To all whom it may concern:

Be it known that I, Edwin L. Wiegand, a citizen of the United States, residing at Canal Dover, in the county of Tuscarawas and State of Ohio, have invented a certain new and useful Improvement in Apparatus for Producing Electrical Heating Devices, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to an apparatus for producing electrical heating devices.

It is the general purpose of the invention to enable a heating device or appliance to be produced in a particularly effective manner, reducing the cost of production and increasing the efficiency of the device or appliance.

A further object of the invention is to provide apparatus (comprising an article in the nature of a tool) whereby such heating device may be conveniently, efficiently, and economically produced.

With the foregoing objects in view, the invention may be defined further and more generally as consisting of the combinations and constructions embodied in the claims hereto annexed and illustrated in the drawings forming a part hereof, wherein—

Figure 1 represents a side elevation of one form of apparatus for producing a device of the character referred to; Fig. 2 a plan view of such apparatus; Fig. 3 a side elevation showing the parts in the positions which they assume immediately prior to inserting the conductor in place; Fig. 4 a vertical cross sectional view through the turret shown in Fig. 1; Fig. 5 a similar view showing the conductor-supporting devices inverted and the parts in position to remove the conductor from the support; Fig. 6 a perspective view of the tool, or that portion of the apparatus on which the conductor is wound and supported prior to its application to the heating device; Fig. 7 a perspective view of the base plate of the heating device prior to the application of the conductor thereto; Fig. 8 a perspective view of the stripping plate and Fig. 9 a similar view of the base of the tool; Fig. 10 a sectional view through the heating element; Fig. 11 a detail in perspective of one of the pins on the tool base; and Figs. 12 to 14 inclusive sectional views through the heating element and the cooperating parts illustrating the successive steps in the process of producing the heating device.

In carrying out the process illustrated and claimed herein, I first apply to the base for a heating device a layer of material, preferably cementitious, such as is ordinarily employed for the support of the conductors of such devices. For the first layer, the material may be in a sufficiently fluid condition to enable its application by pouring. This layer is then dried, preferably by specially arranged surface-plates, heated preferably by steam. After this preliminary layer has been so dried, a second layer, preferably of the same kind of material, is applied to the article and is partially dried in the manner described in connection with the first layer, until it is reduced to a plastic or putty-like consistency, which renders it capable of receiving and retaining the conductor. The conductor is given a form which will enable it to perform its heating function in an efficient manner. It is then introduced (preferably by the mechanism to be described hereinafter) into the plastic second layer, the ends of the conductor being suitably arranged for connection with the source of current supply. After the introduction of the conductor into the plastic material, the material is dried, preferably in the manner described hereinbefore in connection with the first layer. A final layer of the cementitious material is then applied and this final layer is then partially dried, to put it in condition to receive a pressure plate, which pressure plate is subjected to a very high pressure, such as is obtained by the use of a hydraulic press, with the result that a very intimate contact is obtained between the conductor and the surrounding material, producing a homogeneous mass and adapting the exposed surface of the material for the reception of a plate which serves to keep in place the heating element proper (consisting of the conductor and the surrounding material) as well as covering this element for the purpose of protection. After the pressing operation, the heating element still contains a certain amount of moisture, which is driven out by a preliminary heating in a drying kiln, after which the
whole is subjected to a heating action sufficient in temperature and duration to vitrify the material.

In carrying out the process hereinbefore described, I may and as at present advised preferably will employ apparatus of the character shown in the drawings, which will now be described in connection with reference characters:

1 denotes a bed of any suitable size and outline, said bed being designed to support the moving parts of the mechanism and the device to which the conductor is to be applied. For convenience of description, that part of the heating device which receives the heating element proper will be referred to as the "base." In the drawings, for purposes of illustration, the heating device is shown as forming part of a sad iron. This base is indicated at 2 and is shown as located on the bed in any convenient manner, as by means of gages 3 shown as secured to the plate 4. Projecting upwardly from the end of the bed 1 opposite the base 2 is a pair of brackets 5.

6 denotes an arm having at one end a pair of forks 7, which are pivoted between the brackets 5, as by means of screws 8 extending through the brackets and having conical ends 9 entering correspondingly-shaped sockets in the forks. The opposite end of the arm 6 is also forked, the forks being indicated at 10 and 11 and the fork 11 being provided with an extension having an operating handle 12.

13 denotes a ring which is pivotally supported between the forks 10 and 11, by means of a screw 14 and a shaft 15. The screw 14 has a conical end which enters a corresponding recess 14a in the ring and the shaft 15 is journaled in the arm 11 and connected to the ring 13, whereby the ring is pivotally supported while capable of rotation, under conditions which will be described hereinafter. The ring 13 surrounds the reduced end or neck 16 of a turret 17, a plate 18 being secured to the end of such neck and overlapping the ring, thereby retaining the turret in place when the same is inverted, as shown in Fig. 5. The turret 17 and the plate 18 are provided with a common bore 19, the purpose of which will be explained hereinafter.

On the top of the turret there is mounted the tool on which the conductor is wound to give it the desired shape and on which it is supported until applied to the previously-prepared base 2. The tool comprises a base plate 20 having projecting therefrom a series of pins 21, the pins being arranged to support the conductor while it is being wound and to give to said conductor the desired symmetrical shape which will best adapt it for use in the particular heating device of which it is to form a part. Each pin is preferably of the shape shown particularly in Fig. 11 and has an upper reduced end 22, which reduced end projects beyond the stripping plate (to be described hereinafter), such reduced end being provided with a substantially vertical narrow face 23 and the top of this reduced end being tapered to make a recess of correspondingly small dimensions when inserted in the cementitious material in the base 2.

24 denotes a stripping plate which is mounted on the pins 21, said pins projecting through apertures 25 in the plate and having their reduced ends 22 projecting thereabove.

The base plate 20 is shown as provided with an aperture 26 for the reception of the stud 27. This stud is shown as provided with a threaded aperture for the reception of a screw 28 which is placed within a recess 29 in the top of the stripping plate 24, the lower end of this screw being threaded in the aperture in the stud 27. The lower end of the stud 27 projects into the bore 19 and is preferably cupped, as shown at 30.

The base 2 is shown as provided with a central internally threaded boss 2a which enters the recess 29 and which receives the connecting bolt or screw by which the upper part of the heating device is screwed to the base.

The turret 17 is shown as provided with a projection 31 overhanging the ring 13. This projection is provided with a bore 32 for the reception of a plunger 33, the lower end 100 thereof is adapted to enter a recess 94 in the ring, to prevent the rotation of the turret within the ring. A spring 35 surrounds the stem of the plunger and tends to hold the plunger in its depressed condition with its lower end in engagement with the ring. The stem is provided with a laterally projecting pin 36, which moves in a corresponding slide-way, and is also provided with an operating handle 37. The pin 36 is adapted to support the plunger and stem in an elevated position. By lifting on the handle until the pin swings clear of its slide-way and then giving a partial rotation to the stem sufficient to permit the pin to rest on top of the turret projection 31, the plunger will be supported in elevated position and the turret may then be rotated within the ring, to permit the operator conveniently to wind the conductor on the projections 22 of the pins 21.

After the conductor has been applied to the ends of the pins 22, the turret will be returned to the position shown in Fig. 4, and the parts properly located by reinforcing the end of the plunger 33 into the recess 34. The turret is then inverted by means of the operating handle 38 which is fastened to the turret. The turret and the ring are locked
in position, as shown in Figs. 1, 2 and 4, by means of a spring keeper 39 which is fastened to the yoke arm 11 and which is provided with a shoulder 40 adapted to overlie the end of the lever 38 and hold the lever and the shaft 15 against rotation (see dotted lines in Fig. 3). When it is desired to invert the turret and the attached parts, the keeper will be swung out of engagement with the lever and the lever will be rotated approximately 180°, which will bring the parts in proper position to apply the conductor to the base 2. The parts may be maintained in this operative position by means of a bracket 41 projecting laterally from the yoke arm 11 and provided with an adjustable stop 41a whereon the end of the lever 38 may swing. When the lever has been so applied to the bracket, it may be retained in place by means of a keeper, the keeper shown herein being an angle lever pivoted to the bracket and having an arm 42, adapted to be swung across the top of the lever 38, and also having an operating arm 43.

For the purpose of operating the stripper plate to remove the conductor from the pins 22, the following construction is provided:—

44 denotes a lever having a rod 45 pivoted thereto intermediate of its ends, the bottom of the rod being rounded, as shown at 45a, whereby it cooperates with the rounded cavity 39 in the stud 27. The lever is provided with an operating handle 46 and at its opposite end with a notch 47, which is adapted to be engaged by a hook or ball 48 carried by any convenient portion of the lever-arm 6. The weight of the lever-arm 6 and the attached parts may be conveniently supported by means of a leg 49 pivoted to the arm and projecting downwardly from thence. A spring 50 and a stop pin 51 serve normally to keep the leg 49 in supporting relation to the arm 6. When the turret has been inverted and it is desired to apply the conductor to the base 2, it is necessary only to swing the leg on its pivot, whereupon the turret may be lowered to the desired extent.

With the parts arranged as illustrated and described, the operation is as follows: The base is prepared for the reception of the conductor by applying thereto the initial layer 52 of the cementitious material, this material being introduced in a more or less fluid condition. The layer is then dried in any convenient manner, as by the application of the steam heated plate 53 thereunder. A second layer 54 of plastic material is then applied to the base, and this layer is partially dried, as by means of the steam heated plate 55, until it is in a plastic or putty-like condition,—when its consistency adapts it best for the reception and retention of the conductor. The turret being arranged with the tool facing upwardly, the conductor 55 is then applied to the projecting ends 29 of the pins 21. The particular conductor shown herein is of the ribbon type and is one that is well adapted for heating devices. The pins will be so arranged that the conductor will be wound around the vertical faces 23 of the pin-ends. The ends of the conductor are passed through bushings 56, which are previously inserted into holes 57 in the stripping plate 28, and through the aligned holes 55 in the base plate 20. During the application of the conductor to the pins the plunger 33 may be withdrawn in the manner hereinbefore described, permitting the turret to be rotated in its ring 13, for convenience of such application. When the conductor has been wound upon or applied to these pins, giving it the desired symmetrical form, the turret is locked to the ring by means of the plunger 33 and is then inverted by means of the handle 38a and the lever 38 may be locked in place by the keeper 42, 43, in the manner hereinbefore described. The leg 49 is then removed and the turret moved downwardly by the handle 46. The base 2 will bear the stripping plate, with its projecting pins and the conductor, on top of the plastic layer 54 embedding therein the ends of the pins and the conductor. The lever 44 and rod 45 are then applied to the turret in the manner shown in Fig. 5. The operator then presses down on the handle 46. By this operation, the pins will be withdrawn from the conductor, leaving the same embedded in the plastic material. The turret and attached parts will then be returned to elevated position by means of the handle 11° carried by the screw 14. Owing to the tapered ends 22 of the pins, the openings which are made in the plastic material will be of small extent and will not interfere with the production of a homogeneous filling for the base 2 and the intimate contact between such filling and the conductor. The stripping plate is then removed and the plastic material is dried, preferably by the use of one of the plates 110 53. A third layer 59 preferably of cementitious material is then applied to the base 2, covering the conductor, and this final layer is dried sufficiently to permit the application of a pressing plate 30 of proper shape, surface, and dimensions, and preferably operated by a hydraulic press, the opposed members of which are indicated conventionally at 61 and 62, Fig. 14. The result of this pressing action is to secure a very intimate contact between the conductor and the surrounding cementitious material, producing a solid, homogeneous mass, the upper surface whereof is adapted to receive a pressure plate which will preferably form a part of the heating device, and serve to keep in place the heating element (consisting of the conductor and the surrounding
cementitious material.) After the pressing operation, the heating element still contains some moisture, which is driven out by a preliminary heating operation, as in a drying kiln, after which this element is subjected to a temperature sufficiently high and of sufficient duration to vitrify the mass in which the conductor is embedded.

While I have necessarily shown and described in detail the manner whereby an electrical heating device may be produced by means of my process and apparatus, it will be evident that these details may be departed from, more or less, without avoiding the spirit of my invention; hence I do not propose to be limited to such details, except as they may be positively included in the claims hereto annexed or such limitation may be rendered necessary by the state of the prior art.

Having thus described my invention, what I claim is:

1. In an apparatus of the character described, the combination of a base support, a supporting device for a conductor, means for moving said device toward and from the base, and means adapted to remove the conductor from its supporting device and apply it to the base.

2. In an apparatus of the character described, the combination, with a suitable base, of a supporting device whereeto a conductor is applied, and means adapted to remove the conductor from its supporting device and apply it to the base.

3. In an apparatus of the character described, the combination, with a base, of a supporting device whereeto a conductor is applied, and means for transferring the conductor from the supporting device to the base.

4. In an apparatus of the character described, the combination, with a base having a mass of plastic material thereon, of a supporting device adapted to have an elongated flexible conductor wound thereon, and means for removing the conductor from the supporting device and inserting it in the plastic material.

5. As a means for applying a conductor to a suitable base, the combination of a plurality of pins whereeto the conductor is applied, and means cooperating with the conductor to remove the same from the pins.

6. As a means for applying a conductor to a suitable base, the combination of a support for a conductor, and means cooperating with the conductor to remove the same from the support.

7. As a means for applying a conductor to the base of a heating device, the combination of a plurality of pins on which the conductor is wound, and a conductor to remove the conductor from the 65 pins.

8. As a means for forming a conductor and applying the same to a heating device, the combination of a plurality of pins, a stripping plate reciprocably mounted on said pins and through which the pins project, a conductor wound on the projecting ends of said pins, and means whereby relative movement may be secured between the plate and the pins to strip the conductor 75 from the pins.

9. In an apparatus of the character described, the combination of a base support, a base plate having a plurality of pins projecting therefrom on the ends of which the conductor is wound, a stripping plate mounted on the pins and interposed between the conductor and the base plate, means for moving said base plate toward the base support, and means for moving the stripping plate relatively to the base plate to remove the conductor from the projecting ends of the pins.

10. In an apparatus of the character described, the combination of a rotary carrier, a base plate mounted thereon and having means for supporting a conductor, a base support, a heater base thereon, means for moving the carrier toward and from the support, and means cooperating with the base plate to remove the conductor therefrom and transfer the same to the base.

11. In an apparatus of the character described, the combination of a base plate having means for supporting a conductor thereon, means for supporting the base plate whereby it may be rotated in a vertical plane, and means cooperating with the base plate and movable with relation thereto for removing the conductor therefrom.

12. In an apparatus of the character described, the combination of a base plate having means for supporting a conductor thereon, means for supporting the base plate whereby it may be rotated in planes at right angles to each other, and means cooperating with the base plate and movable with relation thereto for removing the conductor therefrom.

13. In an apparatus of the character described, the combination of a base support, a heater base thereon, a base plate having means for supporting thereon a conductor wound in symmetrical form, means for rotatably supporting the base plate and for moving the same toward and from the base support, and means cooperating with the base plate to remove the conductor therefrom and apply it to the heater base.

14. In an apparatus of the character described, the combination of a support, a heater base on said support having plastic
material therein, a base plate having means for supporting thereon a conductor wound in symmetrical form, means for bringing the base plate into operative relation to the plastic material within the heater base, and means cooperating with the base plate to remove the conductor therefrom and insert it in the plastic material.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

EDWIN L. WIEGAND.

Witnesses:

SEVERN N. WIEGAND,
AGNES E. WIEGAND.