unite the layers and make intimate contact between the parts, substantially as described.

4. The method of making an electrical resistance or heating apparatus which consists in placing a suitable resistance between two layers of suitable vitreous insulating material, placing the layers of insulating material and the resistance between the plates of the heating apparatus, heating the layers of insulating material so as to fuse them and pressing them while hot between the plates and around the resistance so as to unite the layers and make intimate contact between the parts, fastening the parts securely together and allowing them to cool in this condition, substantially as described.

5. The method of making an electrical resist-

ance or heating apparatus which consists in placing a suitable resistance between two layers of cold glass, placing the layers of glass and the resistance between the plates of the heating apparatus, heating the device so as to fuse the layers of glass and cause them to unite, and pressing the glass while hot between the plates so as to press it around the resistance and make it completely incase the same and at the same time make intimate contact with the plates, substantially as described.

6. The method of making an electrical resistance or heating apparatus which consists in placing a suitable resistance between two layers of cold glass, placing the layers of glass and the resistance between the plates of the heating apparatus, heating the device so as to fuse the layers of glass and cause them to unite, and pressing the glass while hot between the plates so as to press it around the resistance and make it completely incase the same and at the same time make intimate contact with the plates, then allowing the device to cool in this condition, substantially as described.

7. The method of making an electrical resistance or heating apparatus which consists in placing a suitable resistance between two layers of cold glass, placing the layers of glass and the resistance between the plates of the heating apparatus, heating the device so as to fuse the layers of glass and cause them to unite, and pressing the glass while hot between the plates so as to press it around the resistance and make it completely incase the same and at the same time make intimate contact with the plates, then fastening the parts securely together and allowing them to cool in this condition, and forcing the plates closer together from time to time as the insulating materials cool, substantially as described.

8. The method of making an electrical resistance or heating apparatus which consists in providing one of the plates with a suitable recess to receive the insulating material, placing in this recess a layer of vitreous insulating material, laying a suitable resistance on top of said layer, placing a second layer of vitreous insulating material on top of the resistance, placing the second plate on top of the upper layer of insulating material, heating the device so as to fuse the insulating material, and pressing the plates together while the insulating material is hot, so as to press the insulating material around the resistance and cause

it to be in intimate contact therewith and at the same time to make the insulating material completely fill the recess in the lower plate and the space between the plates and thus be in intimate contact therewith, substantially as described.

9. The method of making an electrical resistance or heating apparatus which consists in placing a suitable resistance on vitreous insulating material, placing a sheet of mica or similar material on each side of the insulating material, placing the insulating material, the resistance and the sheets of mica between the plates of the apparatus, heating the insulating material and pressing the parts together while the insulating material is hot so as to form an intimate contact between the parts, substantially as described.

10. The method of making an electrical resistance or heating apparatus, which consists in winding a suitable resistance around a plate of glass or other vitreous substance, placing the resistance between two layers of suitable vitreous material, placing the layers of insulating material and the resistance between the plates of the apparatus, heating the device so as to fuse the insulating material, and pressing the insulating material while hot between the plates and around the resistance so as to unite the layers and make an intimate contact between the parts, substantially as described.

11. The method of making an electrical resistance or heating apparatus, which consists in winding a suitable resistance around a plate of glass or other vitreous substance, placing the resistance between two layers of suitable vitreous insulating material, placing the layers of insulating material and the resistance between the plates of the apparatus, heating the device so as to fuse the insulating material, and pressing the insulating material while hot between the plates and around the resistance so as to unite the layers and make an intimate contact between the parts, fastening the parts securely together and allowing them to cool in this condition, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES E. CARPENTER.

Witnesses:

WILLIAM J. DOLAN,
JOHN O. GEMPLER.