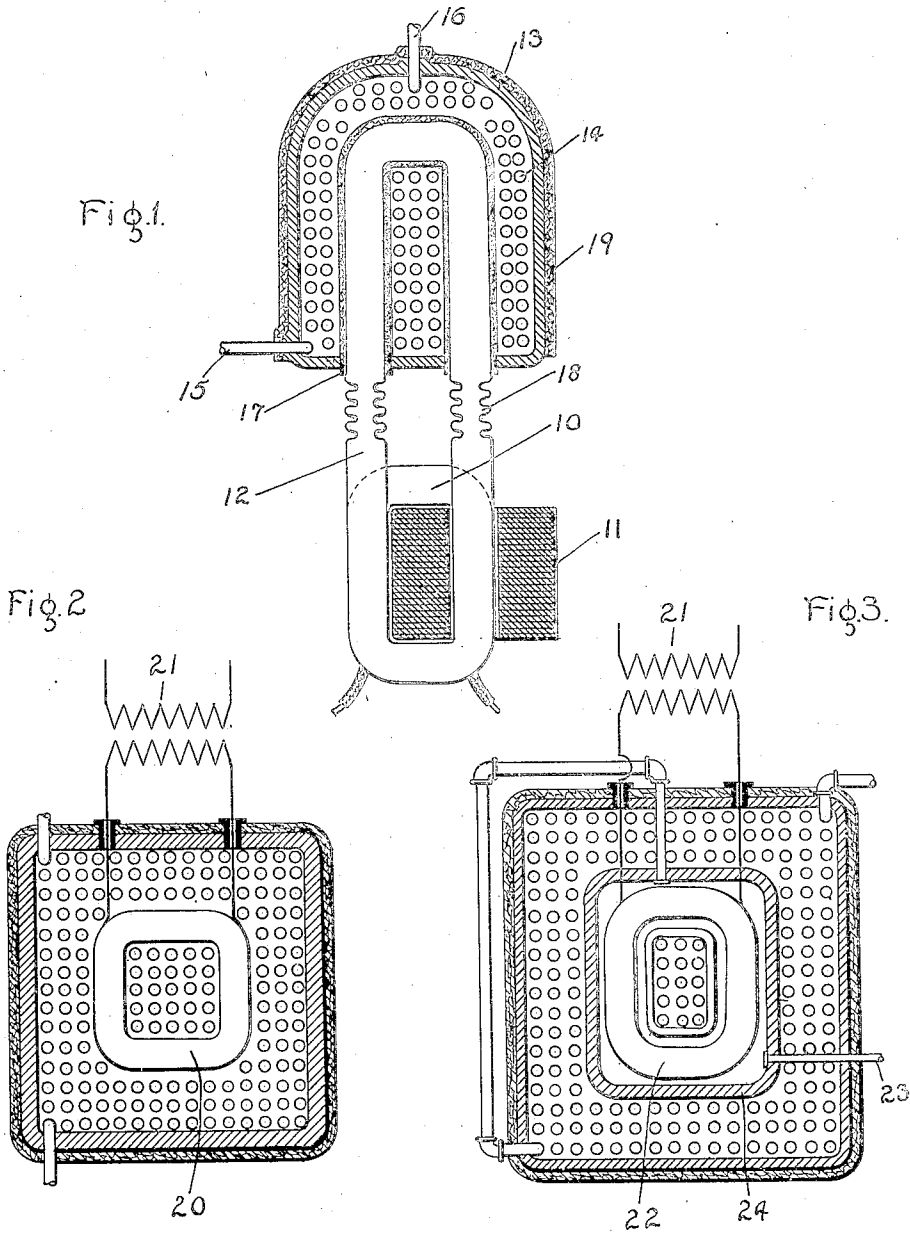


No. 857,122.

PATENTED JUNE 18, 1907.

E. THOMSON.
ELECTRIC HEATER.
APPLICATION FILED OCT. 15, 1906.



Witnesses:

A. Gordon Hamilton
J. Ellis Allen

Inventor:

Elihu Thomson

By *Albert H. Davis*
Att'y.

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF SWAMPSCOTT, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC HEATER.

No. 857,122.

Specification of Letters Patent.

Patented June 18, 1907.

Application filed October 15, 1906. Serial No. 338,920.

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

This invention relates to electric heaters, and has for its object the provision of means, whereby the energy of an electric current may be transformed into heat in a reliable and efficient manner.

My invention relates more specifically to electric heaters to be used with alternating currents.

One of the objects of my invention is to provide an electric heater which is capable of being used efficiently and safely on high, as well as low voltages, provision being made for conserving the insulation, when working at high potentials.

It is also one of the objects of my invention to meet practical conditions, and to save all possible heat by arranging compact and powerful apparatus, the insulation of which will be very high, and which will avoid lagging currents produced by too large self induction. To this end, the body in which the heat is produced is designed to act, not only as a hysteric core but also as a closed secondary, the core being made of the shell type and completely surrounding the coil so that there will be no stray magnetism.

A further object of my invention is to produce an alternating current device of the transformer type, the construction being such that the primary coil may be kept cool as well as the secondary if desired; in order not to weaken the insulation by heating the insulating material or impair the conductivity of the coils.

Further objects of my invention will appear in the course of the following specification, in which I have shown certain specific forms merely for the purpose of illustration.

In the drawings in which several types of my device are shown, Figure 1 represents a sectional view of one form of the invention; while Figs. 2 and 3 represent slightly modified constructions.

Referring to Fig. 1 of the drawings, 10 is the primary of the transformer, having a core 11 and a heavy secondary 12. This secondary is arranged to pass into a mass of iron,

which may be of any desired construction. In this particular instance I have shown the iron in the form of a shell 13, having tubes therein. The shell may be constructed by casting it around the pipes or tubes 14, the inlet of which may be at 15 and the outlet at 16. These tubes may be for generating steam, or heating circulating water, the circulation being across and back from the inlet to the outlet. The secondary 12 which likewise acts as a primary to the surrounding shell and tubes passes up into these tubes in such a manner that a portion of them passes between the legs of the secondary so as to constitute a core. This arrangement constitutes one of the important features of my invention. The hard iron shell 13 forms a short-circuited secondary of which 12 is the primary, so as to waste energy in closed circuits parallel to the secondary coil thus generating heat, while the core composed of tubes, which are made preferably of hard hysteric iron, causes a loss due to hystereses. The secondary is preferably jacketed or lagged with some non-conductor, as for instance, asbestos 17, so as to maintain the secondary coil as cool as possible by preventing the conduction of heat thereto from the casing and the core. I also endeavor to prevent the transfer of heat by narrowing or cutting away a portion of the secondary, as at 18, thus reducing the conductivity with respect to heat without materially interfering with the electric conduction. The shell may likewise be lagged with asbestos 19, if desired.

In Figs. 2 and 3, the arrangement is somewhat different, the construction being such that the heating coil is supported in a space surrounded by an iron body, which in this case also forms a core. The circulation of fluid takes place through the passages as before. In this form the heating coil 20 is made to receive the current at low potentials from an ordinary step-down transformer 21. The coil may consist of a number of turns of wire and be allowed to run hot, since very little heat will be conducted back to the transformer through the conductor.

In Fig. 3, the coil 22 is shown supported so that there will be circulation of fluid around it. This fluid may be oil if desired, which may enter cold at 23, and after circulating around the heating coil, afterward pass to the outer portions through the tubes to re-

ceive the full amount of heat. This heater may also be lagged if desired. It should be understood that the construction of the casing or shell may be varied as desired. In the construction shown in Fig. 3, the heater may be constructed in halves the joint being in the plane of the paper. The tubes and the inner casing 24 can be cast in one part with the outer casing.

It will be understood of course, that the forms of my invention herein shown and described are merely typical since many changes and modifications will readily suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. An electric heater comprising a transformer having its primary circuit embedded in a mass of hysteretic iron.

2. An electric heater comprising a transformer having its primary circuit inclosed by a mass of hysteretic iron, and tubes embedded in the iron for a heat-transmitting circulatory medium.

3. An electric heater for alternating currents, comprising a primary coil, and a short-circuited secondary of magnetic material provided with tubes forming a core for the primary coil.

4. An electric heater comprising a transformer having its primary circuit inclosed by a mass of hysteretic iron, and embedded iron tubes in said mass conveying a heat-transmitting circulatory medium.

5. An electric heater for alternating currents, comprising a primary coil and a short-circuited secondary of magnetic material

having a portion thereof arranged to form a core for the primary coil.

6. An electric heater for alternating currents comprising a primary coil, and a short-circuited secondary inclosing and completely surrounding the same.

7. An electric heater for alternating currents, comprising a transformer, having a tubular short-circuited secondary, and a primary coil mounted within the same.

8. An electric heater for alternating currents, comprising a primary coil and a short-circuited secondary inclosing the same, and provided with tubes surrounding the primary coil.

9. An electric heater comprising a transformer having its primary circuit embedded in a mass of iron, and a heat-insulating medium between the iron mass and the primary circuit to maintain a relatively low temperature in the primary circuit.

10. An electric heater comprising a heat-generating transformer, the primary of which is a low-resistance conductor carrying a current of large volume, and means applied to said conductor to maintain a low temperature relatively to that of the transformer.

11. An electric heater for alternating currents, comprising a primary coil and a multi-tubular short-circuited secondary, inclosing and completely surrounding the same, a portion of said tubes forming a core for the primary coil.

In witness whereof, I have hereunto set my hand this twenty-fifth day of September, 1906.

ELIHU THOMSON.

Witnesses:

JOHN A. McMANUS, Jr.,
HENRY O. WESTENDARP.