(No Model.)

E. E. GOLD.

ELECTRIC HEATER.

No. 604,384. Patented May 24, 1898.

FIG. 1.

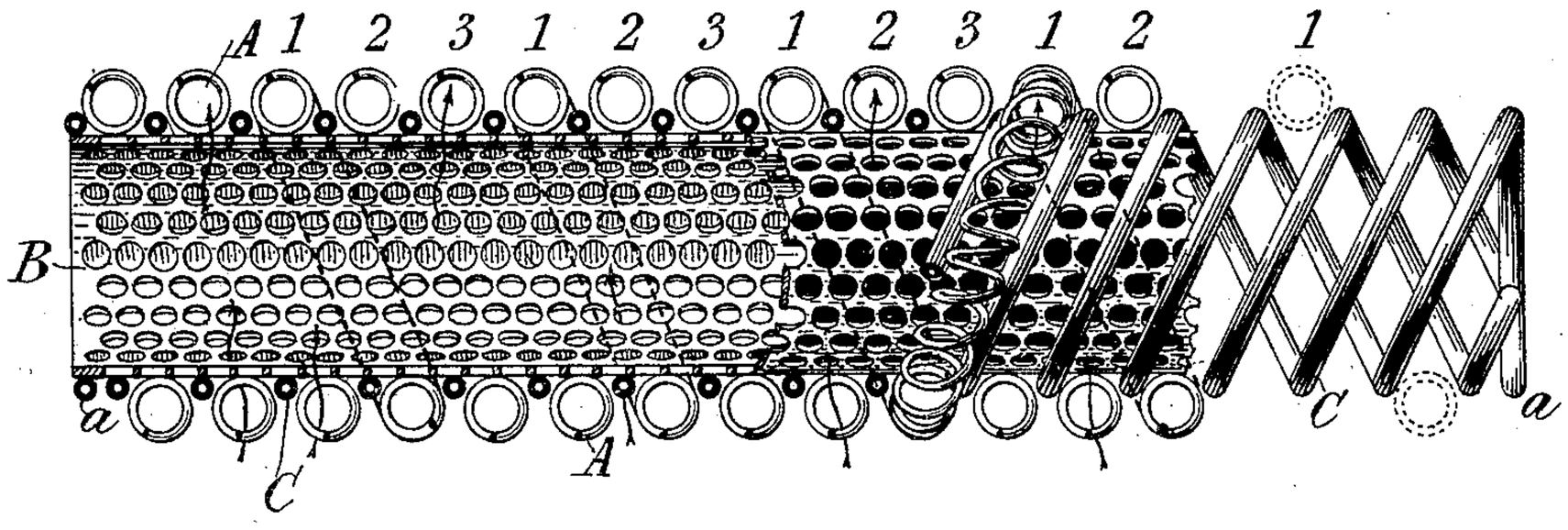


FIG. 2.

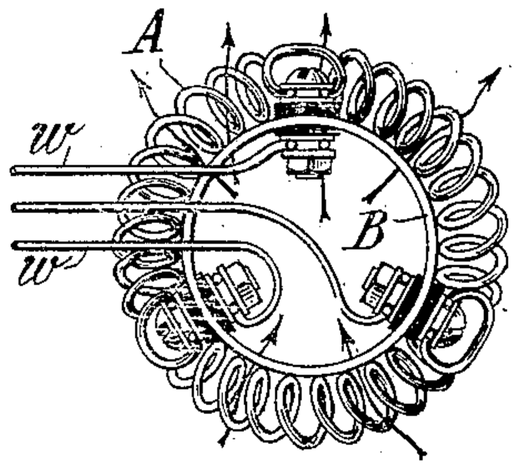


FIG. 3.

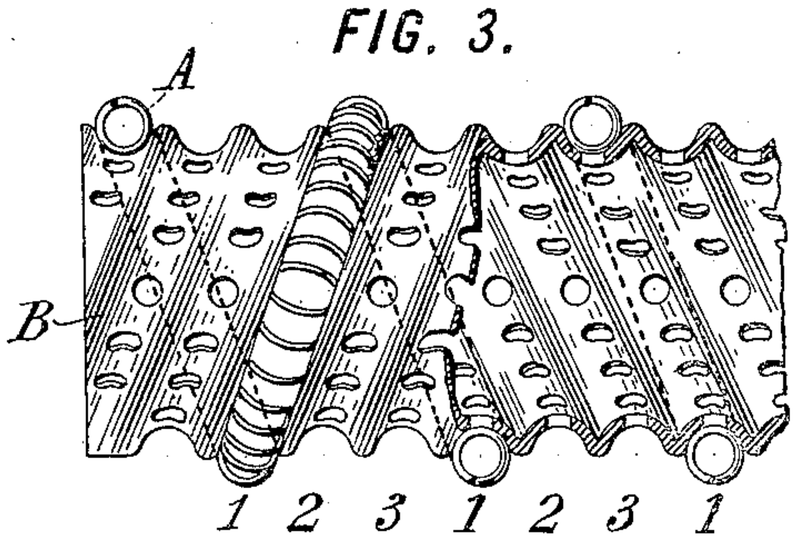
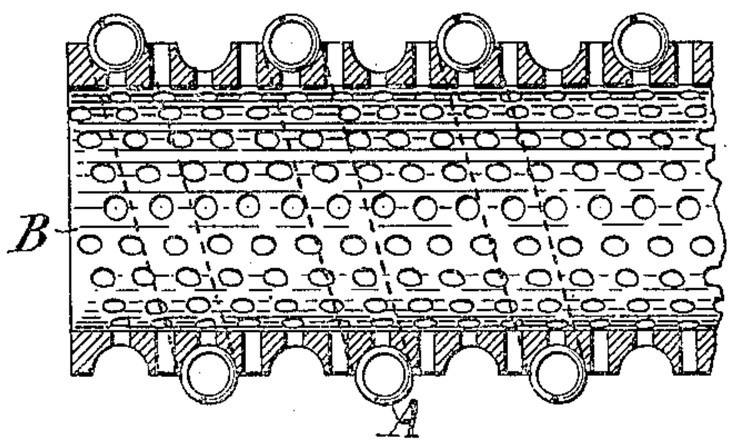


FIG. 4.



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ELECTRIC HEATER.

SPECIFICATION forming part of Letters Patent No. 604,384, dated May 24, 1898.

Application filed October 14, 1897. Serial No. 655,176. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. GOLD, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

This invention relates to electric heaters in which a resistant wire is wound into a helix, which helix is wound into a major helix.

According to my invention I provide as a support for the helices a hollow open-work body in the general form of a hollow cylinder, employing by preference a foraminous or perforated tube of enameled metal or of other suitable insulating material, around the exterior of which the resistant helices are wound in order to permit free circulation of air through the central space inclosed within the major helix or helices, adapted for circulation of air through and across the convolutions of the resistant wire. The perforated tubular support is either spirally grooved upon its exterior to receive the helices and keep the successive major convolutions thereof out of contact with one another, or preferably the tube is surrounded by a separating helix or helices of insulating material, preferably enameled wire, wound with the same pitch as the major helix or helices and adapted to keep the successive convolutions thereof properly separated.

Figure 1 of the accompanying drawings is a sectional elevation, partly broken away or dissected, to show the construction and illustrating the preferred embodiment of my invention. Fig. 2 is an end elevation thereof. Figs. 3 and 4 are sectional elevations showing modified constructions.

In all the figures, A designates a helix of resistant wire which is wound or coiled spirally into a major helix, and B designates the open-work tubular support for this major helix.

The supporting-tube B is perforated or foraminous, the perforations being as numerous and closely grouped as is consistent with the provision of sufficient strength for the support of the coils or helices. I prefer the use of thin sheet metal, which may be cylindrical, as shown in Figs. 1 and 2, or may be spirally corrugated, as shown in Fig. 3; but, if preferred, a thicker material may be employed—as, for example, earthenware—in the manner shown in Fig. 4, where the tube is formed externally with spiral grooves to receive the helices. If metal or any conducting material is employed, it must be insulated from the helix either by coating the resistant wire with an insulating material, as enamel, or preferably by coating the tubular support with such material. I prefer the use of enameled sheet metal as the material of the support, since this material enables the heater to be made of ample strength with but little weight, and while affording the requisite electrical insulation it has but slight heat-absorptive capacity, so that the heater becomes immediately effective when the required current is turned on.

The resistant wire is wound in the usual manner about a mandrel to form a helix, which for distinction I will call the "minor" helix, and this is then wound spirally around the exterior of the supporting-tube B, thus forming it into a larger or major helix. The minor helix should be wound with close convolutions, which should be stretched open somewhat in winding the major helix, so that the major helix will have a contractile tendency, causing it to hug closely upon the support and also insuring that the convolutions of the minor helix shall be so opened out or separated that no contact and consequent short-circuiting can occur. The ends of the helix are fastened to the support by means of insulated binding-posts, as shown in Fig. 2, or in any other suitable manner, the circuit-wires *w w* being connected with these binding-posts, as shown in Fig. 2. It is important to prevent contact between successive convolutions of the major helix, which contact would result in short-circuiting, and to this end it may in some cases be sufficient to rely upon the frictional cling of the helix to the cylindrical tubular support; but it is preferable to interpose some sort of continuous separation between the adjacent convolutions, and to this end I may form the support with spiral grooves or corrugations on its exterior, as shown in Figs. 3 and 4. I prefer, however, the cheaper construction shown in Fig. 1, where the convolutions are separated by an intervening winding of insulating material,

which may be enameled wire of sufficient diameter to keep the resistant convolutions so separated as to prevent any possible contact, as clearly shown. This separating-winding (lettered C) is constructed as a helix of wire of suitable size, the ends of the wire being connected to rings *a a* at opposite ends of the heater and the winding and rings being preferably sufficiently large to slip easily over the supporting-tube B. When thus slipped over the tube, it forms a series of spiral ridges thereon, and the resistant helix is wound in the intervening spiral spaces or channels. By this means a light, strong, and cheap construction is provided which affords ample security against short-circuiting. It is to be remarked that this separating-winding C is not used as a support for the resistant helix, the latter being supported solely on the tube B. In Fig. 1 the tube B is broken off at the right-hand end to show the separating-helix C more clearly. In another application, Serial No. 668,528, filed January 31, 1898, I have set forth and claimed a helix of enameled wire constituting not merely a separation for successive convolutions of but as a support for the compound resistant helix, and I refer to that application for the purpose of clearly differentiating such supporting-helix of enameled wire from the merely-separating helix of such wire used in connection with a tubular support B, as herein described.

I have thus far described the heater as though but a single helix were wound upon the support. I have shown, however, two or more helices wound in alternate or successive order around it and insulated from one another.

In Figs. 1, 2, and 3 heaters of three coils or helices are shown, while in Fig. 4 a heater of two coils is shown. Only one of the coils is shown in Figs. 3 and 4, the grooves in which to wind the one additional coil in Fig. 4 and the two additional coils in Fig. 3 being shown empty. In Fig. 1 to enable the three helices to be distinguished they are numbered, respectively, 1, 2, and 3. This construction with a plurality of coils forms no part of my present invention and is not claimed in this application.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. An electric heater comprising an insulating open-work support consisting of a thin foraminous tube, and a helix of resistant wire wound helically around said support, whereby air may circulate between the meshes of said helix and through the openings into and out of the interior of said support and into contact with all portions of the heated resistance wire.

2. An electric heater comprising an insulating open-work support of thin foraminous metal in the general form of a hollow cylinder, coated with insulating-enamel, and a helix of resistant wire wound helically around said support, whereby air may circulate between the meshes of said helix and through the openings into and out of the interior of said support and into contact with all portions of the heated resistance wire.

3. An electric heater comprising a hollow open-work support in the general form of a hollow cylinder, having projections winding helically around it, and a helix of resistant wire wound helically around said support parallel with and between said projections, whereby said projections serve to separate the successive windings of resistant wire, and the openings in said support permit circulation of air into and out of the interior thereof and into contact with all portions of the helix.

4. An electric heater comprising an insulating open-work support consisting of a thin foraminous tube, an enameled wire wound helically around said support, and a helix of resistant wire wound helically around said support in the spaces between the parallel convolutions of said enameled wire, whereby the resistant wire is supported by said support and its parallel windings are separated by said enameled wire.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

EDWARD E. GOLD.

Witnesses:
GEORGE H. FRASER,
THOMAS F. WALLACE.