L. W. CHUBB.

ELECTRIC HEATING ELEMENT.

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1,360,267. Patented Nov. 30, 1920.

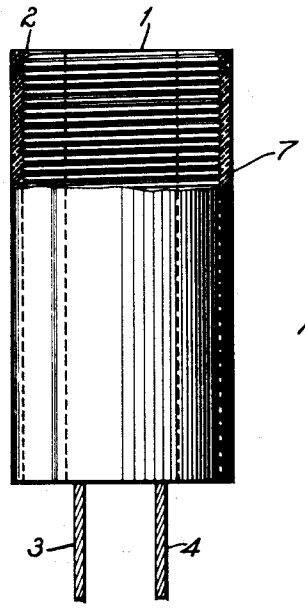


Fig. 1.

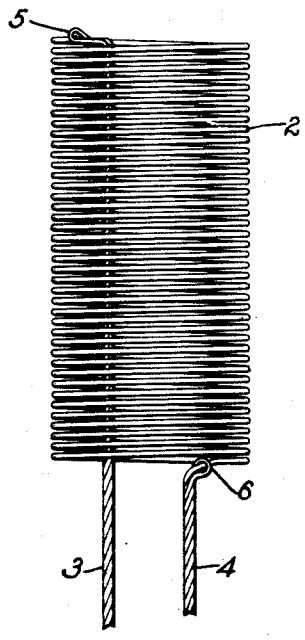


Fig. 2.

WITNESSES:

R. J. Fitzgerald.

R. D. Brown

INVENTOR

Lewis W. Chubb.

BY

Wesley G. Carr

ATTORNEY

UNITED STATES PATENT OFFICE.

LEWIS W. CHUBB, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRIC HEATING ELEMENT.

1,360,267. Specification of Letters Patent. Patented Nov. 30, 1920.

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To all whom it may concern:

Be it known that I, LEWIS W. CHUBB, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electric Heating Elements, of which the following is a specification.

My invention relates to resistance elements for use in electric heating apparatus and the like, and it has for its object to provide a simple, reliable and inexpensive heating element which shall possess great durability in service but which shall not require the use of considerable amounts of expensive resistance material.

In the accompanying drawing, Figure 1 is an enlarged side elevational view, with parts broken away and shown in section, of one form of resistance element constructed in accordance with my invention, and Fig. 2 is a side elevational view of the resistance conductor and terminal attachments forming a part of the structure shown in Fig. 1.

In electric percolators, sad irons and other heating apparatus in which the resistance conductors must be operated at high temperatures for considerable periods, it is important that the resistance material be of a non-oxidizing character, since, otherwise, the heating element will rapidly deteriorate in use. To this end, it has been customary to make use of resistance material which is inherently durable and resistant to oxidation at the high temperatures at which electric heating apparatus is operated. The materials which are available for this purpose, such as the well-known alloys containing nickel and chromium, are relatively expensive, and it is my purpose to avoid the use of such materials, either wholly or in part.

In carrying out my invention, I make use of a resistance material which need not be particularly resistant to oxidation and I protect the resistance element from access of air by means of cementitious substance such as a protective coating of cement, enamel and the like. To the ends of the resistance conductor, I attach terminal conductors by welding or otherwise, such terminal conductors being preferably of an inherently durable material so that they may be left exposed to the air without damage. The same general result may be obtained by making the terminals of a material which is like or similar to that of the main resistance conductor but of a sufficiently large cross-sectional area to reduce the temperature of the terminals during the operation of the device below the point at which harmful oxidation takes place. Still another arrangement for reducing the temperature of the exposed terminals and permitting the use of terminals composed of relatively oxidizable metal consist in bringing out the terminals at such a distance from the highly heated portion of the apparatus that they are comparatively cool and therefore will not oxidize harmfully. This arrangement may be employed for example in immersion heaters and other heating devices having handles through which the terminal wires may be led.

The accompanying drawing illustrates a heating element adapted for use in electric percolators, the parts being considerably enlarged for the sake of clearness. The heating element, as shown, consists of a hollow spool or core 1, of lava or other suitable insulating material, having a screw thread formed upon its outer surface to receive a helical coil of resistance wire 2 which is wound upon the spool 1 from end to end. Terminal conductors 3 and 4 are attached, respectively, to the ends 5 and 6 of the coil 2, the terminal 3 being suitably passed through an opening in the spool 1 and extending downward within the spool. The terminals may conveniently be electropercussively welded to the ends of the coil 2, although any other suitable method of attachment may be employed.

Completely surrounding the coil 2 is a protective air-excluding coating 7 of cement, enamel or the like. This cement or enamel may be of any suitable nature, the essential requirements being that none of its ingredi-

ents shall chemically attack the material composing the resistance coil and that it shall be a good conductor of heat.

I have produced satisfactory resistance elements in accordance with my present invention by making the coil 2 of nickel-steel and the terminals 3 and 4 of nickel-chromium alloy, cobalt-chromium alloy, nickel-chromium-iron alloy or the like. I have found that nickel-steel or other relatively oxidizable ferrous alloy may also be used for the terminals, provided such terminals are made of sufficient thickness to avoid overheating and consequent oxidation during the operation of the device.

It is to be understood that the specific materials to which I have referred are mentioned only by way of illustration and that many other materials and many forms of apparatus other than those which I have shown and described may be employed without exceeding the limits of my invention or the scope of the appended claims.

I claim as my invention:

1. A resistance device for electric heating apparatus and the like comprising a resistance conductor of oxidizable material protected from access of air and terminal conductors secured thereto and having exposed surfaces composed of a material that is highly durable when heated in the air.

2. A resistance device for electric heating apparatus and the like comprising a resistance conductor of oxidizable material protected from access of air, and terminal conductors united to the ends of said resistance conductor and having exposed surfaces composed of a material that is more highly durable when heated in the air than said oxidizable conductor.

3. A resistance device for electric heating apparatus and the like comprising a support of electrical insulating material, a resistance conductor on the exterior of said support composed of a material that is oxidizable when heated in air, a coating of an electrical-insulating heat-conducting substance covering the resistance conductor to protect the same from access of air, and terminal conductors united to the resistance conductor consisting of a material that is less readily oxidizable when heated in air than the material of said resistance conductor.

4. A resistance device for electric heating apparatus and the like comprising a resistance conductor of ferrous metal, the said resistance conductor being protected from access of air and being provided with terminal conductors having exposed surfaces of a material that is highly durable when heated in the air.

5. A resistance device for electric heating apparatus and the like comprising a resistance conductor embedded in an air-excluding coating, and terminal conductors secured thereto and consisting of a material having higher durability when heated in the air than the material composing said resistance conductor.

6. A resistance device for electric heating apparatus and the like comprising a resistance conductor carried upon an insulating support and covered by an air-excluding coating, and terminal conductors secured to the said resistance conductor and consisting of a material having high durability when heated in the air and having a composition differing from that of the resistance conductor.

7. A resistance device for electric heating apparatus and the like comprising a resistance conductor of ferrous metal carried upon an insulating support and protected from access of air by means of a coating of cement, or the like, and terminal conductors secured to the said resistance conductor and consisting of a material having a higher durability when heated in the air than that of the ferrous metal comprising said resistance conductor.

8. A resistance device for electric heating apparatus and the like comprising a support of electrical insulating material, a resistance conductor mounted on the exterior of said support composed of a material that is oxidizable when heated in air, a coating of an electrical-insulating heat-conducting cementitious substance covering the exterior of said support and the resistance conductor thereon to protect the same from access of air, and terminal conductors united to the resistance conductor consisting of a material that is less readily oxidizable when heated in air than the material of said resistance conductor.

9. A resistance device for electrical heating apparatus and the like comprising a hollow support of electrical insulating material having a spiral groove in its exterior surface, a resistance conductor wound in said groove composed of a material that is oxidizable when heated in air, a coating of an electrical-insulating heat-conducting cementitious substance covering the exterior of said support, said groove and the resistance conductor in the groove to protect said conductor from access of air, and terminal conductors united to the ends of the resistance conductor consisting of a material that is less readily oxidizable when heated in air than the material composing said resistance conductor.

10. A resistance device for electric heating apparatus and the like comprising a resistance conductor of ferrous metal carried upon an insulating support and protected from access of air by means of a coating of a cementitious substance and terminal conductors secured to the said resistance con-

ductor and consisting of an oxidation-resistant alloy containing chromium and a metal of the nickel-cobalt type.

11. A resistance device for electric heating apparatus and the like comprising an externally threaded spool of insulating material, a wire of ferrous metal wound thereon and protected from access of air by means of a coating of cement or the like, and terminal conductors welded to the said resistance conductor and consisting of an oxidation-resistant alloy containing chromium and a metal of the nickel-cobalt type.

In testimony whereof, I have hereunto subscribed my name this 28th day of August, 1916.

LEWIS W. CHUBB.