J. A. MEARS, Jr. & C. ELLIS.

ELECTRICAL HEATER.

APPLICATION FILED APR. 7, 1908.

916,348. Patented Mar. 23, 1909.

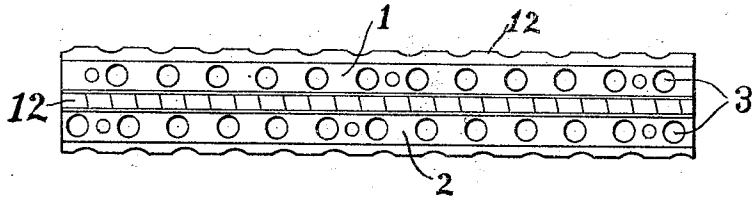

Fig. 1

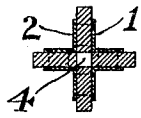

Fig. 2

Fig. 3

Fig. 4

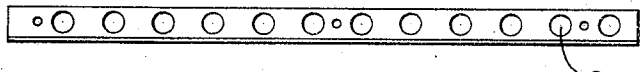

Fig. 5

Fig. 6

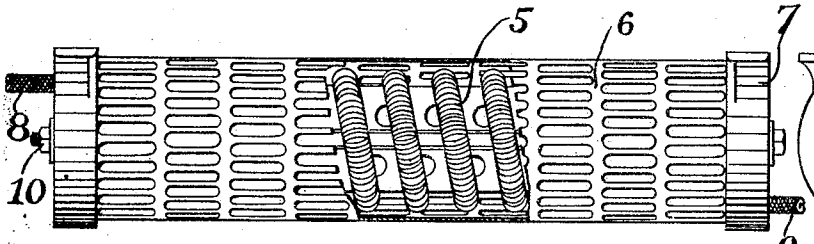

Fig. 7

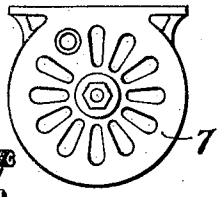

Fig. 8

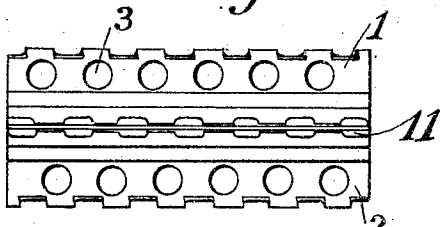

Fig. 9

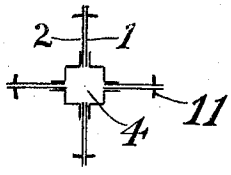

Fig. 10

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ELECTRICAL HEATER.

No. 916,348. Specification of Letters Patent. Patented March 23, 1909.

Application filed April 7, 1908. Serial No. 425,794.

To all whom it may concern:

Be it known that we, JOSEPH ARCHIBALD MEARS, JR., and CARLETON ELLIS, citizens of the United States, and residents, respectively, of New York and of Larchmont, in the State of New York, have invented a new and useful Improvement in Electrical Heaters, of which the following is a specification.

This invention relates to electrical heaters especially adapted for heating cars, and relates particularly to heaters of a novel type securing perfect ventilation, involving unusual simplicity and stability of construction and rigidity of setting, all as hereinafter fully set forth; the particular points of novelty being pointed out in the appended claims.

The object of the present invention is to supply a heater consisting of a spirally coiled wire, spirally arranged on an exceedingly well ventilated spindle or framework so as to perfectly separate the coils or helices and provide for a maximum amount of wire in a minimum of space, and at the same time arranging the spindle or framework so that while the coil is rigidly supported it comes into contact with the spindle or framework at a few points only, and as the air may circulate freely through the coil and spindle or framework perfect ventilation is secured, so that an unusual amount of heat at a moderate temperature may be generated from a very compact heater. This efficient heat generation we also aim to develop with the wire at a much lower temperature than formerly employed. From the peculiar construction of our heating device, giving rise to perfect ventilation, to a maximum amount of effective heating surface of the wire and a minimum amount of contact surface we secure results of a highly satisfactory character.

In carrying out our invention, we construct our wire support, bobbin, or spindle, as indicated in the accompanying drawings which represent our invention in somewhat diagrammatic fashion and wherein—

Figure 1 shows in plan view our ventilated spindle. Fig. 2 is an end elevation of said ventilated spindle. Fig. 3 depicts a vane of insulating material showing the ventilating openings; while Fig. 4 is an end elevation with the ventilating openings shown by dotted lines. Fig. 5 is a plan view of the angle-iron having ventilating openings coinciding with those of the vane or web shown in Figs. 3 and 4. Fig. 6 is an end elevation of the ventilating angle-iron structure. Fig. 7 is an assemblage of the above elements and ventilating devices, all shown in plan view having a portion of the outer casing cut away to show the preferred relative position of the heating coils and air vents. Fig. 8 is an end elevation of said assemblage. Fig. 9 is a modified form of said ventilated spindle depicted in plan view and Fig. 10 is an end elevation of said Fig. 9.

In the drawings, 1 and 2 are angle irons having the ventilating apertures 3. These angle irons, four in number, are bolted or clamped so as to support the insulating strips 12. The latter has serrations or grooves regularly spaced in its outer edge. The insulating strip is preferably made of the composition hereinafter described. As stated the angle-irons and strips are perforated at frequent intervals, as shown at 3, so as to afford ventilating spaces through which the air current rushing upward through the heater may freely pass, thus cooling the wire, extracting heat from the inner side of the coil, as well as from the outer. In this manner a far more perfect absorption of the heat, and much better ventilation and greater and more efficient movement of the air currents, are secured than where the coil is wound on a solid support, such as for instance, a porcelain tube. Such novel construction effectually provides against the overheating locally of the coil, so that its life is much longer than where non-ventilated supports are employed. The angle irons and vanes are so combined as to leave an opening or passage 4 in which may be passed a long bolt 10 for the purpose of clamping the end frames 7 of the housing or casing 6.

At 5 in Fig. 7 is shown the wire helix spirally arranged on the ventilated spindle and in contact with said spindle at points spaced ninety degrees apart. The almost entire portion of the helix is therefore available for useful work. Fig. 9 is of somewhat similar construction, but has the supporting points or grooves coated with a special insulating enamel, as hereinafter set forth. The grooves are preferably formed by bending over the edge of the angle irons to form the lips 11. It is likewise supplied with ventilating apertures as shown at 3. The wire support is preferably wound with high

resistance wire, such for instance, as iron or soft steel wire. It should be wound tightly so as to avoid vibration, and the insulated strips of enamel should be tough and thoroughly non-conductive of electricity. By constructing our heating device in this manner, practically all the surface of the wire is available for heating purposes.

The conversion of electrical energy into heat takes place in accordance with well known laws. The heat developed and the efficiency with which it is absorbed by the atmosphere depend upon the resistance of the coil, upon its length and upon the amount of available heat radiating, air contacting surface of the wire; with a short coil of wire having an extremely high resistance and a small surface, of course, very high temperatures must needs be employed to generate the same amount of heat as where longer coils of wire of a lower resistance and greater surface are used. Owing to the enormous radiating surface secured by our system of ventilated construction, very moderate temperatures only are employed and a large volume of air is heated thus securing high heating efficiency, and rendering the wire resistant to the crystallizing influences which prevail when higher temperatures are employed.

A suitable composition for making the insulating strip above indicated, is made by mixing long fibered asbestos with oxid of zinc, barium chlorid and zinc sulfate. This mixture is moistened with water and pressed into shape. When it solidifies a highly insulating compound is produced. Other binding materials for the asbestos may be similarly employed.

A useful enamel for coating the supporting surfaces of the spindle is secured by mixing two parts of ground glass, one part of zinc oxid, one-half part of lime and one part feldspar, applying this mixture by means of an aqueous solution of glue or dextrin, or the like, to the surface to be enameled, and heating the spindle until the enamel fuses, when the spindle is slowly cooled to allow annealing changes to progress to completion, when the spindle is then ready to be wound with the spiral helix.

The above described insulating composition or enamel provides an efficient and permanent insulating structure which withstands hard usuage without cracking or chipping, thereby effectually preventing short circuiting and consequent loss of energy.

Having described our invention, to the details of which we of course do not limit ourselves, but claim such modifications therefor as we are entitled to under the doctrine of equivalence, what we claim as our invention and desire to secure by Letters Patent, is:—

1. An electrical heater comprising a spindle formed of a plurality of radial vanes suitably secured together each of said vanes being provided with transverse perforations, and with notches or serrations at regular intervals along its edge, and a spirally wound heating element supported in said serrations.

2. An electrical heater comprising a spindle made up of a plurality of radially disposed vanes, angle irons to which said vanes are secured near their inner edge, said vanes having a plurality of transverse perforations to provide ventilating openings, and also being formed with serrations at regular intervals along their outer edge, a spirally twisted heating coil wound around said spindle and lying in said serrations, and a foraminous housing surrounding said coil.

3. An electrical heater, comprising a spindle made up of a plurality of separately formed, radial vanes, angular members to which said vanes are secured around a common center so as to leave an opening therethrough, a heating element spirally wound on said spindle, a housing surrounding said spindle, ends for said housing, and a bolt, passing through said opening and said ends and serving to secure the latter in position.

4. An electrical heater comprising a spindle formed of a plurality of radial vanes suitably secured together, and a spirally wound heating element supported on said vanes, each of said vanes being provided with a plurality of transverse perforations, whereby the free circulation of air through the heater is facilitated.

5. An electrical heater comprising a spindle formed of a plurality of blades or vanes suitably secured together and extending radially from a common axis, said vanes being so mounted that longitudinal spaces are formed between them, each of said vanes being provided with a plurality of transverse ventilating openings, and a heating element wound spirally around said spindle so as to embrace said perforated vanes.

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