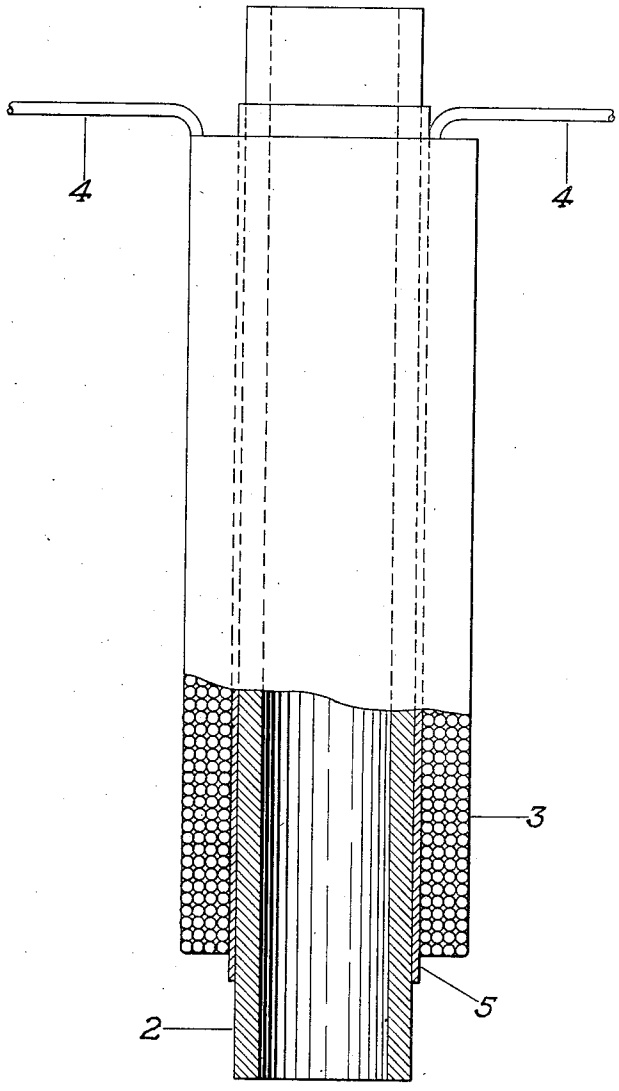
C. E. MAGNUSSON & L. F. CURTIS.

ELECTRIC HEATER.

APPLICATION FILED SEPT. 26, 1917.

1,260,564. Patented Mar. 26, 1918.



WITNESSES:

Leimuel Paul Crim.

Harry Bustis Bennett

INVENTORS:

Carl Edward Magnusson

Leslie Forrest Curtis.

BY

ATTORNEY

UNITED STATES PATENT OFFICE.

CARL EDWARD MAGNUSSON AND LESLIE FORREST CURTIS, OF SEATTLE, WASHINGTON.

ELECTRIC HEATER.

1,260,564. Specification of Letters Patent. Patented Mar. 26, 1918.

Application filed September 26, 1917. Serial No. 193,385.

To all whom it may concern:

Be it known that we, CARL EDWARD MAGNUSSON and LESLIE FORREST CURTIS, citizens of the United States, residing at Seattle, in the county of King and State of Washington, have invented new and useful Improvements in Electric Heaters, of which the following is a specification.

Our invention relates to improvements in electric heaters of the induction type used in heating water or other fluids, buildings, or for other domestic or industrial purposes.

The object of our invention is to improve the power factor of electric heaters of the induction type.

We attain this object by the structure illustrated in the accompanying drawing which is a complete illustration, the upper portion being an elevation and the lower portion of which is in longitudinal section.

The numeral 2 indicates an iron or steel tube or pipe through which water or other fluid flows and in which it is heated, this pipe forming the core for the transformer or converter.

The numeral 3 indicates a primary winding consisting of a coil or coils of insulated wire, and

The numeral 4 indicates the terminal leads of the primary winding.

Between the primary winding 3 and the core 2 is the secondary winding 5 and this winding preferably consists of a concentric sheath of copper, nickel, or any non-magnetic metal or metals, alloy or alloys.

The electric fluid heater may be an elemental unit or a combination of elemental units, each of which consists of three parts: First, an iron or steel tube or pipe (2) in which water or any other fluid flows, and in which it is heated. This pipe or tube also provides a path of low reluctance for the magnetic flux. Second, a primary winding (3) consisting of a coil or coils of insulated copper or other conducting wire or wires to which electrical energy is supplied by connecting the leads (4) to some source of alternating currents. Third, a secondary circuit consisting of a concentric sheath (5) of copper, nickel, or any non-magnetic metal or metals, alloy or alloys.

The concentric sheath (5) is in contact or very close proximity to the central iron or steel tube or pipe (2) and the coil or coils of insulated wire (3) are wound around the concentric sheath (5) as closely as possible.

The electric energy received by the primary winding (3) is transmitted chiefly to the secondary circuit (5) by transformer action and is there converted into heat. A small portion of the energy received is converted into heat in the primary winding (3) due to its resistance (RI^2 loss) and also in the central iron or steel tube (2) due to hysteresis and eddy currents.

The advantage of this mechanism results from the reduced leakage flux between the primary and secondary circuits. This reduction is obtained chiefly by using the concentric sheath of non-magnetic metal or alloy mentioned, in contact with or in close proximity to the central iron or steel pipe described. The power factor is by this means greatly improved over that of any existing electric heater of the induction type. The power factor in our invention is greater than 95%, while in existing heaters of the induction type it does not exceed 83%.

Our invention differs from existing electric heaters of the induction type in this important respect, namely, the presence of the concentric sheath of non-magnetic metal forming the secondary circuit as above described—and the relation of the parts is such that a very close assemblage between the fluid carrying core, the primary winding, and the secondary is secured, and not only does this give a very compact and convenient type of heater, but one in which the power factor is greatly improved. Furthermore the construction is such that the manufacture and assemblage of the parts may be very quickly and cheaply made.

We are aware that at present there is patented the combination in electric heaters of a primary coil through alternating currents flow, a metallic cylinder constituting a secondary coil or circuit inside of a primary, an iron core inside of said cylinder, with a chamber for passage of fluid between said secondary coil and said iron core, but,

What is claimed is:—

1. An electric heater consisting of a transformer having a hollow core with an unobstructed fluid passage therethrough, a secondary coil or circuit surrounding said hollow core and closely adjacent thereto, and a primary coil surrounding said secondary.

2. An electric heater consisting of a transformer having a tubular core with an unobstructed fluid passage therethrough, a metallic sheath forming a secondary coil or

circuit in contact with and surrounding said tubular core, and a coil of insulated wire constituting a primary circuit closely surrounding said secondary.

3. An electric heater consisting of a transformer having a hollow core formed of an iron or steel pipe with an unobstructed fluid passage therethrough, a sheath of non-magnetic metal fitting closely said hollow core, and a coil of insulated wire forming the primary fitting closely the said secondary throughout substantially its entire length.

4. An electric heater consisting of a transformer having a core of iron or steel pipe of uniform exterior and interior diameter, a sheath of non-magnetic metal forming a secondary circuit fitted exteriorly of said pipe, and a primary coil wound closely about said non-magnetic sheath.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

CARL EDWARD MAGNUSSON.
LESLIE FORREST CURTIS.

Witnesses:
LUCAS C. KELLS,
ROY W. MCREYNOLDS.