(No Model.)

L. S. M. PYKE & H. T. BARNETT.

ELECTRICAL INDUCTORIUM.

No. 484,543. Patented Oct. 18, 1892.

FIG. 3.

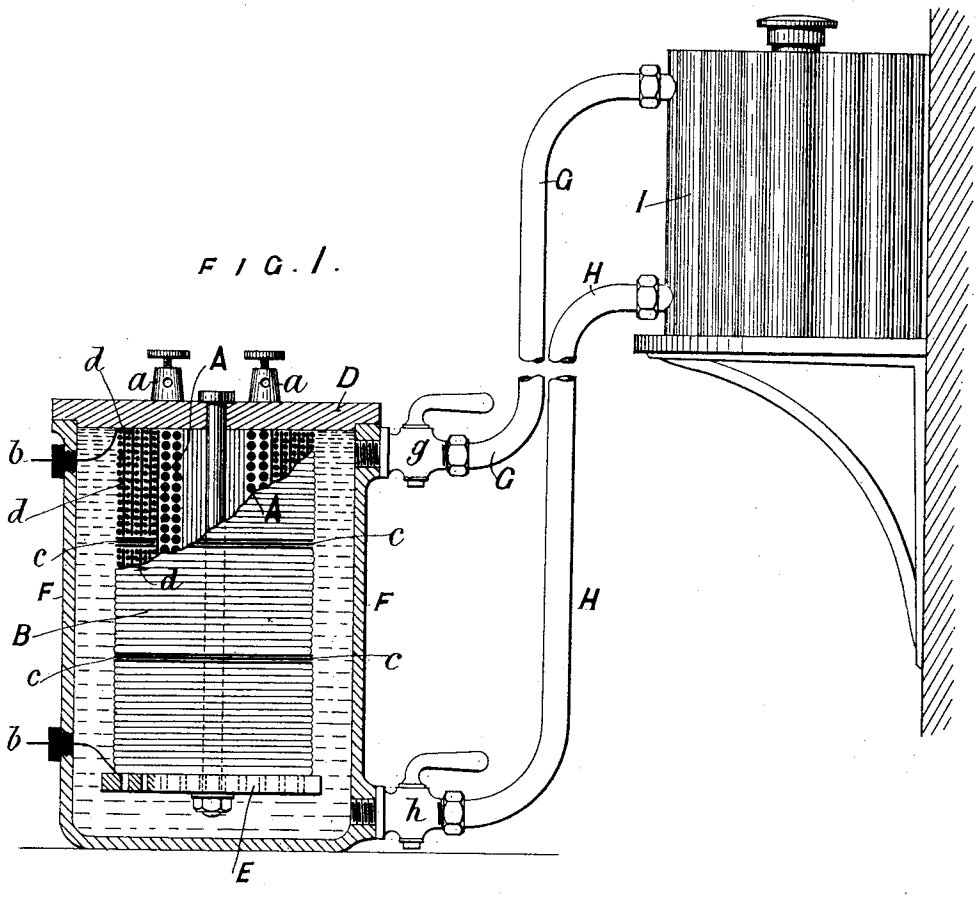

FIG. 1.

FIG. 2.

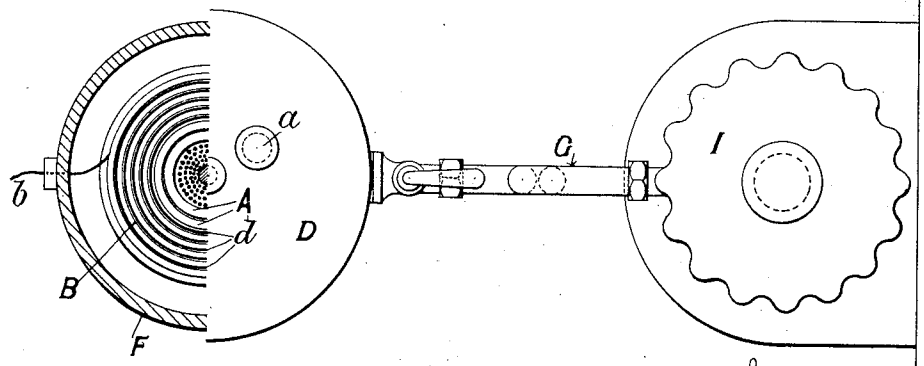

FIG. 4.

Witnesses;
L. M. Rachschlager,
H. E. Ewing.

Inventors;
Lazarus S. M. Pyke
Harry T. Barnett.
by Bissell & Knauth
their Attorneys.

UNITED STATES PATENT OFFICE.

LAZARUS SIMON MAGNUS PYKE AND HARRY THEODORE BARNETT, OF LONDON, ENGLAND, ASSIGNORS TO SAID PYKE AND EDWARD STEPHEN HARRIS, OF SAME PLACE.

ELECTRICAL INDUCTORIUM.

SPECIFICATION forming part of Letters Patent No. 484,543, dated October 18, 1892.

Application filed February 5, 1892. Serial No. 420,441. (No model.) Patented in England March 12, 1890, No. 3,900.

To all whom it may concern:

Be it known that we, LAZARUS SIMON MAGNUS PYKE, residing at 34 New Tothill Street, in the city of Westminster, and HARRY THEODORE BARNETT, residing at 16 Hotham Road, London, England, electrical engineers, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in Electrical Inductoria, (for which we have received Letters Patent in Great Britain, No. 3,900, dated March 12, 1890,) of which the following is a specification.

This invention relates to the insulation and cooling of electrical inductoria or induction-coils and transformers; and it consists, essentially, in the combination, with an inductorium or coil having its coils mechanically insulated by a material which is readily permeable by liquid, of a mass of insulating liquid in which the inductorium or coil is immersed so that it is entirely surrounded by and thoroughly permeated in all its parts with a sufficient mass of liquid to effect the necessary insulation. The insulating liquid employed may be petroleum, paraffine-oil, or other analogous heavy liquid hydrocarbon, and in order that the same may constitute an efficient electrical insulating medium, so as to effectually prevent leakage of high-tension currents, it is thoroughly dehydrated by being passed through preferably powdered metallic potassium, sodium, or some other substance capable of seizing on and decomposing any water.

In order to prevent the ultimate overheating of the liquid without the employment of an inconveniently-large volume thereof in the transformer-container, the invention further consists in the combination, with the inductorium or coil, the liquid insulator, and the container in which these are placed, of a system of circulating-pipes and cooling-vessel, whereby the liquid is maintained in constant circulation around and through the inductorium or coil by the change of specific gravity due to change of temperature of the liquid and whereby the liquid which has become heated is cooled again, and so fitted for continuing its work of insulating and cooling the coil, the vessel in which the cooling is effected being so constructed as to expose relatively to its volume a large area of heat-radiating surface at which the heat acquired is abstracted—say by a water-jacket—or dissipated into the surrounding atmosphere, some sodium, potassium, or some other substance capable of seizing on and decomposing any water being placed in the liquid-insulator circuit to continually maintain the dehydration of the same. The inductorium is so wound and constructed as to have interstices between or through as many as possible of its parts to permit free circulation of the liquid insulator, and where space allows the container itself may have a corrugated cooling-surface or a water-coil or other means of lowering the temperature of the liquid insulator.

Reference is to be had to the accompanying drawings, forming part of this specification, wherein—

Figure 1 represents an elevation of an electrical inductorium or coil, partly in section, immersed in the insulating liquid within a containing-vessel, which is represented in vertical section. Fig. 2 is a half-sectional plan of the same. Fig. 3 is an elevation, and Fig. 4 a plan, of a cooling-vessel coupled therewith.

The same reference-letters indicate the same parts in all the figures.

A is the primary wire connected to the terminals *a*, and B the secondary wire connected to the terminals *b*. The primary wire A is by preference double-cotton covered and the secondary wire is single silk or cotton covered. The secondary wire is by preference coiled in sections, which may be separated from each other by spaces or by several thicknesses of any unsized or porous paper *c*, the various concentric windings or layers of each section also being separated from each other and from the primary wire by sheets of porous paper or other porous material *d*. The coil is preferably supported from above by a central bolt passing through the core and through the end pieces D E, of which the latter is perforated to permit of the liquid penetrating and circulating, and the former, which is of wood, forms the cover for the containing-vessel F, which is preferably of glass.

This vessel is shown provided with a pair of vulcanite plugs, through which the ends of the secondary wire are led to their terminals *b*. The plate D rests upon the edges of the containing-vessel F, upon which it is pressed so as to make a hermetic closure, the coil being thus supported within the container F. The latter is filled with the insulating liquid, in which the coil is entirely immersed and by which it is permeated throughout its whole structure by reason of the porous nature of the materials by which its wires and coils are mechanically separated and partly insulated. The vessel F is connected at points respectively near its top and bottom with flow and return circulation pipes G H, (shown controlled by stop-cocks *g h*,) and respectively connected with the top and bottom parts of a cooling-vessel I, placed at a sufficiently-higher level as nearly as possible above the vessel F to establish a continuous circulation of the liquid.

The cooling-vessel I is shown constructed of sheet metal corrugated so as to expose a relatively-large area of cooling-surface and is provided with a filling-aperture closed by a screw-cap. The circulation system is kept closed at all points to prevent absorption of moisture from the air.

The invention has been described and illustrated as applied to an open magnetic circuit high-tension transformer, for which purpose this invention is invaluable, having rendered possible for the first time the employment of a relatively-small transformer capable of converting to an enormously-high tension and of working for prolonged periods without any appreciable rise of temperature.

What we claim is—

1. The herein-described method of insulating and cooling an electrical inductorium (induction-coil or transformer) by conveying to and away from the containing-vessel by a continuous circulation through the coils a dehydrated hydrocarbon, substantially as described, and for the purposes set forth.

2. The combination, with an electrical inductorium (induction-coil or transformer) whose wires are mechanically insulated or separated by permeable material, of a dehydrated liquid hydrocarbon contained in a vessel surrounding said inductorium, and means for maintaining a continuous flow of the liquid hydrocarbon from, to, and in said vessel, substantially as described, and for the purposes set forth.

3. The combination, with an electrical inductorium (induction-coil or transformer) whose wires are mechanically insulated or separated by permeable material and which is immersed in liquid hydrocarbon contained in a vessel, of a system of circulation-pipes and cooling-vessel connected to the containing-vessel, as described, for the purpose of carrying off and radiating the heat generated by the inductorium, as specified.

4. The combination, with an electrical inductorium (induction-coil or transformer) whose wires are mechanically insulated or separated by permeable material and which is immersed in liquid hydrocarbon contained in a vessel, of a system of circulation-pipes and cooling-vessel connected to the containing-vessel, as described, for the purpose of carrying off and radiating the heat generated by the inductorium, as specified, either the containing-vessel or the cooling-vessel having corrugated sides, so as to expose a relatively-large area of radiating surface, as described.

5. The combination, with an electrical inductorium (induction-coil or transformer) whose wires are mechanically insulated or separated by permeable material and which is immersed in liquid hydrocarbon contained in a vessel, of a system of circulation-pipes and cooling-vessel connected to the containing-vessel, as described, and some substance capable of energetically decomposing water for the purpose of continually dehydrating the liquid hydrocarbon, as specified.

Dated this 12th day of January, 1892.

LAZARUS SIMON MAGNUS PYKE.
HARRY THEODORE BARNETT.

Witnesses:
G. F. WARREN,
Notary Public, London.
JOSEPH LAKE,
17 *Gracechurch Street, London, E. C.*