(No Model.)

H. LEMP & J. TREGONING.

ELECTRIC METAL WORKING APPARATUS.

No. 432,629. Patented July 22, 1890.

Fig. 1.

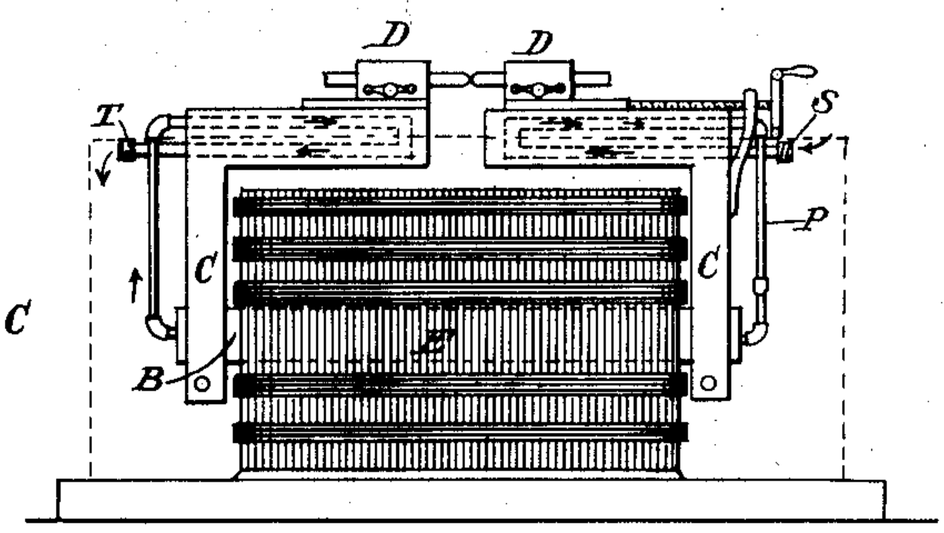


Fig. 2.

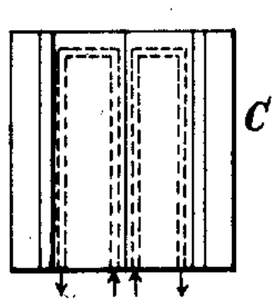
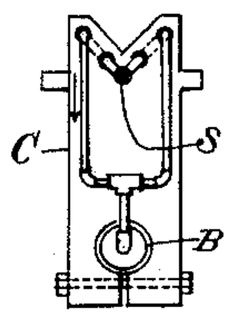


Fig. 3.



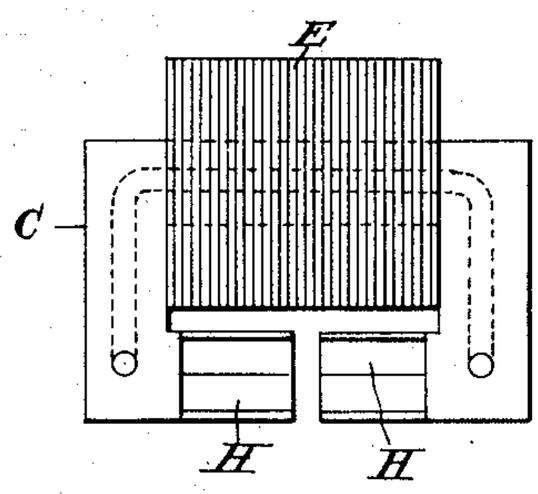


Fig. 4.

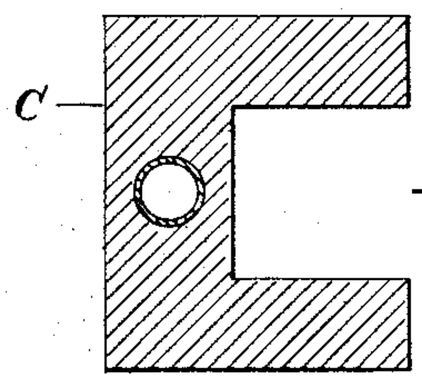


Fig. 5.

ATTEST:

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UNITED STATES PATENT OFFICE.

HERMANN LEMP AND JOHN TREGONING, OF LYNN, MASSACHUSETTS, ASSIGNORS TO THE THOMSON ELECTRIC WELDING COMPANY, OF MAINE.

ELECTRIC METAL-WORKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 432,629, dated July 22, 1890.

Application filed April 2, 1890. Serial No. 346,270. (No model.)

To all whom it may concern:

Be it known that we, HERMANN LEMP and JOHN TREGONING, citizens of the United States, and residents of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Electric Metal-Working Apparatus, of which the following is a specification.

Our invention relates to apparatus in which electric currents of large volume and heating effect are employed, but more particularly to apparatus employed for welding, forging, brazing, riveting, and other metal-working operations wherein the work is heated by the passage of an electric current.

In some of its features our invention applies more especially to electric induction-coils or transformers built with special reference to the production from a primary current of a secondary current of great volume but comparatively low electro-motive force. In transformers or induction-coils of this general character constructed for welding or other metal-working operations, the secondary bar or conductor in which the currents of large volume are developed and conveyed to the holders for the work after continued use is liable to become heated to an undesirable extent. This heat will appear principally at the movable or jointed parts of the apparatus, owing to the higher resistance at such points. When a clamp-slide is employed in this class of apparatus, it therefore happens that the heat is developed to a very great extent in the bed on which such clamp moves and is actuated. It may occur, also, that all the parts of the secondary may become heated by reason of conduction or through the presence of the currents of great volume and the rapid changes of electrical or magnetic condition existing when the apparatus is operated by alternating currents.

Our invention consists, essentially, in the provision for that part of the solid conductor on which the clamp-slide is actuated and moves of internal passages or pipes adapted to provide circulation for a cooling medium.

Our invention consists, further, in the combination, with the solid copper or other conductor forming the secondary for a transformer or induction-coil, of internal passages for circulation of a cooling medium.

Our invention consists, also, in the combination, with an electric conductor made of cast copper, of an internal pipe or conduit made of a denser material and preferably inclosed in the copper by casting such copper around it. By the use of such separate pipe or tube of denser material we obviate the difficulty which arises from the fact that the cast copper is ordinarily so porous as to permit a cooling fluid to leak through it. The pipe or tube of a denser material included in the cast metal of the conductor may be of the same material as the conductor itself or may be of a different material, it only being necessary that such tube or pipe should be of a material sufficiently dense to prevent leakage. By casting the conductor around the tube or passage we, moreover, facilitate the manufacture of electric conductors in which it is desirable that there should exist a tube or passage for a cooling circulating medium. This facility of manufacture exists especially where the tube or passage is tortuous.

In the accompanying drawings we have shown in Figure 1, in side elevation, a form of induction-coil constructed in accordance with our invention and adapted to furnish currents for electric welding or other electric metal-working operations. Fig. 2 is a plan of the bed or rest on which the clamp-slide moves. Fig. 3 is an end elevation of a portion of the apparatus. Fig. 4 illustrates the application of our invention to another form of secondary conductor. Fig. 5 is an enlarged cross-section through the secondary conductor, Fig. 4.

E indicates a body of laminated iron, such as is employed in electric transformers. The laminated mass or core is open at its center to receive a copper tube or conductor B, and the primary wire of the apparatus is threaded through the same opening with the tube B, and passing around the outside of the iron core, as is usual in the art. The tube B forms a part of the secondary, which secondary is continued in the shape of castings C, fastened to the ends of the tube and having at their inturned upper ends suitable rests or supports for clamps D D, of any suitable construction

adapted to hold the work. The clamps D D may be made, one or both, movable by any suitable devices. The movable clamp or clamps preferably move in a V-shaped groove or bearing on the upper side of the secondary bar, as shown more clearly in Fig. 3. The form of the clamps themselves, of the actuating and bearing devices, and of the means for moving one or both of them, form no part of our present invention, and are therefore not described with any greater particularity.

In the body of metal upon which the movable clamp-slide is guided are provided passages, as shown in dotted lines, for the circulation of a cooling medium. These passages may be made by drilling into the copper, but preferably, as will be presently described, are constructed of tubes of iron or brass, around which the solid metal of the conductor C is cast. Through the tube B, forming a part of the secondary, there also passes a pipe, as indicated, which is connected with the system of circulation, as will be presently described. In the present instance four longitudinal pipes or passages are shown in the bearing for the clamp-slide, two located near the center or bottom of the guide portion and two nearer the outside and top, the two latter being connected, respectively and separately, with the two inner tubes. The outer ends of the two inner tubes are joined together to a pipe S, through which cold water or other cooling liquid may be delivered, while the two outer ends of the external pipes are joined, as shown, through a pipe P, to one end of the tube leading through the conductor B. The system of circulation is continued, if desired, in a similar manner through the opposite side of the apparatus, and the liquid is carried away through an exit-pipe at T.

In practice it will be found rather difficult to drill the copper castings so as to form passages in the manner shown, and besides it frequently happens that the porous nature of the cast copper or other conductor would allow the liquid to leak. To avoid this difficulty we propose to form the passages from tubing of the proper size and form and of a material whose melting-point is higher than that of copper. Ordinary iron gas-tubing will serve the purpose. The tubing, arranged as may be required, is laid in the mold and the copper cast around it, the ends of the tubing being allowed to project from the casting sufficiently to allow the connecting-tubes to be joined to it. As the iron tubing is sufficiently dense to prevent leakage, the difficulty arising from the porous nature of the copper is entirely avoided. The tubing as contained in the cast copper of a different form of conductor is illustrated in Fig. 5 in cross-section. The form of conductor there shown is one which is illustrated in plan in Fig. 4, and may constitute the secondary bar of a transformer.

The groove illustrated in Fig. 5 in the side of the copper bar serves to receive the primary windings and the ends of the copper bar or casting at H H receive or support the clamping devices or other attachments for utilizing the current. The ends at H H are separated, as shown, by a slight space to insulate the two poles from one another. The laminated iron core (indicated at E) is applied in any usual way, as by forming the same in two parts and clamping the parts together over the secondary body. The circulating-tube in such secondary bar may take any desired path for keeping the parts liable to heating cool.

We do not limit ourselves to the use of copper as the conductor, and our invention is obviously applicable to a conductor made of any other conducting material.

The internal circulating-tube, it is obvious, might be even made of copper itself, provided it were, for instance, of drawn copper or of copper sufficiently dense in structure to prevent leakage.

What we claim as our invention is—

1. In an electric welding or metal-working apparatus, the combination, with the sliding clamp, of a guide-rest for the same having internal passages for circulation of a cooling medium.

2. In a transformer or induction-coil, a bar secondary having internal passages for circulation of a cooling medium.

3. An electric conductor of cast copper having internal pipes or conduits made of denser material.

4. An electric conductor of cast copper or similar good conducting material having internal pipes or passages of a denser nature around which the copper is cast.

5. In an electric transformer for metal-working operations, a cast copper secondary having pipes of denser material for carrying a cooling-liquid inclosed in said copper by casting the copper around them.

6. In an electric transformer, a secondary bar or conductor consisting of cast metal, such as copper, provided with circulating tubes or pipes inclosed in the casting

7. An electric conductor of cast copper cast around an internal pipe or tube for carrying a cooling medium.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 29th day of March, A. D. 1890.

HERMANN LEMP.
JOHN TREGONING.

Witnesses:
H. J. WIGHTMAN,
WARREN B. LEWIS.