

(No Model.)

H. LEMP.
ELECTRIC METAL WORKING APPARATUS.

No. 534,802.

Patented Feb. 26, 1895.

FIG. 1.

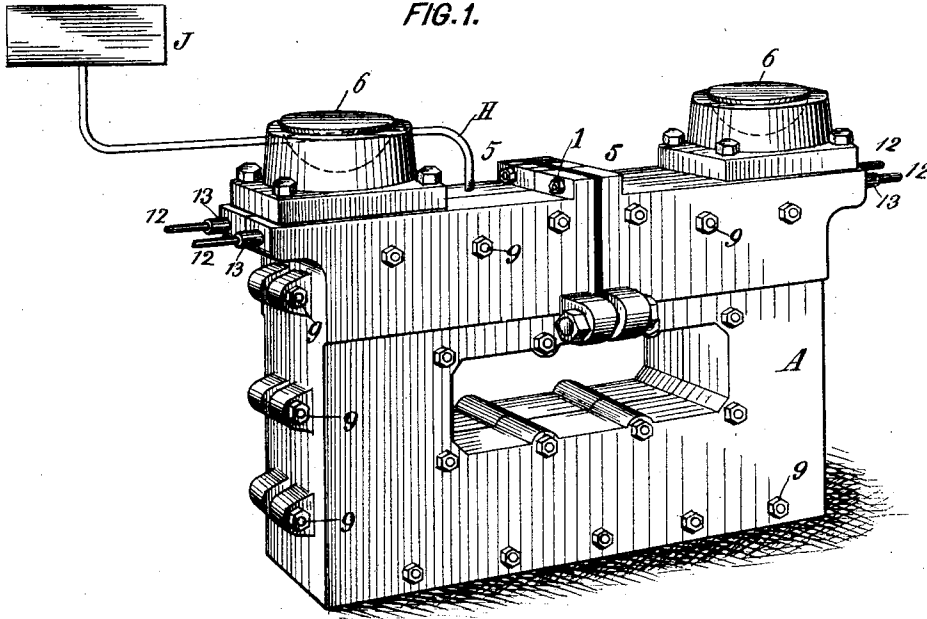


FIG.3.

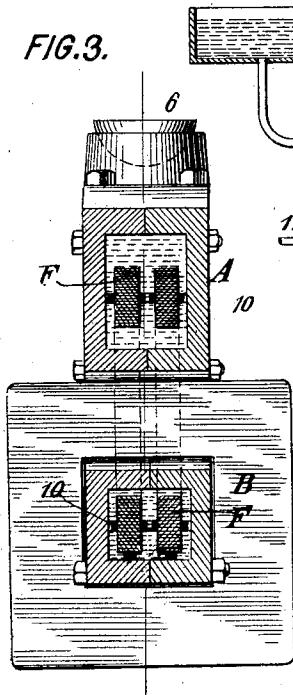
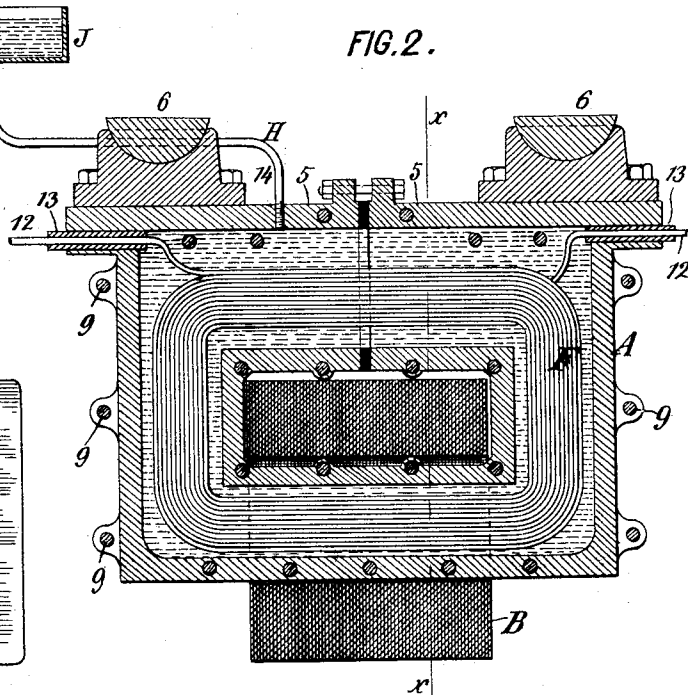


FIG. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTRIC METAL-WORKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 534,802, dated February 26, 1895.

Application filed December 3, 1892. Serial No. 453,918. (No model.)

To all whom it may concern:

Be it known that I, HERMANN LEMP, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric Metal-Working Apparatus, of which the following is a specification.

My invention relates to transformers or converters and is designed especially to provide an efficient and cheap construction of a transformer adapted to furnish the heavy currents employed in electric welding and other metal working apparatus.

While I have described the invention as carried out in a transformer having its coil or conductor of heavy cross section forming the secondary thereof, it will be obvious to electricians that the transformer constructed as hereinafter described might be employed for generating currents of higher potential than those supplied to it by simply using the conductor of heavy cross section as a primary and, therefore, my claims are to be understood as covering that use of the construction specified in such claims which would involve simply the inversion of the apparatus, that part of the same which is for ordinary use the secondary becoming in such case the primary. I shall, however, describe the invention as carried out in a transformer wherein the conductor or coil of heavy cross section is used as a secondary to generate heavy currents.

My invention provides a transformer wherein magnetic leakage between the primary and secondary will be prevented; the primary will be protected from contact with the secondary in an effective manner while the primary will be rendered waterproof and shielded from mechanical injury as well; and the heat generated either in the primary or secondary during use will be readily carried away without breaking down the insulation.

The invention consists in making the secondary or heavy section element of the apparatus as a liquid tight tube which envelopes the primary and in keeping the primary immersed in oil contained in said secondary.

The invention consists further of an electric transformer having a primary wound with a number of turns and a secondary having but one turn and composed of a single tube which follows the winding of the primary coil and forms a tubular envelope or jacket therefor throughout substantially its whole length.

The invention consists further in making the secondary or heavy section element from two solid copper castings bolted together to form a tube inclosing the primary.

The invention consists also in the features of construction and combinations more particularly specified in the claims.

In the accompanying drawings:—Figure 1, illustrates a transformer embodying my invention the usual iron core being removed. Fig. 2 is a vertical longitudinal section of the transformer. Fig. 3, is a vertical cross section through said transformer on the line x, x , Fig. 2.

A, is the tubular secondary which contains the two primary fine wire coils F. The secondary or heavy section conductor A, is formed as a liquid tight tube and completely incloses the primary as shown.

The electrical terminals or poles of the secondary A, are formed at 5, where the ends of the tubular secondary come close together, the general shape in outline of the secondary being square or rectangular although this form may obviously be departed from to any desired extent. The secondary as will be seen forms but a single turn of very heavy cross section.

At or near the poles or terminals 5, 5, are mounted suitable contacts 6, 6, by which current may be taken off from the secondary for any desired purpose. These contacts 6, 6, are preferably formed as hemispherical blocks of copper accurately ground into sockets on the secondary.

To form an endless tube which may serve as a liquid receptacle containing the oil and primary the ends of the secondary are united at 5, by an insulating liquid tight joint 7, of any suitable character. This joint may be a piece of wood or any other suitable material

and may be rendered absolutely tight by any well known cement poured between the metal and wood.

As will be seen from the drawings the secondary or heavy section conductor A, consists of two metal channel castings fastened together by bolts at points 9. To form a good joint between the two halves of the secondary when thus bolted together a thin packing may be interposed between the halves at the joint.

I do not limit myself to the exact form of the castings and they might, if desired, be of different shape in cross section if they both be adapted to form a tube when bolted together around the primary.

It will be understood that the primary is applied in the groove or channel of one of the castings and then the other placed over it to inclose it. The primary may consist of any form of conductor but preferably is made of copper strips insulated by asbestos, preferably asbestos cloth, and loosely wound to allow the asbestos to take up the oil and to permit a partial circulation of oil therethrough. The primary is held in position in the tube out of contact with the latter by means of supports or distance pieces 10, distributed at proper points. Terminals of the primary wire are indicated at 12. They pass through insulating bushings 13, in the casting A, which bushings are properly constructed to form a liquid tight joint. When the secondary has been placed around the primary and the proper liquid tight joints formed, as described, it is filled with oil, connection with a reservoir or supply pipe being maintained to allow for expansion under increase of temperature. Preferably I employ some heavy cylinder oil that shall stand as high a temperature as 100° centigrade. The oil affords waterproof insulation and a means for conveying heat away from the primary.

As shown the primary coil consists of a number of turns designed to produce from a current of considerable tension a current of reduced potential but very large volume in the secondary A. The oil may be introduced through an orifice at 14 or any other point. H, is a tube connected to such orifice and leading from any suitable reservoir J. The tube H, may be a flexible copper tube and the reservoir or stand pipe may be located at some distance from the transformer.

While it is preferable to make the secondary or heavy section element as an endless tube by joining its ends through an insulating joint, it will be obvious that my invention is not limited to such construction as the ends might be at some distance from one another and the two free ends of the tube stopped independently of one another. I prefer, however, to use the construction shown wherein the tube is made endless, by bringing the terminals of the casting in close proximity and joining them through an insulated

joint. K is the usual laminated iron core made in two or more sections secured together and threading the primary and secondary as indicated at K.

In this transformer it will be seen that the maximum efficiency is obtained for a given weight of copper inasmuch as the secondary completely surrounds the primary coil so that the lines of force generated by the primary shall cut the secondary to the greatest extent possible.

What I claim as my invention is—

1. An induction coil or converter having a secondary constituting a liquid tight tube enveloping the primary and containing oil, as and for the purpose described.

2. In an induction coil or converter, the combination with the primary, of a tube enveloping the same and constituting the secondary, said tube having its ends united by an insulating liquid tight joint to form a liquid receptacle, and containing oil, as and for the purpose described.

3. The combination in a converter, of a primary having a number of turns and a secondary consisting of a sealed metal tube enveloping the primary coil and containing oil, as and for the purpose described.

4. An electric transformer having a primary wound with a number of turns and a secondary having but one turn and composed of a single tube which follows the winding of the primary coil and forms a tubular envelope or jacket therefor throughout substantially its whole length.

5. In an electric transformer, the combination with a primary having a number of turns, of a secondary having but a single turn enveloping the primary coil, and filled with oil, substantially as described.

6. In a transformer, a secondary consisting of two metal channel castings fastened together to form a tube, in combination with a primary contained in said tube.

7. In a transformer, a secondary having a single turn composed of two grooved castings secured together to form a tube containing the primary.

8. In a transformer, the combination with a tubular secondary forming an oil containing receptacle, of a primary enveloped thereby, and consisting of loosely wound metal strips separated by asbestos.

9. In a converter, the combination with a tubular secondary, of an inclosed loosely wound primary immersed in oil contained in said secondary, as and for the purpose described.

10. In a converter, the combination with the primary, of a secondary consisting of two solid copper castings bolted together so as to form a tube inclosing the primary, the interior space being filled with oil, as and for the purpose described.

11. The combination, substantially as de-

scribed, in a transformer, of a tubular secondary inclosing the primary and filled with oil, and an oil reservoir or stand pipe connected with said tubular secondary, as and for the purpose described.

5 12. The combination, substantially as described, with the tubular secondary, of a primary supported out of contact with the tube by suitable distance pieces or supports and

immersed in oil contained in said secondary, as and for the purpose described. 10

Signed at Lynn, in the county of Essex and State of Massachusetts, this 30th day of November, A. D. 1892.

HERMANN LEMP.

Witnesses:

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