W. S. HADAWAY, Jr.

ELECTRIC HEATING DEVICE.

APPLICATION FILED JULY 24, 1908.

1,068,763. Patented July 29, 1913.

Fig. 1.

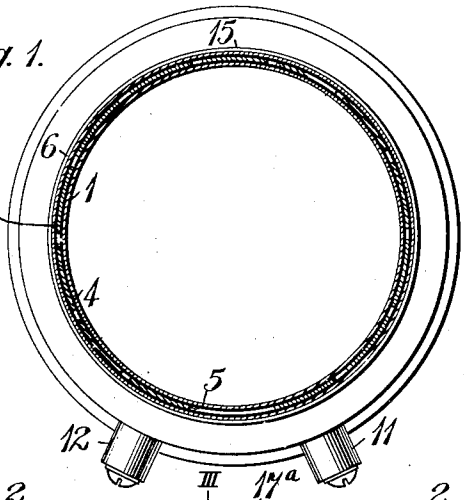


Fig. 2.

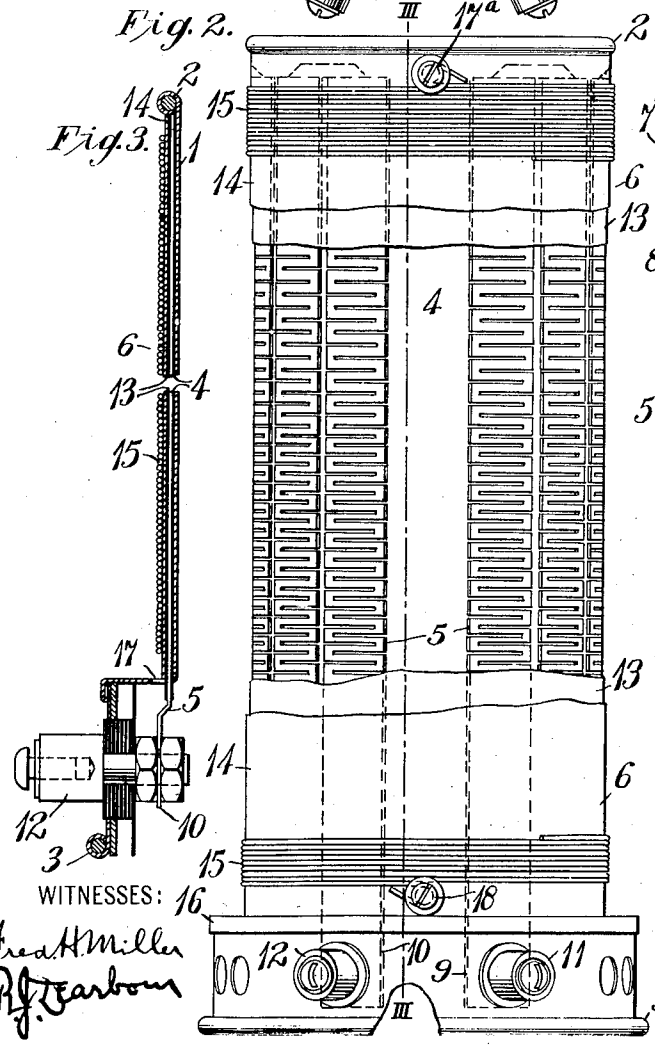
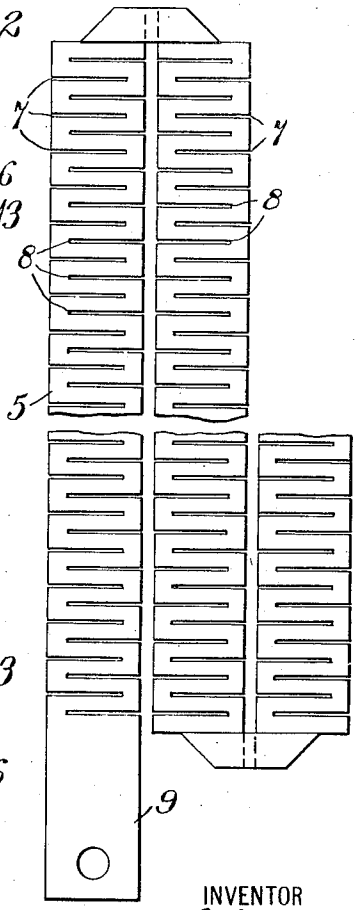


Fig. 3.

Fig. 4.



WITNESSES:

Fred H. Miller

R. J. Dearborn

INVENTOR

William S. Hadaway Jr.

BY Fisley & Carr

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM S. HADAWAY, JR., OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRIC HEATING DEVICE.

1,068,763. Specification of Letters Patent. Patented July 29, 1913.

Application filed July 24, 1908. Serial No. 445,200.

To all whom it may concern:

Be it known that I, WILLIAM S. HADAWAY, Jr., a citizen of the United States, and a resident of East Orange, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Electric Heating Devices, of which the following is a specification.

My invention relates to electric heating devices, and it has for its object to provide an improved device of this character which shall be simple and durable in construction and adapted for general heating purposes.

The heating device of my present invention comprises a metal cylinder to which heat is imparted by resistance ribbon that is insulated from its outer surface and is suitably disposed on the insulation in a zigzag form and held in position under heavy pressure by any suitable means, such as steel band wire which is closely wrapped around the cylinder and resistance element.

By constructing my improved heating device as above indicated, I am able to utilize a maximum amount of the heat which is generated in the resistance element, the pressures established by the band wire being sufficient to prevent any relative movement between the several parts of the device on account of unequal expansion and contraction which usually occur in devices of this character.

Figure 1 of the accompanying drawings is a plan view, and Fig. 2 a side elevation, of an electric heating device constructed in accordance with my invention, the wrappings of insulating material and the metal armor being broken away in Fig. 2 to disclose the resistance ribbon. Fig. 3 is a sectional view on the line III—III of Fig. 2, and Fig. 4 is a detail view of the resistance ribbon which is partially disclosed in Fig. 2.

Referring to the drawings, the device here illustrated comprises a hollow cylinder 1, preferably constructed of sheet iron or other heat-conducting material, having stiffening rings 2 and 3 around which its ends are bent, a wrapping 4 of insulating fabric, a resistance strip or ribbon 5 and a metal armor 6, which is wrapped around the cylinder after the resistance is properly disposed on the insulating wrapping 4, as hereinafter set forth. It may be desirable to use a cylinder of tile or other electrical non-conductor in lieu of the conducting cylinder.

The resistance strip or ribbon 5 is preferably constructed of a steel band or ribbon which is provided with a plurality of slots 7 and 8 that extend inwardly from opposite edges and are arranged alternately so that a zigzag current-conducting path is provided. As shown in the drawings, this ribbon is laid on the insulating wrapping 4 in a zigzag form, the center lines of the main portions of the zigzag strip being parallel to the axis of the cylinder, but, while this form is considered preferable, it is not essential to my invention. The slots 7 and 8 are omitted at the bends of the strip (see Fig. 4) so that a materially greater current-carrying capacity is produced and the danger of overheating and rupturing the strip at these points is avoided. For the same reason, the slits 7 and 8 are also omitted from the ends of the strip which constitute leads 9 and 10 of the resistance element and are respectively connected to terminal members 11 and 12.

When the resistance strip is in position, a wrapping 13 of insulating material is applied, a sheet metal plate 14 being preferably wrapped on top of the insulation. This sheet metal plate constitutes a portion of the armor 6 which further comprises a plurality of turns of steel band wire 15 that are closely wound around the outer surface of the cylinder after the parts 4, 5, 6 and 13 are in position. The primary object of the steel band wire 15 is to create a relatively heavy pressure between the metal cylinder 1 and the resistance ribbon, which are only separated by a thin wrapping of insulation, in order to insure a uniform expansion of the two parts and a transfer of a maximum amount of the heat generated in the resistance ribbon to the metallic walls of the cylinder that are exposed to the air or to some other liquid or fluid which it is desired to heat. Metal bands or rings may be shrunk onto the cylinder, to produce the desired pressure, instead of the band wiring.

As illustrated in Figs. 2 and 3, one end of the cylinder is provided with an enlargement 16 to which the terminal members 11 and 12 are secured, holes 17 being provided in the shoulder formed at the junc-

tion of the enlargement with the cylinder, through which the resistance leads 9 and 10 extend. The ends of the band wire are secured to binding screws 17ª and 18.

The thickness of the insulation on the outer surface of the assembled resistance unit may be greater or less, according to the use for which the heater is intended. When it is used to heat water or other liquids flowing through it, the radiation of heat from the outer surface is prevented as far as possible.

While I believe that the resistance ribbon illustrated is preferable for use with my improved heating device, my invention is not restricted to its use, and any suitable form of resistance element may be employed. It is also conceivable that structural modifications may be effected in the heating device itself within the spirit and scope of my invention.

I claim as my invention:

1. An electric heating device comprising a cylinder of heat-conducting material, a resistance element disposed on the surface thereof and insulated therefrom, and a compression metal sheath for the assembled cylinder and its resistance element comprising turns of wire disposed in compact side-by-side relation and under tension.

2. An electric heating device comprising a hollow metal cylinder, a resistance strip or ribbon disposed on its outer surface and insulated therefrom, a plate of heat-conducting material wrapped around the cylinder and the resistance and electrically separated from the latter, and a wrapping of band wire for pressing the resistance strip or ribbon against the outer surface of the cylinder.

3. An electric heating device comprising a metal tube or cylinder, a zigzag resistance strip or ribbon disposed on the outer surface of the cylinder and insulated therefrom, the center line of the ribbon being parallel to the axis of the cylinder, successive wrappings of insulating and heat-conducting material wound over the resistance strip, and a close wrapping of band wire surrounding the assembled device and forcing its parts together to increase the heat-conductivity from the resistance ribbon to the walls of the cylinder.

4. An electric heating device comprising a sheet metal cylinder, an insulating wrapping on its outer surface which is uninjured at high temperatures, resistance strip or ribbon laid on the surface of the cylinder from end to end in a zigzag form, said ribbon being provided with a plurality of slots which extend inwardly from opposite edges and are arranged alternately to increase the length of the current-conducting path therethrough, and successive wrappings of insulation and sheet metal and an outer wrapping of band wire for pressing the other parts together.

5. An electric heating device comprising a hollow cylinder, a resistance strip or ribbon disposed on its outer surface and insulated therefrom, a plate of heat-conducting material wrapped around the cylinder and the resistance and electrically separated from the latter, and a wrapping of band wire for pressing the resistance strip or ribbon against the outer surface of the cylinder.

6. An electric heating device comprising a tube or cylinder, a zigzag strip or ribbon disposed on the outer surface of the cylinder and insulated therefrom, the center line of the ribbon being parallel to the axis of the cylinder, successive wrappings of insulating and heat-conducting material wound over the resistance strip, and a close wrapping of band wire surrounding the assembled device and forcing its parts together to increase the heat-conductivity from the resistance ribbon to the walls of the cylinder.

In testimony whereof, I have hereunto subscribed my name this 21st day of July, 1908.

WILLIAM S. HADAWAY, Jr.

Witnesses:

Russell Barbour,

Birney Hines.