Aug. 7, 1923. 1,464,255

R. F. ZIMMERMANN

ELECTRICAL HEATING DEVICE

Filed July 14, 1922 2 Sheets-Sheet 1

Fig. 1.

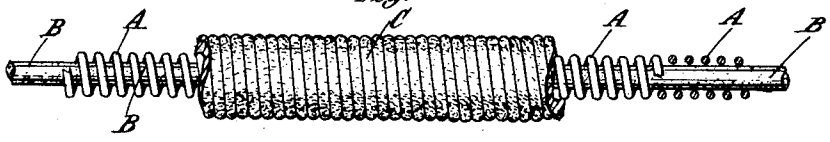


Fig. 2.

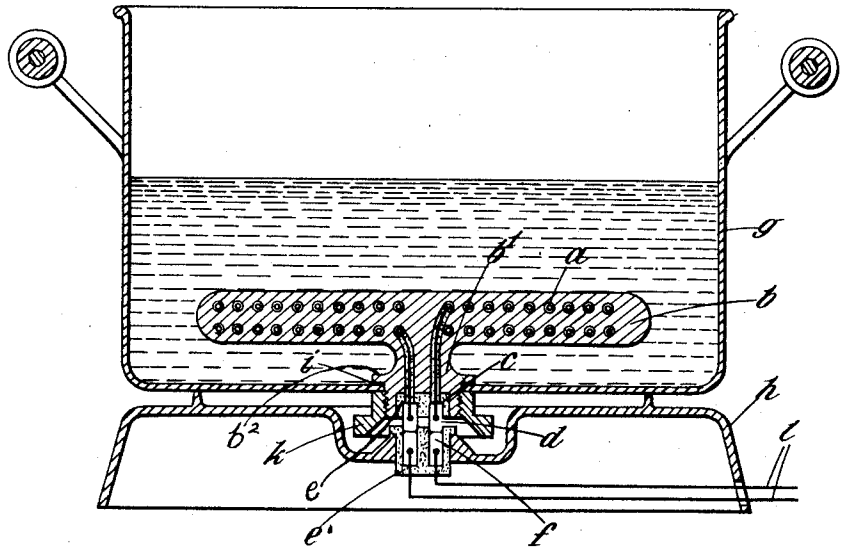
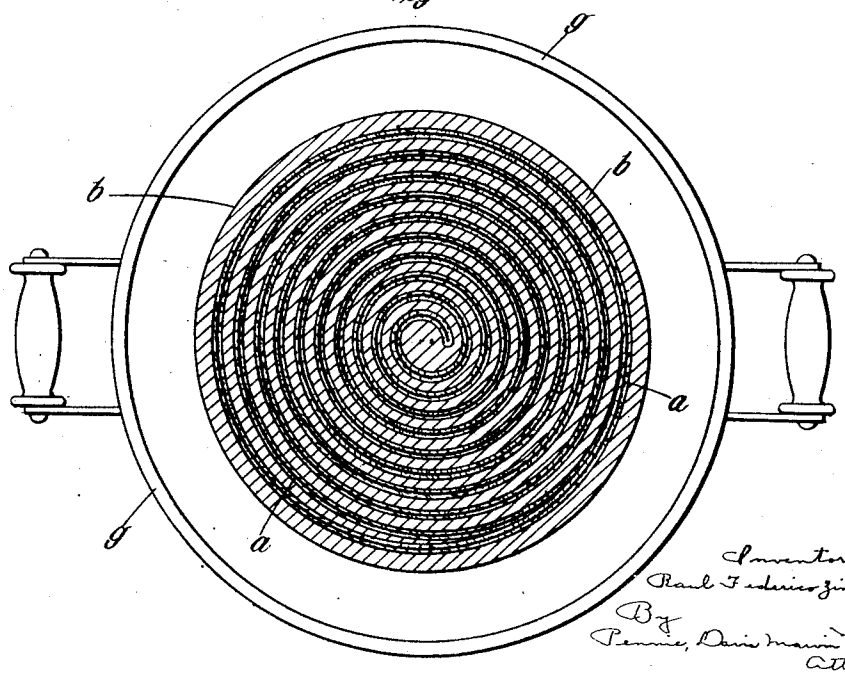


Fig. 3.



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ELECTRICAL HEATING DEVICE

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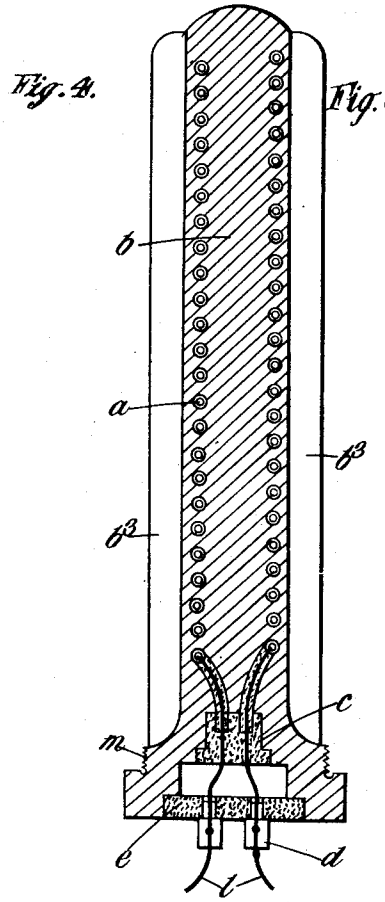
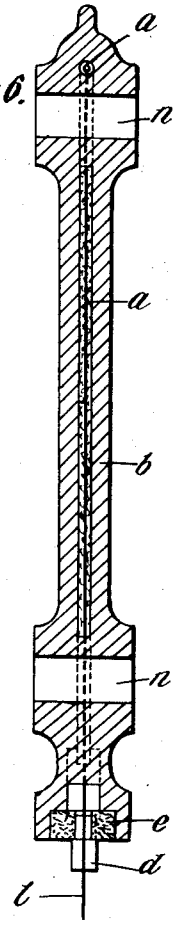
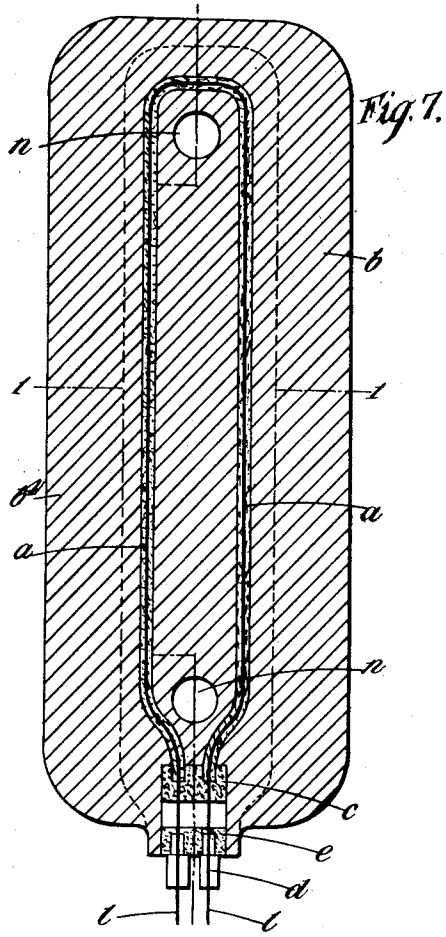






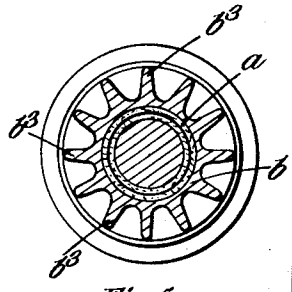


Fig. 5.

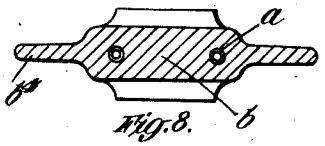
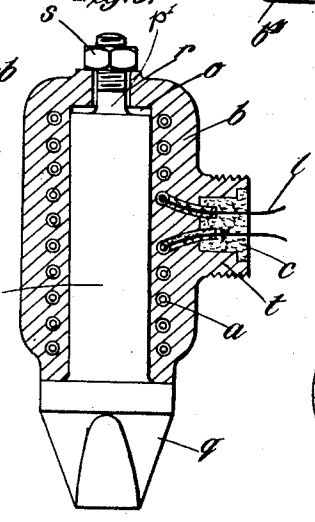


Fig. 8.



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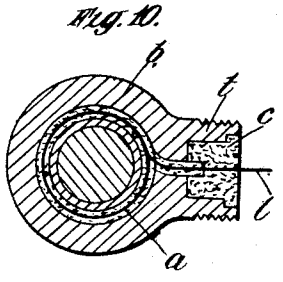

Patented Aug. 7, 1923. 1,464,255

UNITED STATES PATENT OFFICE.

RAUL FEDERICO ZIMMERMANN, OF BUENOS AIRES, ARGENTINA.

ELECTRICAL HEATING DEVICE.

Application filed July 14, 1922. Serial No. 574,890.

To all whom it may concern:

Be it known that I, RAUL FEDERICO ZIMMERMANN, a citizen of the Argentine Republic, residing at Calle Cangallo 456, Buenos Aires, Argentina, have invented certain new and useful Improvements in or Relating to Electrical Heating Devices, of which the following is a specification.

This invention has reference to electrical heating devices.

In accordance with the invention the electrical heating element comprises an electrical resistance wire wound spirally upon a dry calcinated non-fusible material such as asbestos fibre or core and covered with one or more layers of a dry calcinated non-fusible and electrically insulating material, which may also be asbestos fibre, the whole being embedded in cast aluminium or other suitable metal or alloy. In forming the heating element the resistance wire covered as described above may be embedded in or supported by sufficient metal to form a nucleus. An electrical current is then passed through the resistance wire in order to calcinate the asbestos and to neutralize its hygroscopic condition and the nucleus is then placed within a suitable mold and aluminium or other metal or alloy cast about it to produce an element or article of the desired shape, care being taken to permit the terminals of the wire to protrude. If the metal of the nucleus be the same as that subsequently cast about it the metal of the said nucleus will autogenously fuse and form a homogeneous mass.

A heating element produced in the manner described may be embodied in a variety of electrical cooking or heating utensils or devices.

For example the heating element may fit in or form part of a saucepan, kettle, or other cooking or heating utensil, in which case the covered resistance wire is in the form of a spiral and the metal within which it is embedded is of circular or other suitable shape adapted to be almost completely surrounded by the liquid to be heated. In an alternative form applicable chiefly to the heating of water or other liquid in comparatively large quantities the heating element is in the form of an elongated mass of metal having the covered resistance wire arranged so as to extend spirally throughout the major portion of the length of the metal, which to increase the radiating surface is preferably provided with ribs or vanes.

The invention may also be embodied in a radiator for heating rooms, buildings, and the like, in which case the heating element is in the form of a plate of metal of suitable shape in which the covered resistance wire is arranged in the form of a loop. Several of such plates may be employed to form the radiator, being connected together by bolts or other securing means passing through orifices formed in the upper and lower portions of the plates.

The invention may also be applied to a soldering iron, the heating element constituting the head of the soldering iron the covered resistance wire being spirally arranged in the metal which is hollowed out so as to provide a longitudinal cavity which extends centrally of the convolutions of the covered resistance wire, and provides a housing for the stem of the soldering bit.

In order that the said invention may be clearly understood and readily carried into effect I will now proceed to describe the same more fully with reference to the accompanying drawings in which:—

Figure 1 is a view showing the heating element,

Figure 2 is a vertical section and Figure 3 a plan partly in section showing the application of the heating element to a saucepan.

Figure 4 is a vertical section and Figure 5 a sectional plan showing the heating element embodied in a device for heating relatively large bodies of water or other liquids.

Figures 6, 7 and 8 illustrate the application of the heating element to a radiator for rooms, buildings and the like, Figures 6 and 7 being respectively an end elevation and a front sectional elevation, and Figure 8 a section on the line A—B of Figure 7.

Figures 9 and 10 are respectively a sectional elevation and a sectional plan showing the application of the heating element to a soldering iron.

The electrical heating element consists of a resistance wire A, of chrome nickel for instance, wound spirally upon a strip or cord B, of a non-fusible material such as asbestos fibre, a layer or layers C, of a non-fusible and electrically insulating material, which preferably is also asbestos fibre, being wrapped or wound around the same, and

the whole embedded in cast aluminium or other suitable metal or alloy of a suitable shape for the purpose in view. In some cases the covered resistance wire is first supported or embedded by or in sufficient metal to form a nucleus and an electrical current is then passed through the resistance wire to calcinate the asbestos or the like and to neutralize its hygroscopic character, and aluminium or other metal or alloy is cast about the nucleus while in a suitable mold to produce an article or element of the desired shape. This step of first forming a nucleus may however in some circumstances be dispensed with and the requisite amount of metal to form the article or element may be cast about the covered resistance wire in one operation.

Figures 2 and 3 illustrate the adaptation of the heating element to a saucepan or cooker, for domestic use for example. The covered resistance wire *a* in this case is embedded in a circular mass of metal *b* in the form of a disc, which may be formed by first arranging the covered wire *a* about a central core of aluminium and after calcinating the asbestos as above described casting aluminium about it, when a homogeneous mass of aluminium with the covered wire embedded therein will be formed. The disc *b* is formed or provided with an exteriorly threaded boss *b'* which may fit within an orifice formed in the bottom of the cooking utensil *g* so that the disc *b* is located therein in such a way as to be immersed in the water or other liquid in the vessel in such manner as to be almost completely surrounded by the water not only at the top and sides but also at the bottom. The disc *b* is held firmly in position by a nut *k* threaded upon the said boss *b'*. Preferably the latter is formed with a shouldered portion b^2 adapted to be drawn downwardly on to the inner surface of the bottom of the vessel surrounding the orifice, a washer *i* being interposed to ensure fluid tightness. The terminals *d* of the resistance wire pass through and project from the said boss, the orifice through which they project being sealed hermetically with a suitable insulating material *e*. The terminals *d* may if desired be connected directly with a source of electrical current but preferably a stand or base *h* is provided upon which the vessel is supported, the said stand having centrally thereof the terminals *f* of conductors *l* leading from a source of electrical current in such manner that when the vessel is placed upon the stand the terminals *d* thereof contact with the terminals *f* of the stand and establish the circuit. The stand or base *h* is recessed as shown to accommodate the nut *k* securing the heating element in the vessel *g* and the terminals *f* are insulated from the stand by insulating material *e'*. This construction provides a very efficient cooking utensil in which as there is no direct contact between the electrical current and the liquid in the vessel there is no possibility of decomposition of the liquid by electrolysis while as the metal which is heated by the current is immersed in the liquid in the vessel practically the whole of the electrical energy is utilized for heating and cooking purposes.

Figures 4 and 5 show an alternative form applicable chiefly to the heating of water or other liquid in comparatively large quantities the covered resistance wire *a* being embedded within an elongated mass of metal *b*, the covered resistance wire *a*, being arranged so as to extend spirally throughout the major portion of the length of the metal which to increase the radiating surface is shown as provided with ribs or vanes b^3. At one end the diameter of the metal body is increased and is exteriorly threaded as indicated by *m* so that it may be screwed into an orifice in a wall of the tank or other receptacle with the terminals *d* of the resistance wire extending through the said orifice so as to be connected with the source of electric supply, fluid tightness being obtained, as in the example given above, by means of suitable insulating and sealing material *e'* surrounding the protruding ends of the wire.

In Figures 6 and 7 the heating element *a* is shown embodied in a radiator for heating rooms, buildings and the like. The covered resistance wire *a* is embedded, in the form of a loop, in a plate of metal *b* of suitable shape the ends of the resistance wire projecting from one end thereof, a recess or cavity being provided in said plate and filled with a suitable sealing and insulating material *e'* as in the other examples. Preferably several of such plates are employed to form the radiator and are connected together by bolts or other securing means passing through orifices *n* formed in the upper and lower portions of the plates. A radiator of any desired size and heating capacity can therefore be obtained by securing together as many plates as are necessary. The plates *b* are shown as being provided with integral ribs b^4 to increase the radiating surface.

The invention is shown in Figures 9 and 10 as applied to a soldering iron, the covered resistance wire *a* being arranged spirally and embedded within a mass of metal *b* constituting the head of the soldering iron the metal being hollowed out so as to provide a longitudinal cavity *o* which extends centrally of the convolutions of the wire and provides a housing for the stem *p* of the soldering bit *q*. The said stem *p* has a reduced upper portion *p'* extending through an orifice or passageway *r* communicating with the cavity *o* and is secured in position by means of a nut *a* threaded on the said reduced portion. The ends *e* of the re-

sistance wire project through one side of the head or may if desired be carried through a hollow handle or shaft of the tool which handle may be screwed to a boss *t* formed on the head, the said boss being recessed as shown to accommodate the sealing and insulating material.

The term "heating device" hereinafter appearing in the claims is used in its broadest sense, and is intended to include cooking utensils, heating tools, radiators, or any other form of heater.

What I claim and desire to secure by Letters Patent of the United States is:—

1. The method of making an electrical heating element consisting in winding an electrical resistance wire on a core of insulating material, covering the winding of electrical resistance wire with insulating material, calcining the insulating material by passing an electrical current through the resistance wire and embedding the resistance wire with its covering and core of calcined insulating material by casting metal around the same.

2. An electrical heating element embodying an electrical resistance wire spirally arranged on and covered with dry calcined insulating material and embedded in metal cast thereon, the insulating material being calcined by an electric current passed through the resistance wire before casting the metal thereon.

3. An electrical heating element embodying an electrical resistance wire spirally arranged on and covered with dry calcined asbestos embedded in a casting of aluminum.

4. An electrical heating element embodying an electrical resistance wire spirally arranged in and covered with dry calcined insulating material embedded in the form of a spiral in a casting of metal.

5. An electrical heating element embodying an electrical resistance wire spirally arranged in and covered with dry calcined insulating material embedded in the form of a spiral in a casting of metal provided with screw threads for attachment to a support.

6. An electrical heating element embodying an electrical resistance wire spirally arranged in and covered with dry calcined insulating material embedded in the form of a spiral in a casting of metal provided with screw threads for attachment to a support and with ribs for increasing the heating surface.

7. A heating device comprising an electrical heating element embodying an electrical resistance wire spirally arranged on and covered with dry calcined insulating material embedded in a casting of metal, the covered resistance wire being spirally arranged and embedded within a circular shaped mass of metal fitted within the device.

8. A soldering iron having a head of cast metal in which is embedded an electrical heating element embodying an electrical resistance wire spirally arranged on and covered with dry calcined insulating material embedded in a casting of metal, the said head being fitted with the stem of a soldering bit which is secured in position by a nut engaging with the said stem.

RAUL FEDERICO ZIMMERMANN.