No. 652,638. Patented June 26, 1900.

H. N. POTTER.

HEATER FOR ELECTRIC GLOWER LAMPS.

(Application filed Sept. 8, 1899.)

(No Model.)

Fig. 1

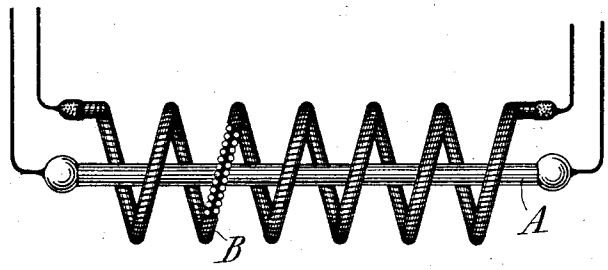


Fig. 2

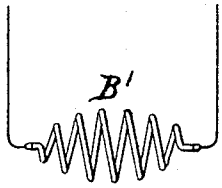


Fig. 3

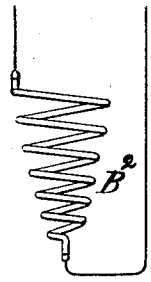
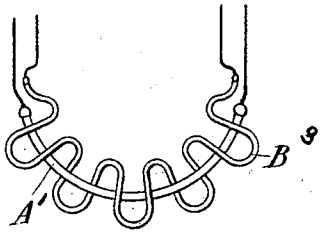


Fig. 4



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UNITED STATES PATENT OFFICE.

HENRY NOEL POTTER, OF GÖTTINGEN, GERMANY, ASSIGNOR TO GEORGE WESTINGHOUSE, OF PITTSBURG, PENNSYLVANIA.

HEATER FOR ELECTRIC GLOWER-LAMPS.

SPECIFICATION forming part of Letters Patent No. 652,638, dated June 26, 1900.

Application filed September 8, 1899. Serial No. 729,840. (No model.)

To all whom it may concern:

Be it known that I, HENRY NOEL POTTER, a citizen of the United States of America, residing at Göttingen, Germany, have invented certain new and useful Improvements in Heaters for Electric Glower-Lamps, of which the following is a specification.

My invention relates to electric lamps in which the light-giving element is composed of a material which at ordinary temperatures is a non-conductor and becomes conducting when heated to a high temperature.

My invention relates particularly to the device for giving the glower its preliminary heating. It has been proposed to perform this preliminary heating in a variety of ways by heaters which are adapted to move away from the glowers when the latter become conducting and also by heaters which maintain a stationary position relative to the glowers. In general a movable heater interferes less with the distribution of light from the glower, since it is removed to such a distance that it subtends but a small solid angle and for the further reason that its shadow usually falls upon opaque portions of the lamp.

Stationary heaters have the advantage of superior cheapness, in that they are, as a rule, less expensive to make and also because they require no mechanism to effect their movement.

Stationary heaters as usually constructed consist of thin tubes of insulating material wound with conducting-wire and generally arranged at one side of the glowers.

Heaters consisting of conductors embedded in non-conducting material and placed above the glowers are found to be generally so slow in starting the glowers that the period of preliminary heating becomes impracticably long for many types of lamp.

I have succeeded in devising a stationary heater that will start the glower with substantially the same efficiency in all positions of the lamp, that is not too frail for either use or transportation, that interferes but little with the radiation of light from the glower, and is free from the evils attendant upon the use of bare heater-wires.

My invention consists of a spiral conductor wound upon a thread or rod of non-conducting material in a manner which is in a way analogous to certain wire-wound strings used with certain stringed musical instruments. The wire spiral and the insulating material which fills the interconvolvular space are together of such thinness as to constitute virtually a "composite wire," susceptible of being formed into helix, festoon, and other open forms capable of surrounding the glower to a greater or less extent, and therefore giving it heat from all sides, which is desirable in order to permit the heating to be satisfactorily effected independently of the position in which the lamp may be operated. At the same time owing to the small diameter of the composite wire but very little light is sacrificed through the interposition of its convolutions. I am thus enabled to secure almost as free light radiation from the glower as is possible where movable heaters are employed and at the same time obtain the cheapness of the stationary embedded-wire heater of the straight tubular type and avoid the evils of the bare-wire heaters.

I will now describe the details of my invention.

I make use of an insulating material which may consist of soapstone powder made into a plastic mass by admixture therewith of organic binding materials—such as starch, gum-tragacanth, &c.—and finally baked hard after being formed to suit its subsequent service. One method by which this material, to which I have given the name "talcite," may be formed is by pressing it forcibly, while plastic, through an orifice or former, by which process it is made into long strings or rods. In making my heater I usually make use of such a press for delivering the plastic talcite in cylindrical rods having a diameter of one-half millimeter or less. With this press I combine a wire-winding frame carrying a spool of fine platinum or platinum-iridium wire and the necessary tension devices, &c., for insuring the proper wire-feed when winding. The wire-winding device rotates about the axis of the issuing talcite rod, and the fine wire is wound about the said rod as it leaves the former. The speed with which the winder revolves about the former is so calculated with reference to the speed of the issuing talcite thread

or rod that the latter receives upon its surface a spiral, the fine-wire convolutions of which lie closely together. I find five convolutions to the millimeter to be a convenient spiral, though I vary this in some heaters for the sake of increased cheapness or for other reasons. This talcite thread with its surface winding may now be given any form of spiral, wave, or festoon that its service may require or the fancy of the maker may suggest. In order to preserve the desired form of the composite wire during the drying operation which now takes place, I usually wind or loop it about an appropriately-shaped form of velvet or plush to permit it to shrink slightly while drying without danger of tearing or becoming firmly attached to the support. I usually accomplish the drying process in a desiccating-chamber over calcium carbid, sulfuric acid, or other water-absorbent; but drying in the air of an ordinary room is quite sufficient. When dry, the composite wire is hard, strong, and quite elastic and may be removed from the form without risk of breaking if care be used. I now roast the spirals or other forms to carbonize the binder, and, finally, I raise the whole to the high temperature of a porcelain-kiln or other convenient furnace free from gases injurious to platinum, or I burn it out electrically by passing current through the conductor. The so baked or burned-out heater is now sufficiently strong to withstand necessary handling and transportation. Terminals may be attached by soldering or in any convenient way.

The accompanying drawings illustrate the general appearance of such a heater and some of the forms into which it may be put for special purposes.

Figure 1 is a view, partially in side elevation and partially in section, of a glower and one form of heater constructed in accordance with my invention; and Figs. 2, 3, and 4 are side elevations of modified forms of heaters.

In Fig. 1 the heater B is in the form of a spiral or helix of uniform diameter, the glower A being axially disposed therein.

In Fig. 2 the heater B′ is in the form of a barrel-shaped helix, this form being employed in order to concentrate the heat somewhat at the ends or terminals of the glower, which, as a rule, heat more slowly than the middle portion.

The spiral heater B^2 of Fig. 3 is in the form of an inverted cone and is more especially adapted for use in connection with vertical glowers.

In Fig. 4 is shown a form of heater B^3, which I call a "wave spiral," as it is a wave winding bent in a partially-cylindrical form, the axis of the cylinder being parallel to the general direction of fall of potential from end to end of the structure when in action, the same as in the case of the ordinary continuous spiral. With this form of heater I employ a curved glower A′.

The composite wire employed by me may obviously be bent into many forms that differ from those shown, and it will therefore be understood that my invention is not limited to any specific form or forms of heater.

I have described one way of making my heater, but do not in any way bind myself to carry out my invention in the aforesaid manner only. In the place of talcite I may use other plastic materials which possess the requisite properties—such, for example, as porcelain or the various materials and mixtures of which glowers for lamps of this class are made. I may further reach the same general result without the use of a press and simultaneous squirting and winding. I find it possible to insert the insulating material into the completely-wound-up fine-wire spiral, and I find it possible to use a string of cotton or other organic matter as a core on which to wind the fine-wire spiral and subsequently impregnate the string with talcite or apply the same as a thick paste and subsequently burning out the string core. These are modifications which do not affect the character of my invention.

In certain cases it is possible and allowable to make the insulating-support in the form of a tube instead of a solid rod. This is also of the nature of a variation without influence upon the character of my invention.

I claim as my invention—

1. In an electric lamp of the class described, the combination of a glower and a heater convolutely embracing the same and consisting of an insulately-embedded conductor, the convolutions of the heater being separated to permit the passage of light from the glower through the heater.

2. In an electric lamp of the class described, the combination of a heater and a glower encircled by the convolutions of said heater, the convolutions in the neighborhood of at least one of the ends of said glower approaching more closely to the adjacent portions of the glower than do the heater convolutions about the middle portions of said glower.

3. In an electric lamp of the class described, the combination with a glower, of a spirally-encircling heater in conical form, the spirals of the heater being spread so as to permit the passage of light from the glower through the heater.

4. In an electric lamp of the class described, the combination with a glower, of a convolutely-disposed rod or thread of insulating material located in proximity to said glower and having a heating-wire spirally wound thereon and partially embedded therein, the convolutions of the rod or thread being separated to permit passage of light from the glower through the heater.

5. A heater for electric glower-lamps comprising convolutions of a composite wire composed of a rod of insulating material and a spiral of conducting material partially embedded in said rod while the latter is in a plastic condition and subsequently firmly at-

tached to said rod by firing at a high temperature, substantially as described.

6. In an electric lamp of the class described, the combination with a glower, of a convolutely-disposed rod of insulating material having a heating-wire wound spirally thereon and disposed in proximity to the glower with its convolutions spaced apart to permit of comparatively-unobstructed passage of light from the glower.

7. The process of making electric heaters of curved form consisting in winding a conductor in the form of a spiral or helix upon a ceramous, plastic, non-conducting rod, bending said rod and its affixed spiral into curved form, and rendering said form permanent by heat.

8. The process of making electric heaters which consists in winding a flexible conductor helically around a plastic rod of non-conducting material, bending said rod to the desired form and then subjecting it to heat to harden the plastic material.

9. The process of making electric heaters which consists in winding a flexible conductor helically around a plastic rod of non-conducting material at such tension as to partially embed the same, then bending said rod to the desired form and finally subjecting it to heat to harden the plastic material.

Signed by me at Hanover, Germany, this 15th day of July, 1899.

HENRY NOEL POTTER.

Witnesses:
KIRKE LATHROP,
LEONORE RASCH.