

(No Model.)

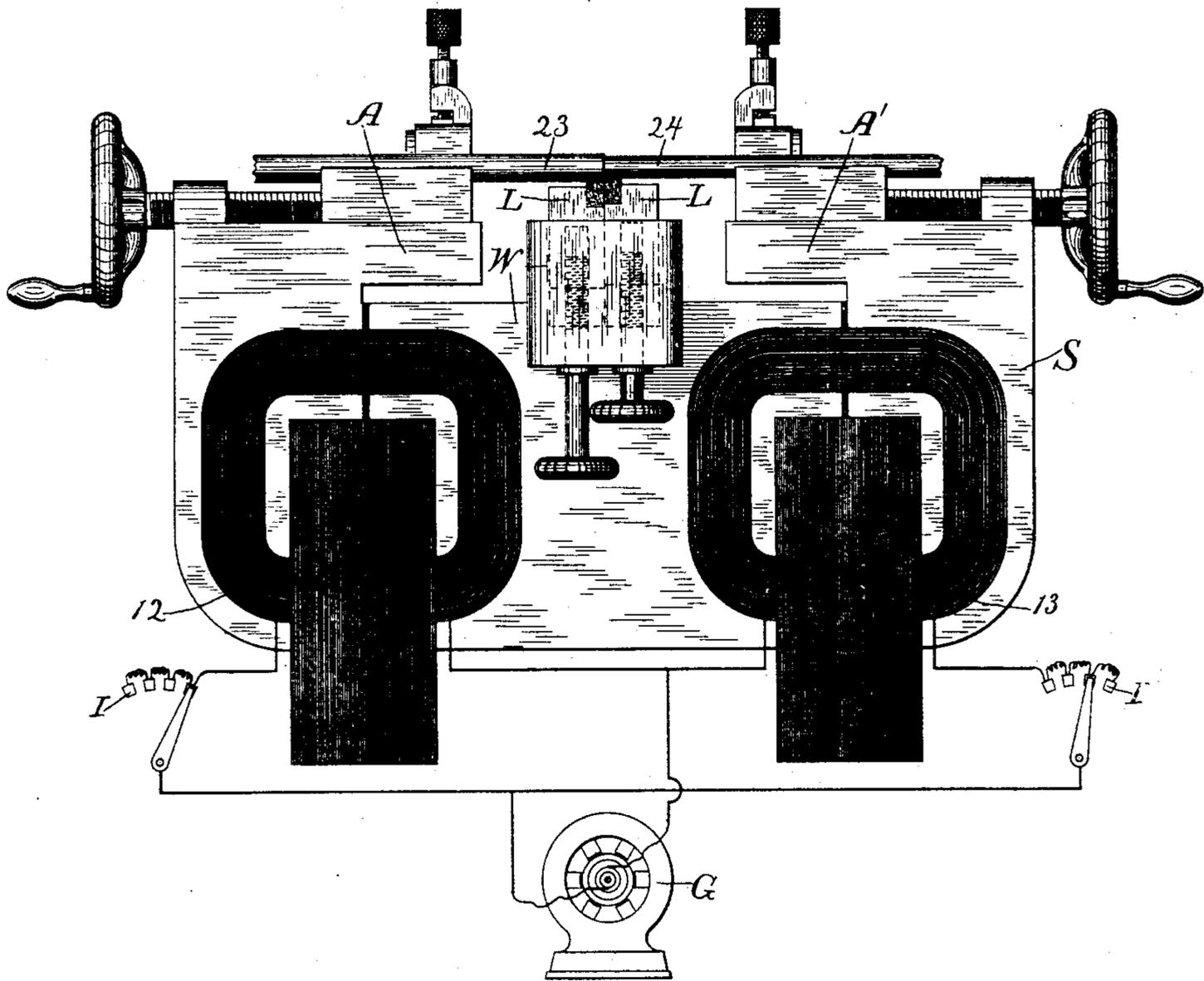
2 Sheets—Sheet 1.

H. LEMP & W. S. MOODY.
ELECTRIC METAL WORKING.

No. 515,778.

Patented Mar. 6, 1894.

Fig-1



WITNESSES:
Wm. D. Capel
J. F. Conroy

INVENTORS:
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By *H. L. Townsend*
Atty.

(No Model.)

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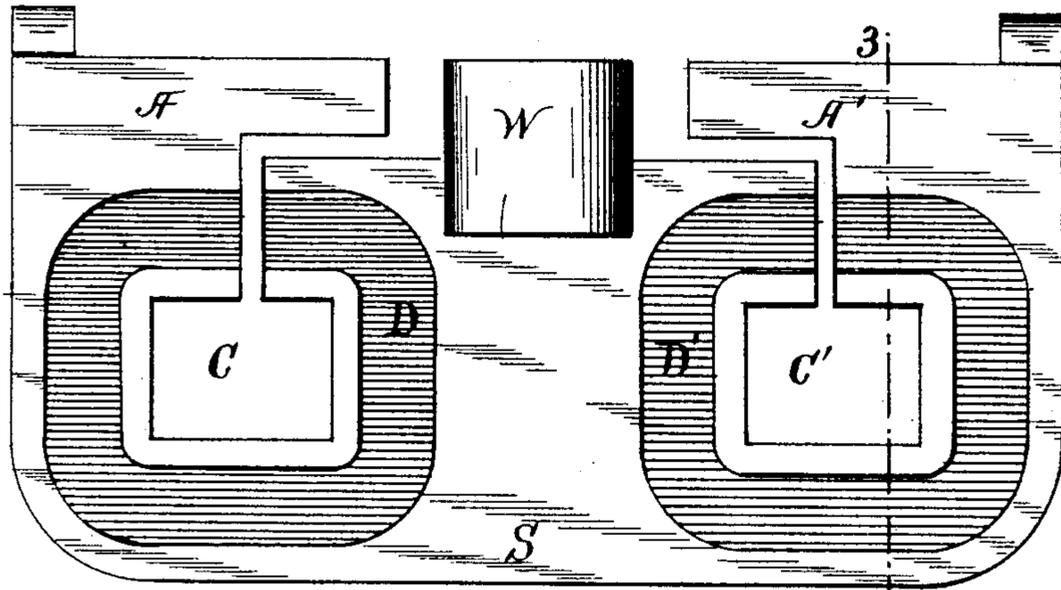


Fig. 2-3

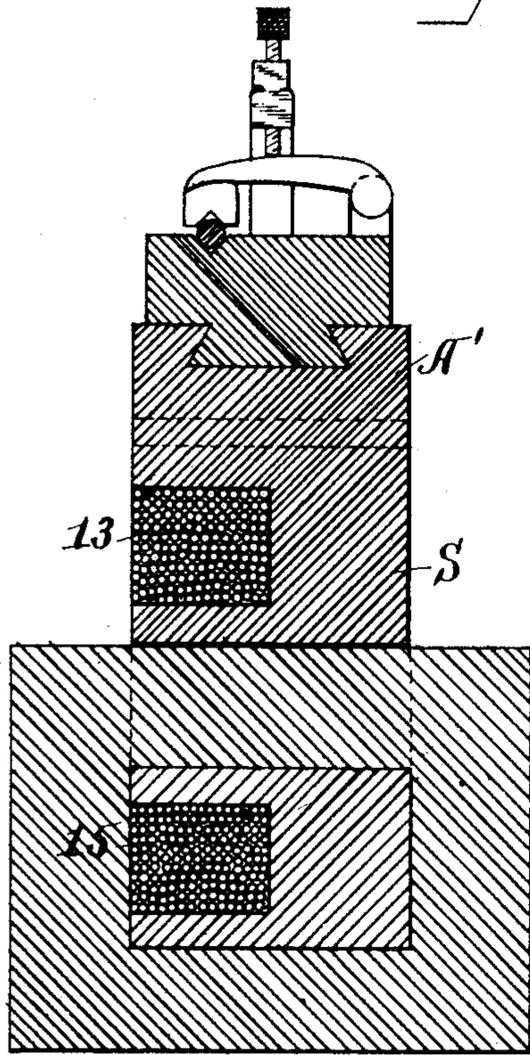


Fig. 3-

ATTEST:

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Wm. H. Capell.

INVENTORS:

Hermann Lemp &
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UNITED STATES PATENT OFFICE.

HERMANN LEMP, OF LYNN, AND WALTER S. MOODY, OF CHELSEA, MASSACHUSETTS, ASSIGNORS TO THE THOMSON ELECTRIC WELDING COMPANY, OF MAINE.

ELECTRIC METAL-WORKING.

SPECIFICATION forming part of Letters Patent No. 515,778, dated March 6, 1894.

Application filed May 26, 1891. Serial No. 394,215. (No model.)

To all whom it may concern:

Be it known that we, HERMANN LEMP, a resident of Lynn, in the county of Essex, and WALTER S. MOODY, a resident of Chelsea, in the county of Suffolk, State of Massachusetts, citizens of the United States, have invented a certain new and useful Process of Electric Metal-Working, of which the following is a specification.

10 Our invention relates to metal working operations wherein electricity is employed as the means for heating the work to the desired temperature, and has special reference to that class of work wherein the piece or pieces
15 to be operated upon by being included in an electric circuit are of different sizes or material or wherein a single piece is acted upon and is of different size or conductivity at opposite ends or portions.

20 Our invention is designed especially with reference to the electric welding of metal pieces end to end wherein one piece is of greater size or conductivity than the other, and the object is to provide a means for adjusting or determining the flow of current in
25 the two pieces so that they shall heat at the proper rate.

Our invention consists essentially in including the two pieces to be welded in a circuit between the terminals of a divided source of electric energy and connecting the work between the terminals with an intermediate point of the divided source or sources and adjusting the relative potential of the two sides
35 or portions of the source according to the conductivity of the pieces to be joined.

Our invention consists further in a construction of electric metal working apparatus adapted to be used in carrying out our invention and more particularly to a construction wherein the source of heating currents is a transformer the secondary of which consists of a body of metal of large mass or cross section.

45 In the accompanying drawings Figure 1 we have shown in side elevation a form of apparatus embodying our novel construction of apparatus, and suitable for use in practicing the method or process of welding herein
50 claimed. Fig. 2, represents the secondary bar

or conductor stripped of its appurtenances, and Fig. 3, represents a cross section of the entire apparatus taken on the plane indicated by line 3, 3, in Fig. 2.

A, A', indicate respectively the terminals
55 of a source or sources of electric energy adapted to supply current which will flow from one to the other of said terminals. These terminals or electrodes are provided with suitable means for holding the work to be operated
60 upon and are arranged in line with one another, as indicated, and have means whereby either or both may be moved in the line joining them so as to subject the work held between them to end pressure. 65

The secondary bar or conductor as more clearly shown in Figs. 2 and 3, is formed of three vertical portions joined at their lower ends and bearing at their upper ends the terminals A, A' and W. Rectangular openings
70 C, C', are provided for the reception of the usual iron cores 15, and about these openings are formed recesses or channels D, D, for the reception of the primary coils 12, 13. The cores are generally formed of plates of sheet
75 iron cut and put together in any convenient manner. The manner of constructing and applying the coils and cores may be varied without departing from our invention. Upon the terminals A, A', are mounted in any suitable
80 manner the necessary work holders. In the present instance said holders are shown as formed of blocks mounted in a dove-tail slide and carrying the common form of screw and lever clamp. At the terminal W, a similar
85 work-holder may be mounted but in the present instance we have shown said terminal provided with the adjustable contacts L, L. This terminal W, stands as a terminal common to the two secondaries, whose other
90 terminals are, respectively, A', A'.

We have herein shown the work holding devices as consisting of suitable clamps adapted to hold two pieces 23, 24, which are to be welded together and are both provided with
95 means for moving the work holder or the work which is in connection with the terminals A, A', so as to subject it to the end pressure requisite in the welding or other operation. The devices for these purposes may be
100

varied indefinitely without departing from our invention and would necessarily be modified according to the particular welding work to be done. Though we have shown the holders as having pieces 23, 24, to be joined together end to end by a butt welding process, we do not limit ourselves to that class of work and as will hereinafter appear the apparatus might be used in the same way if the work consisted of a continuous piece of metal placed between the holders to be heated by the current and of greater cross section at one end than at the other.

The electrode W, is connected to an intermediate point of the source or sources of electric energy whose extreme opposite poles are connected to the terminals A, A'. This intermediate terminal or a projection from it carries one or more contact pieces L, L, which may be moved and placed in electrical connection with the pieces to be welded, as shown. When one of said pieces is larger than the other connection is made with such larger piece by means of the contact connected to the terminal W, so as to bring such larger piece in connection with an intermediate point or point of division of the source and the potential is increased on that side of the divided source or sources which is joined immediately to the larger piece, as to terminal A, thus causing the current to flow in part from or to the point of division of the source through the work connected thereto or from the work to the point of division, on well known principles, so that the larger piece will be heated not only by the current which passes across from one extreme pole of the source or sources A, to the other extreme pole A', but also by the current passing to or from the point of division of the source, while the other piece or portion of the work connected to the terminal A', will be heated only by that part of the current which passes from one terminal A, to the other A'.

The adjustment of the relative potential of the two sides of the source at opposite sides of the point of division may be done in any desired way without departing from our invention.

In the present case we have shown the source of energy as consisting of the secondary bar S, of a transformer the two opposite electric poles or terminals of which secondary consist of the terminals A, A', while the mass of metal W, is an intermediate pole or projection from the metal bar or secondary circuit. To adjust the relative potential of the two sides of the source thus provided we preferably apply upon the bar, at each side of the intermediate pole or terminal, two primary coils and iron cores as indicated, inducing coils or primaries and iron cores being indicated at 12, 1, the same being applied to said bar or conductor S, in any proper manner to induce secondary currents in the said conductor in the same direction which currents will flow

in series from one terminal A, through the work to the other A', and then through the bar S, as a pole to terminal A. If, however, a greater current is flowing in the primary 13, than in the primary 12, there will not only be a current through the bar S, from end to end and across from A, to A', through the work, but there will be a current from A', through the right hand portion of bar S, to W, and from W, to A', through the corresponding portion of the work. If the heavier current be through primary 12, then a division of the current will be from W, through the left hand portion of bar S, to A, and through the corresponding portion of the work to W.

The primary circuits may be supplied with alternating currents from any source desired and to vary the relative potential of the two sides of the secondary, we provide, preferably, means for regulating the flow of current in each primary, such as indicated at I. The regulating device may be of any desired character known in the art. By increasing the relative flow of current in the two primary conductors by the regulating apparatus a greater or less amount of current may be made to flow through the intermediate pole W, and complete its circuit on which ever side of the secondary is given the higher potential.

It will be obvious that our invention might be employed in the same way when the pieces of material are the same in size but have different specific conductivities owing to the difference in the nature of the material.

Our invention could be employed also in regulating the relative heating of the two ends of a continuous piece of metal placed between the electrodes A, A', and larger at one end than at the other.

Our invention might be so used in case it was desired to form an upset or expansion at an intermediate portion of a tapering bar of metal included between the two movable holders of the apparatus which holders would be moved toward one another to subject the bar to end pressure and upset the material after heating by the current. In such a case if the metal were subjected to the action of a current in the ordinary way passed entirely from one terminal to the other it would heat only at the smaller end near the holder and might melt at its point of attachment instead of becoming plastic uniformly between the clamps or at the central point between them. We instance this merely as an example of the applications of the apparatus.

The special construction of the transformer itself and the means for securing the difference of potential in the two sides or portions thereof, we do not herein claim as they form the subject of claims in another application for patent filed by us of even date herewith. Nor do we claim herein the improvement in electric metal working consisting in heating the metal at any point by subjecting it to the simultaneous action of currents passed into

or through it at an angle to one another as this forms the subject of broad claims in our prior application filed October 20, 1890, Serial No. 368,695.

5 What we claim as our invention is—

1. The herein described improvement in electric welding consisting in including the two pieces to be welded in the circuit between terminals of a divided source or sources
10 of electric energy, connecting the work between said terminals with an intermediate point of the source or sources, and adjusting the relative potential of the two sides or portions of the source or sources to the relative
15 size or conductivity of the pieces to be joined.

2. The herein described improvement in electric welding, consisting in including the pieces to be welded in a circuit between the terminals of a divided source or sources of
20 energy, connecting the pieces to be joined with a point of division of said source, and increasing the current flow through the piece requiring a greater current by raising the potential of the side of the divided source con-
25 nected thereto.

3. The herein described improvement in welding metals electrically, consisting in including the two pieces while in abutment in a circuit between the two terminals of a sec-
30 ondary bar or conductor, connecting that metal piece which requires the greater current to an intermediate part of said secondary bar or conductor, inducing in the two sides of the said secondary bar or conductor
35 at opposite sides of such intermediate portion alternating electric currents of the same direction, and producing a greater potential in that side of the secondary bar which is connected to the piece requiring a greater cur-
40 rent.

4. The combination in an electric welding apparatus, of two work holders arranged in line and provided with means for applying end pressure to the pieces between them, a
45 source or sources of energy connected in series to said holders, and means for connecting the work to an intermediate point or

points of division of said source or sources, as and for the purpose described.

5. The combination in an electric metal
50 working apparatus, of two work holders or electrodes arranged in line and provided with means for moving one or both in a direction toward one another, a divided source or sources of energy connected to the same,
55 means for connecting the work to a point of division of the source, and means for adjusting the relative potential of the two sides or portions of the source at opposite sides of the point of connection of the work therewith. 60

6. The combination in an electric welding apparatus, of two work holders arranged in line and forming respectively the terminals of a source or sources of heating current, and two contacts or electrodes connected with an
65 intermediate point or point of division of said source, and adapted to make connection with the work in either holder at pleasure.

7. The combination in an electric metal working apparatus with a secondary bar or
70 conductor, of two adjustable contacts in electrical connection with an intermediate part of said bar or conductor and adapted to bear upon the work placed between the terminals of such secondary. 75

8. The combination in an electric welding apparatus, of two primary conductors, a secondary or conductor in which the said primaries induce currents in the same direction, means for holding the parts to be welded in
80 electrical connection with the terminals of said secondary, and contacts or connections from an intermediate portion of said secondary between the two primaries, as and for the purpose described. 85

Signed at Lynn, in the county of Essex and State of Massachusetts, this 18th day of May, A. D. 1891.

HERMANN LEMP.
WALTER S. MOODY.

Witnesses:

JOHN W. GIBBONEY,
WARREN B. LEWIS.