

No. 786,257.

PATENTED APR. 4, 1905.

M. C. BEEBE.

ELECTRIC HEATER AND METHOD OF MANUFACTURING SAME.

APPLICATION FILED MAY 14, 1900.



Fig. 1.

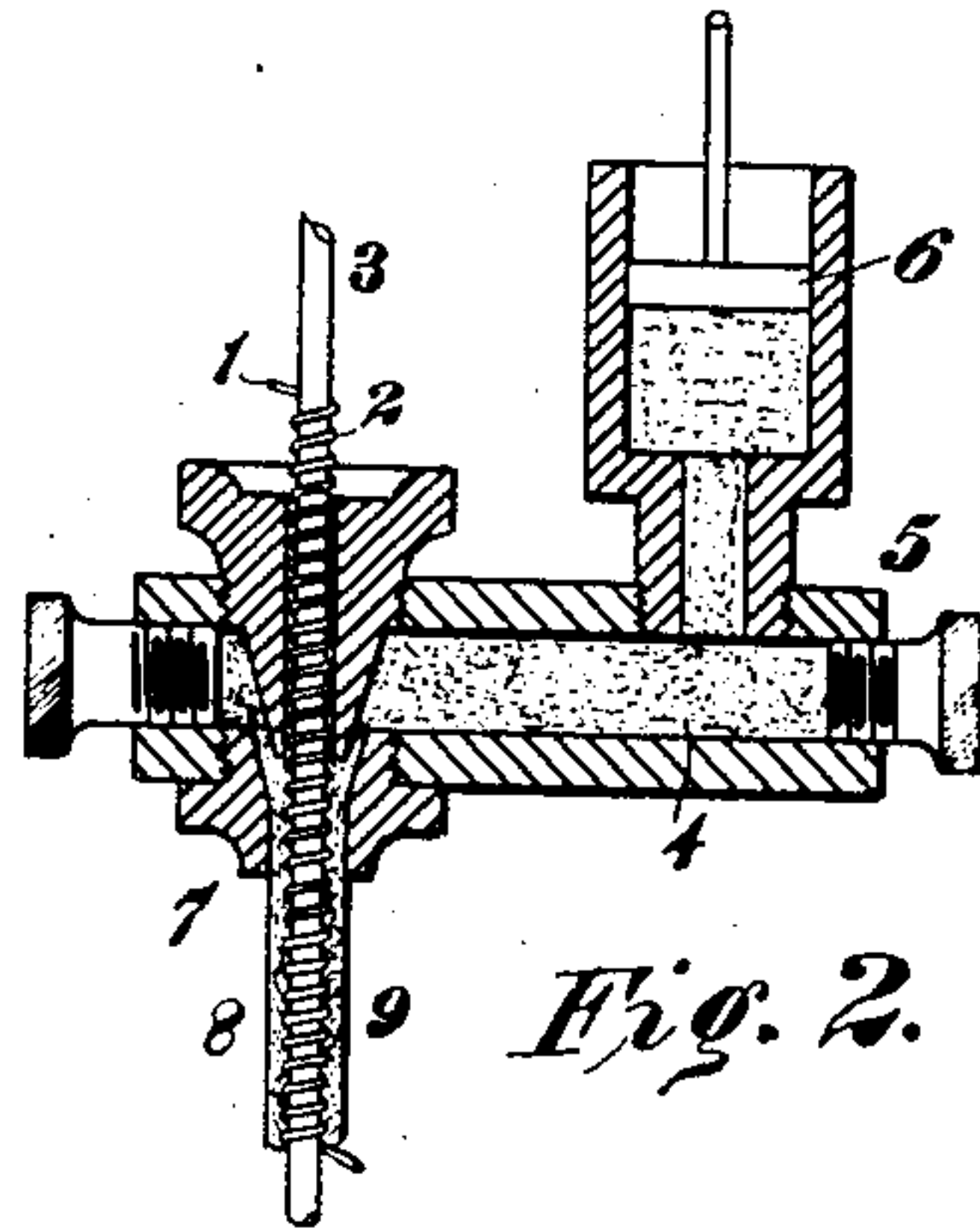


Fig. 2.

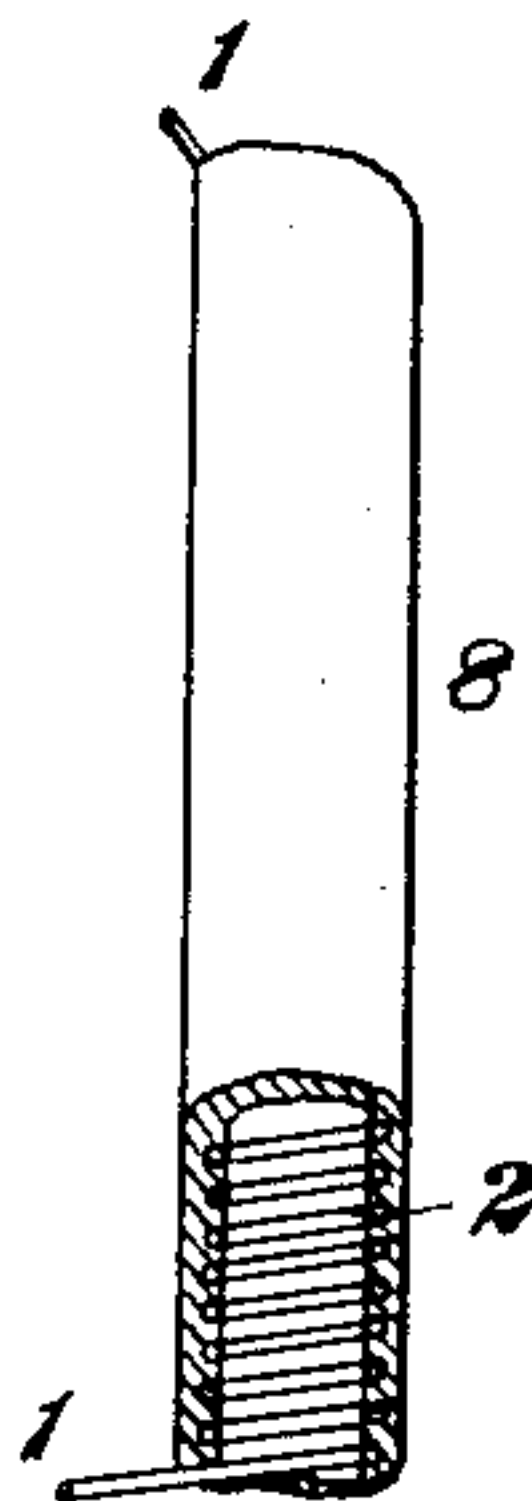


Fig. 3.

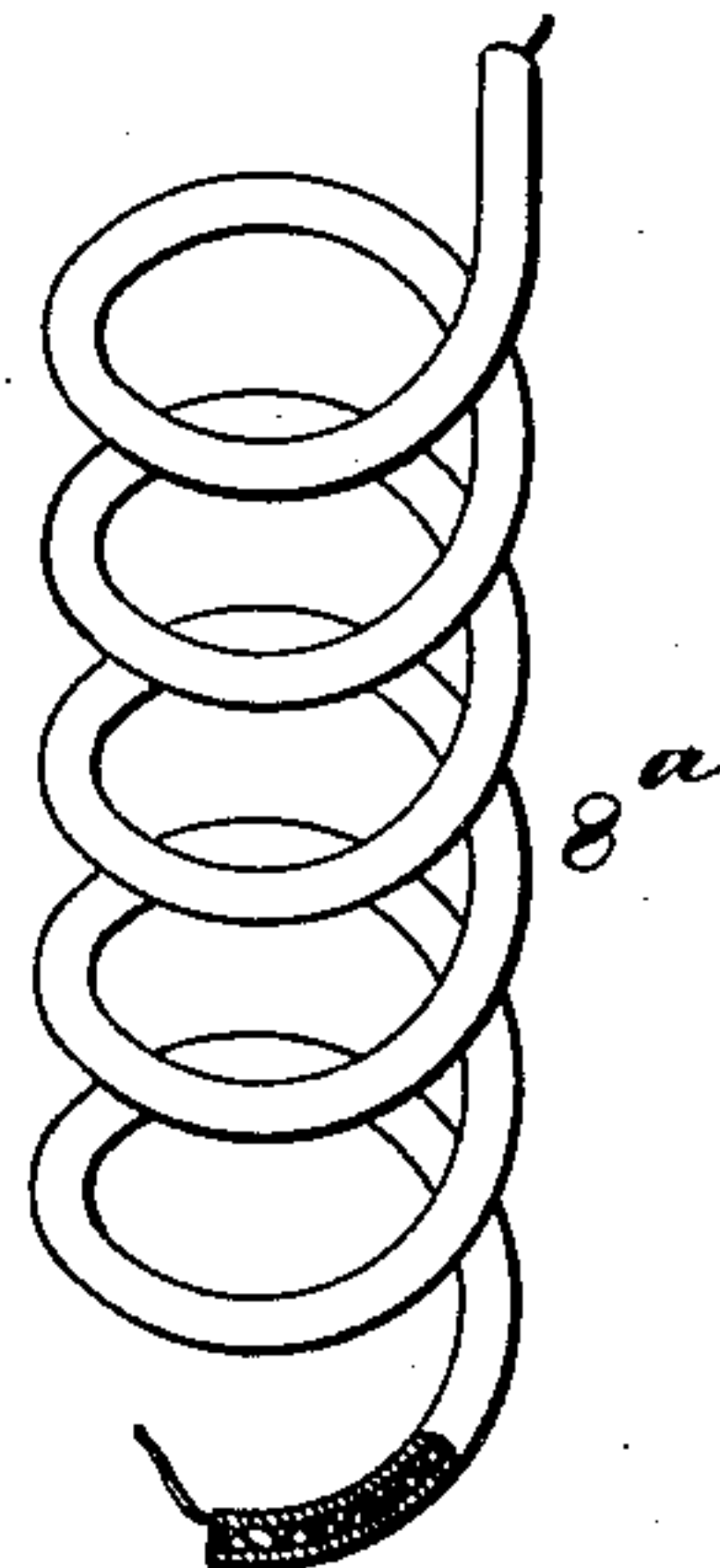


Fig. 4.

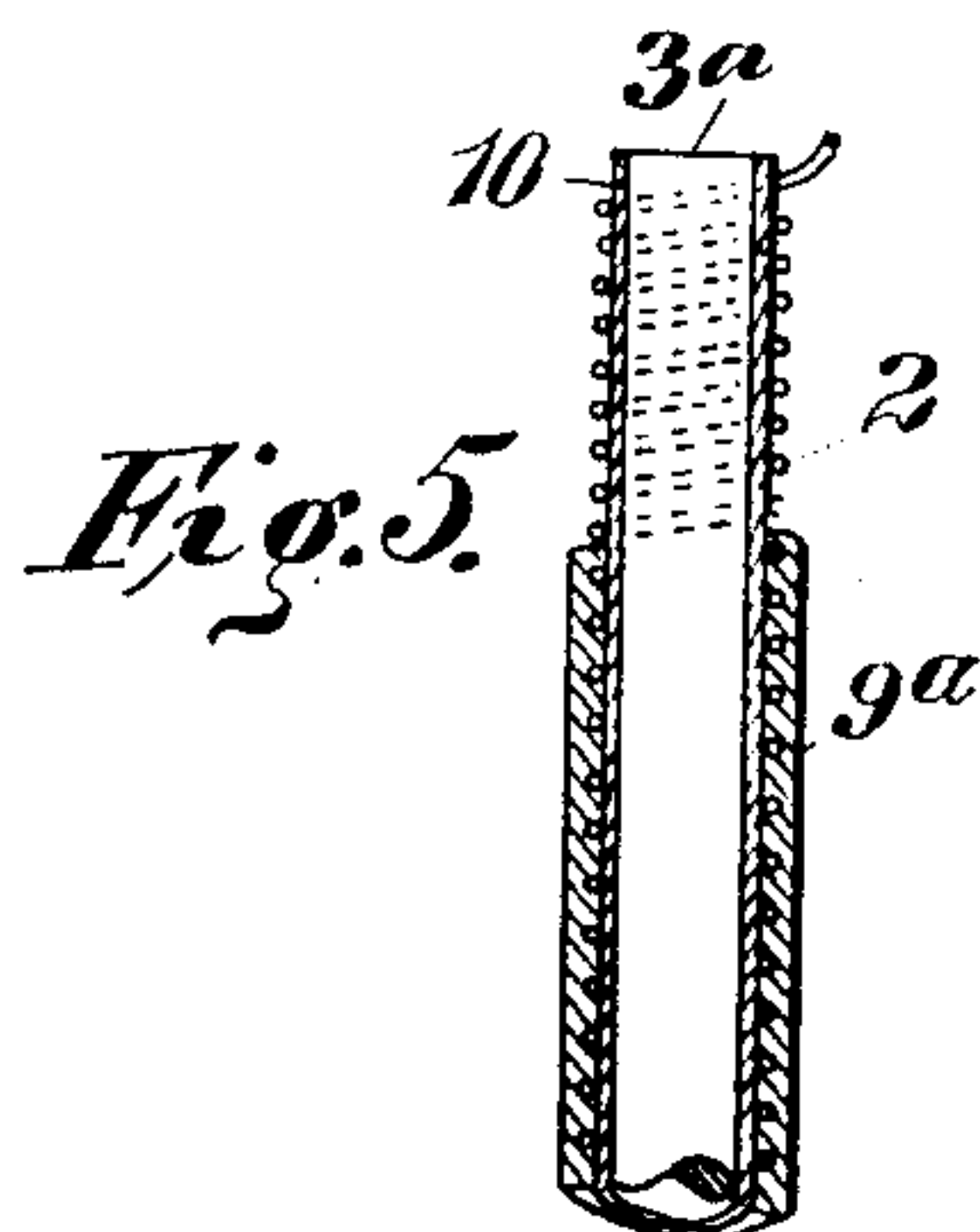


Fig. 5.

WITNESSES:

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ELECTRIC HEATER AND METHOD OF MANUFACTURING SAME.

SPECIFICATION forming part of Letters Patent No. 786,257, dated April 4, 1905.

Application filed May 14, 1900. Serial No. 16,601.

To all whom it may concern:

Be it known that I, MURRAY C. BEEBE, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electric Heaters and Methods of Manufacturing the Same, of which the following is a specification.

My invention relates to electric heaters, and it has particular reference to the heaters employed in electric lamps of the Nernst type and to methods of manufacturing such heaters; but it is not necessarily restricted to use in lamps.

The object of my invention is to provide an electric heater which shall be more durable than those heretofore employed and one in which the conductor shall be effectively protected from contact with other devices and apparatus in connection with which it is used.

A further object of the invention is to provide a simple and inexpensive method of manufacturing electric heaters for use in connection with Nernst lamps or in any other relations in which said devices may be found useful and desirable.

With these ends in view I have devised a heater, a method of manufacture, and an apparatus for use in such manufacture, illustrations of which may be found in the accompanying drawings, in which—

Figure 1 illustrates the first step in the method of manufacture; Fig. 2, the second step in the manufacture and a sectional view of portions of an apparatus suitable for practicing this portion of the method; Fig. 3, a view, on an enlarged scale and partially in side elevation and partially in section, of one form of a completed heater; Fig. 4, a perspective view, partially in section, of another form of completed heater; and Fig. 5, a sectional view of a partially-formed heater constructed in accordance with a modified method.

It has been a usual practice in constructing heaters for Nernst lamps to wind the heater-wire around a non-conducting core which served as a permanent support for the wire. In heaters of this construction the high temperature to which they were subjected in use

often caused a shrinkage of the non-conducting core, which not only exposed the conducting-wire to the air, but in many cases left the turns, or some of them, free from the support, so that they would not maintain their proper relative positions and if moved into contact with each other would establish short-circuits, and thus materially shorten the life of the heater.

My invention overcomes such difficulties, as will hereinafter appear.

In practicing my invention I wind a flexible wire 1, of suitable conducting metal—such, for example, as platinum—and of suitable gage, in a helical coil 2 about a body 3 of such form and dimensions as will give to the coil the desired contour. This body 3 may be a string of any organic material that is readily destroyed when subjected to a high temperature, or it may be otherwise susceptible of removal when the proper period in the process of manufacture is reached. While the body 3 and the wire 1 are each shown of circular cross-section, it will be understood that either of these parts may have any other form in cross-section that may be found useful and desirable in practice. Having wound the desired length of core 3 with a helix 2, I force the combined helix and core, together with a body of plastic material 4, through a suitable press 5, a piston 6 being shown as employed for forcing the plastic material out through the aperture 7 at one side of the press. The product of this operation is a string or rod 8, having a sheath or envelop 9, of non-conducting and incombustible material, in the interior of which the coil 2 and its core are firmly embedded. I now subject the rod 8 to a high temperature in a suitable oven or furnace, which serves to harden the envelop and to destroy the core, provided it is formed of combustible material. This leaves the heater in the form indicated in Fig. 3 and suitable for use. Any shrinkage of the non-conducting material in which the wire helix is embedded will obviously serve to bind the helix more closely in position, and at the same time the latter is entirely protected from contact with any other part of the apparatus in con-

nection with which it is used, contact with which might produce injury either to the heater or to the part with which it should come in contact.

5 In case a heater of different form from that shown in Fig. 3 is desired the rod 8 may be bent into the desired form while the envelop is in plastic condition and before it is sub-
10 jected to heat to harden the envelop and destroy the core. A heater 8^a, bent into spiral or helical form prior to being baked, is shown in Fig. 4 of the drawings.

In case a heater having a straight-line axis or one having an axis in the form of a por-
15 tion of the circumference of a circle is desired a core of metal or other incombustible material may be utilized in the manufacture. In Fig. 5 I have shown a metal core 3^a, provided with a coating 10 of wax or similar
20 material, around which the coil 2 is formed. After the envelop 9^a, of refractory material, is applied the application of heat to harden the envelop will soften the wax, and thus permit the ready withdrawal of the core. Whatever
25 may be the final form of the heater, it will be understood that terminal wires may be attached to the ends of the heater-coil by means of solder or otherwise.

I desire it to be distinctly understood that
30 my invention is not limited to the employment of cores having any specific characteristics or to any specific method of removing them. In fact, it may sometimes be found desirable to employ a core of such form and
35 composition that its retention as a permanent part of the heater may be found advantageous. I desire it to be further understood that my invention is not limited to any specific mode of applying the supporting and protecting en-
40 velop to the heater-wire, the spirit of the invention being satisfied by the application to the heating-coil of an envelop of such composition and dimensions as will support and protect the coil, the subsequent steps of bending
45 of the coil and the removal of the core being either added or omitted, as may be found desirable.

My invention is obviously not limited to the use of any specific mechanism nor is it limited
50 to any specific materials or forms, and hence it will be understood that what is shown and described herein is intended to merely set forth what I have found to be desirable and useful in practice.

55 I claim as my invention—

1. The method of constructing electric heaters which consists in winding a conductor

around a flexible core, applying plastic, refractory material to form a tubular, inclosing sheath, bending the article thus formed into
60 the desired shape and then hardening the sheath.

2. The method of constructing electric heaters which consists in coiling a conductor around a flexible core, applying plastic, refractory and non-conducting material as a tu-
65 bular, inclosing sheath, bending the article thus formed to the desired shape and finally hardening the envelop and removing the core.

3. The method of constructing electric heaters which consists in coiling a flexible conductor around a combustible core of suitable form and dimensions, forming a non-conducting, tubular envelop in close contact with said
70 core and coil and completely covering the coil and subjecting the resulting article to a sufficiently high temperature to destroy the core and harden the envelop.

4. The method of constructing electric heaters which consists in coiling a flexible conductor around a flexible, combustible core of suitable form and dimensions, forming a non-conducting envelop in close contact with said
80 core and coil and completely covering the latter, bending the resulting article to the desired form and then subjecting it to a sufficiently high temperature to destroy the core and harden the envelop.

5. An electric heater for lamp-glowsers comprising a wire helix and a thin, open-ended
90 tube of non-conducting, refractory material in the inner surface of which the said wire helix is wholly or partially embedded.

6. An electric heater for lamp-glowsers, comprising a conducting-coil of helical form and a tubular supporting and protecting envelop
95 the internal diameter of which is substantially equal to that of the coil and the external diameter of which is slightly greater than that of the coil.

7. The method of constructing an electric heater which consists in winding resistance-wire in the form of an open helix around a core, then applying a tubular sheath of plastic, heat-resisting material, then hardening
105 the sheath and finally removing the core.

In testimony whereof I have hereunto subscribed my name this 11th day of May, A. D. 1900.

MURRAY C. BEEBE.

Witnesses:

HENRY NOEL POTTER,
HUGH ANDREW CROOKS.