

H. LEMP.
ELECTRIC METAL WORKING APPARATUS.

No. 564,792.

Patented July 28, 1896.

FIG. 1.

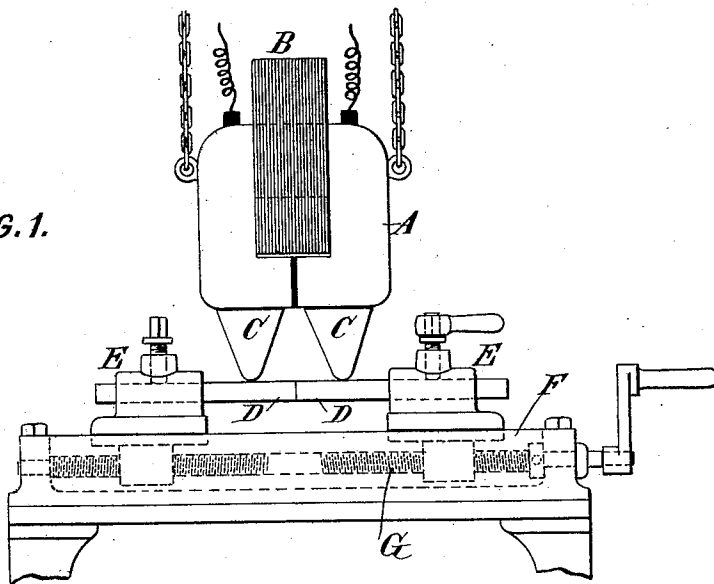


FIG. 2.

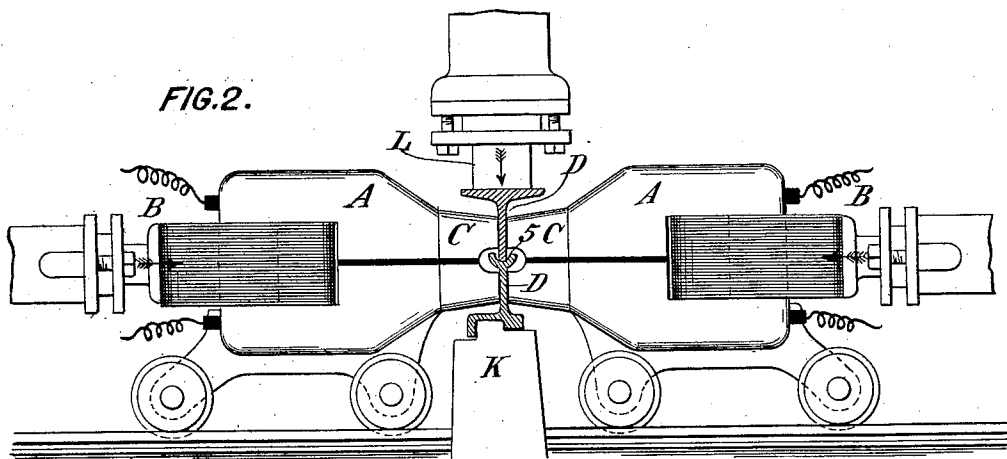
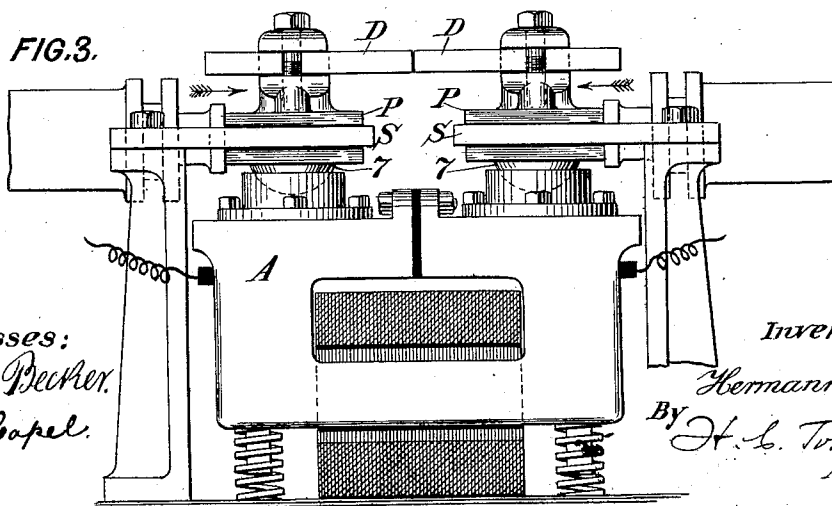


FIG. 3.



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FIG. 4.

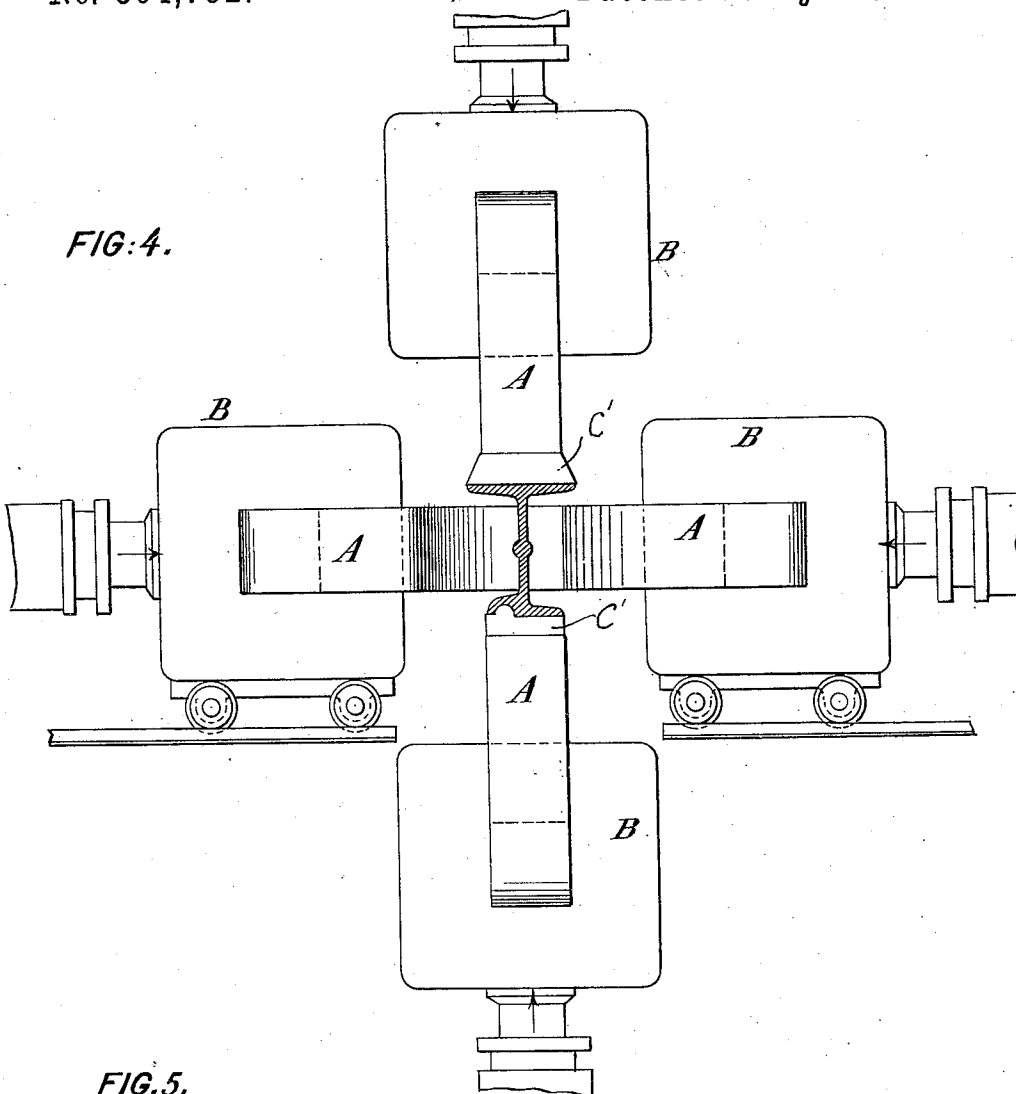
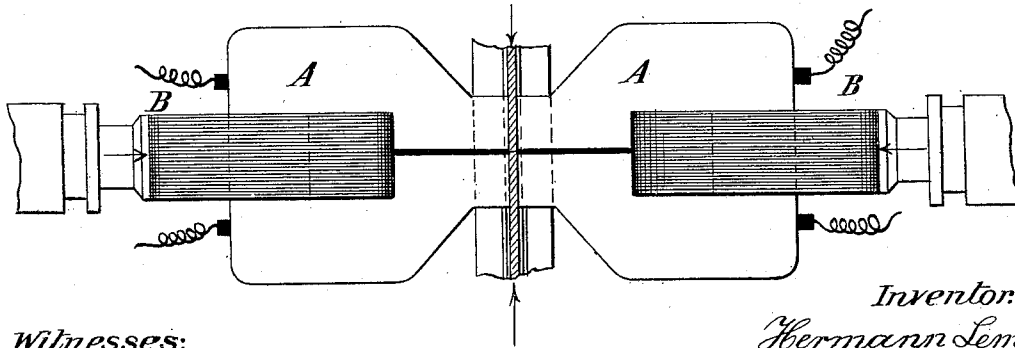


FIG. 5.



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FIG. 6.

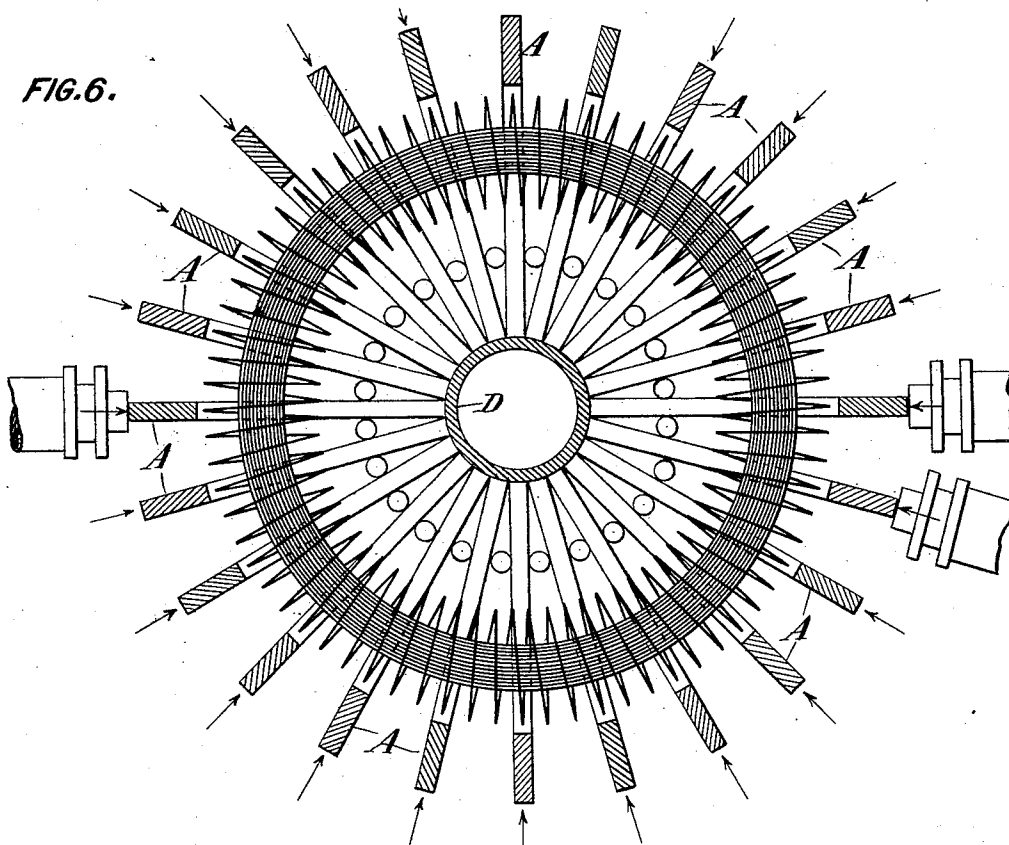
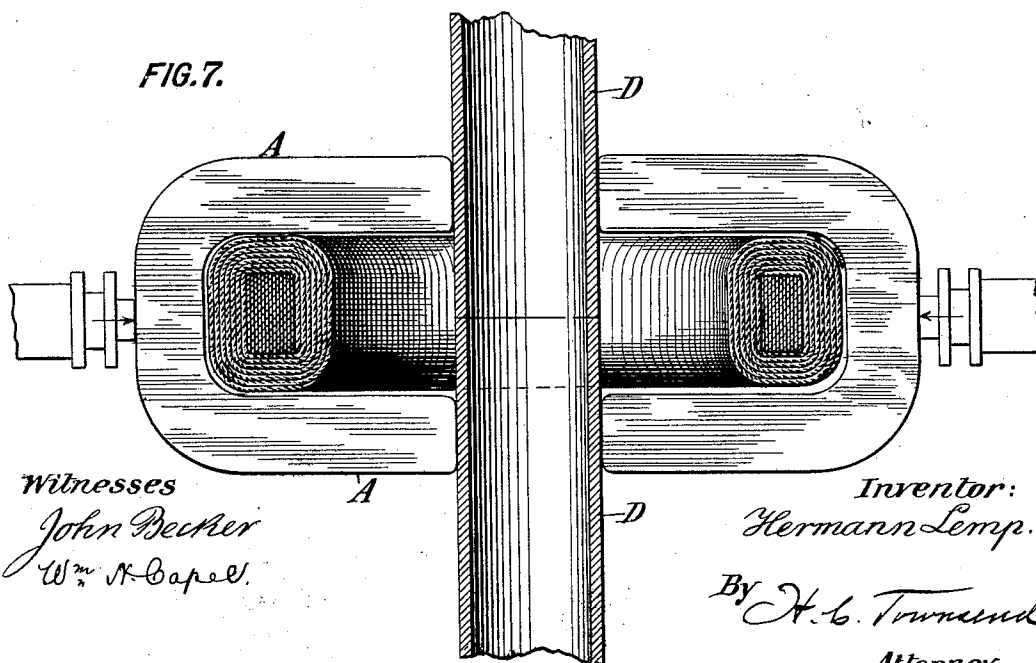


FIG. 7.



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FIG. 8.

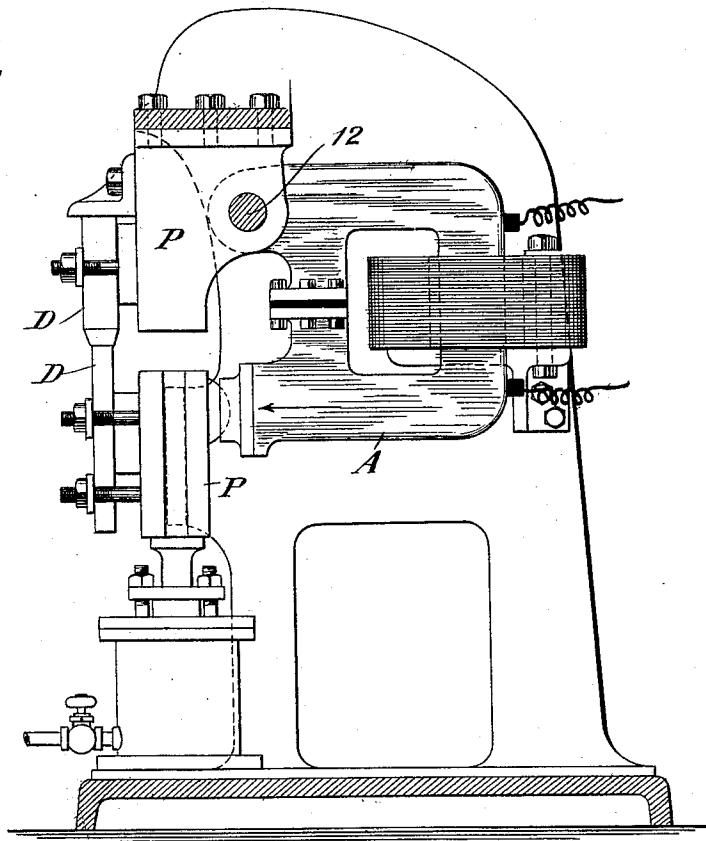
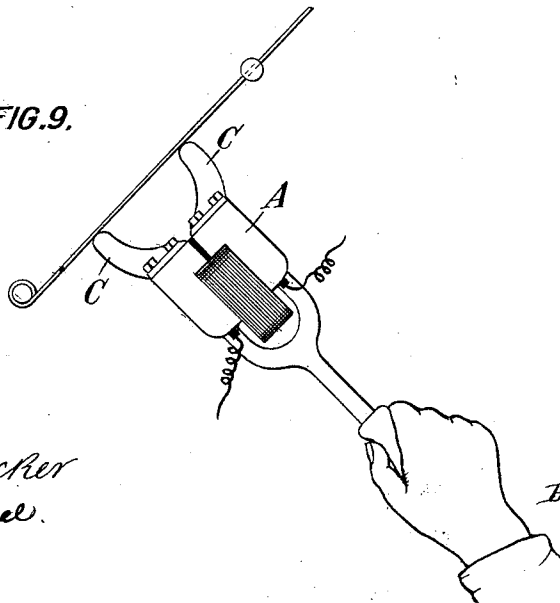


FIG. 9.



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UNITED STATES PATENT OFFICE.

HERMANN LEMP, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON
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ELECTRIC METAL-WORKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 564,792, dated July 28, 1896.

Application filed November 25, 1892. Serial No. 452,987. (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 Electric Metal-Working Apparatus, of which the following is a specification.

My invention relates to that class of metal-working operations and apparatus in which low-tension currents are employed for producing heat by the resistance of a comparatively small section of conductor to the passage of the current, in contradistinction to those operations and apparatus wherein an electric arc is formed upon the work for the purpose of heating.

As is well known, it is customary in operations where the low-tension current is required to derive such current from the secondary of a transformer whose primary consists of a conductor of a number of turns of comparatively small cross-section combined with a secondary of much greater cross-section and preferably having but a single turn. In this class of apparatus, as in all others where dependence is placed upon the low-tension current, it is desirable that the source of the heating energy should be in as close relation to the section of metal to be heated as possible, and it has been the common practice heretofore in this class of apparatus to mount the work holders or supports which require to be moved in the operation of welding or other metal-working operation directly upon the secondary or the terminals or poles constituting the source of heating energy, said work-holders being guided thereon in any proper manner. In this class of apparatus numerous difficulties and disadvantages are found to exist, by reason of the presence of sliding contacts, not only in the operation of the apparatus, but in the work of construction.

The purpose of my invention is to avoid the difficulties referred to.

Another purpose of my invention is to provide for convenient regulation of the heating of the work in those cases where the work is of such size as to require the subdivision of the transformer into a number of parts. Heretofore the regulation of the heating ef-

fect has been obtained by regulating the action of each of said parts of the transformer.

My invention consists, essentially, in making the transformer secondary movable bodily into and out of contact with the work, or with an interposed platen or block bearing on the work.

My invention consists, further, in constructing the contact-block of the terminal as a hemisphere accurately ground into a socket, whereby it will adjust itself to any angle and will distribute the contact-pressure evenly over the whole surface of contact. The work-holding clamp or clamps which require to be operated or moved are supported or guided independently of said secondary.

In carrying out the invention the whole transformer may be moved or the primary may be moved with the secondary, the core remaining stationary, or the secondary alone may be moved, the primary and the core both being stationary. The secondary might be movable as to both of its poles or as to one only, when one only of the work-holders must be moved. In the latter case the secondary could be pivoted to allow the pole or terminal to swing or move freely.

My invention consists, further, in features of construction and combinations of parts, as hereinafter more particularly described, and then specified in the claims.

In the accompanying drawings, Figure 1 illustrates in side elevation an apparatus embodying my invention. Figs. 2 and 3 show in side elevation other forms of apparatus and work embodying the invention. Fig. 4 illustrates another embodiment of the invention. Fig. 5 is a plan of one of the transformers, Fig. 4, in position to apply current to opposite sides of the joint to be made by a butt-weld. Fig. 6 shows in partial plan view the construction of transformer adapted to be used on circular stock for pipes, one terminal of the secondary being removed. Fig. 7 is a cross-section through said apparatus. Fig. 8 illustrates a modification of the invention, wherein the secondary is differently supported and made movable as to one of its terminals only. Fig. 9 shows a further modification of the invention.

Referring to Fig. 1, A indicates the secondary of a transformer, which may be of any suitable type, constructed, preferably, with a secondary having but a single turn of copper and a primary consisting of one or more turns contained in a groove or tube formed of the secondary conductor.

B is the usual laminated iron core of the transformer, and C C typify the contact terminals or poles of the secondary, through which terminals current may be delivered to the work. The general type of transformer which I prefer to employ is described in my Patent No. 428,618, dated May 27, 1890; but other forms or other modifications of transformer might obviously be used without departing from the invention. The terminals C C may be of any desired form, attached to or constructed in one piece with the transformer secondary A.

D D indicate two pieces of metal to be welded, and E E suitable clamps or holders for said pieces D, said clamps being mounted and guided on a suitable frame or block F, after any desired manner, and operated by means of a screw-shaft G, working in nuts connected to the clamp-bodies, as clearly indicated.

As the manner of clamping the work in electric welding and metal-working operations and the purely mechanical devices for operating either one or both work-holders is well known in the art and the means for holding the work in my invention may be indefinitely varied without departing from the spirit thereof, further detail description of the means for holding and operating on the work need not be given.

In the construction of apparatus illustrated in Fig. 1 the transformer is bodily moved in vertical line into and out of contact with the work by means of a chain and fall or other device. When allowed to rest by its own gravity on the stock or work held rigidly in the clamps, and when the current is turned into the primary in the usual manner, it is obvious that the work will become heated by the current and the operation of welding or other metal-working operation may be then effected.

The shape of the contact-terminal of the secondary or other source may be varied according to the shape of the work. The manner of attaching and mounting the contacts on the secondary may be modified as hereinafter described.

Fig. 2 shows a construction wherein two transformers are employed, each mounted on a suitable carriage and movable into and out of contact with the work by pressure, hydraulic or otherwise. The pieces to be welded (indicated at D D) are held between an anvil K and a plunger L, operated by hydraulic or other power, as well understood in the art. The joint heated by the current of the transformer is completed at 5. The work illustrated is that sometimes done in constructing

railway-rails. The surfaces of contact of the terminals C are here shown flat to engage the web of the rail. It will be understood that in this, as in some other cases to be described, where the transformer and its primary move together, flexible connections are furnished for the primary.

Fig. 3 illustrates a modification in which the poles of the transformer, instead of being brought into and out of direct contact with the work, are made to abut against platens or blocks connected to the work. P P indicate such platens or blocks of conducting metal, to which the work is bolted or secured in any proper manner, as shown. The platens or blocks are one or both made movable on suitable rigid mechanical guides S, as indicated, and the movable platen is operated by hydraulic pressure, as indicated, or in any other suitable manner. This figure illustrates a preferred form of contact-terminal that is moved into and out of contact with the work or a part to which the work is secured. The terminals, as shown, consist of metal hemispheres accurately ground into sockets in the ends of the transformer secondary, whereby they will adjust themselves to any angle and will distribute the contact-pressure evenly over the whole flat surface of contact. In this figure of the drawings the core is shown as supported independently of the transformer secondary and in such manner as to permit the latter to be moved without moving the core. The secondary may be supported by springs which press it toward the work or may be operated by hydraulic pistons.

Figs. 4 and 5 illustrate the invention as employed in an apparatus for forming a butt-weld between two sections of rail. In this case four transformers are employed and mounted to be movable out of and into contact with the work on various radial lines converging in the work. The two transformers operating on the side of the rail are moved against the rail on a track by hydraulic or other pressure, and the transformers making contact with the bottom and top of the rail are movable by hydraulic or other pressure on suitable guides or ways. The work itself is properly clamped by any strong mechanical device operated by hydraulic or other power. The contacts or terminals C' in this case are supposed to be removable platens or blocks conformed to the surface of the work with which they engage, but form in effect the contact-terminals of the transformer. The currents flow in this and in the other cases described in the direction indicated by the arrow. It is preferable to feed all the transformer primaries from one large generator or a bank of generators working in phase with each other to obtain the best effect. It is, however, possible to disregard the latter precaution to a certain extent, owing to the great self-induction in the secondary circuit.

In the construction illustrated in Figs 6 and 7, the transformer is shown adapted to

apply current in forming a butt-weld in large circular stock or pipes or other forms of work where, owing to the size, it is desired to introduce current at a number of points around the work. In this transformer a number of secondaries are employed in conjunction with a single core and primary, and the several secondaries are movable into and out of contact with the work without moving the primary and core. The core is, as shown, circular or endless in form and has the primary wound around it, while the secondaries A are of U shape and are arranged radially upon the core with their poles adapted to make contact at opposite sides of the joint between two pieces introduced axially through the core. Each secondary may be moved, as before described, by any pressure device.

In the modification illustrated in Fig. 8 the upper block or platen for the work being stationary while the lower alone is movable by hydraulic or other pressure upon a suitable guide, the contact-terminal of the secondary which feeds the lower block or platen P is alone made movable into and out of contact with the work or part connected with such work. The secondary is itself hinged or swung, as shown at 12, from the upper block P, swinging around 12 as a center. The weight of the transformer secondary furnishes the necessary power to keep its lower terminal in partial contact with the movable platen or block P.

Fig. 9 shows a small transformer adapted to be supported in the hand and employed for locally heating parts of rods, wires, or sheets, by bringing its terminals C into contact with the work, as indicated.

What I claim as my invention is—

1. In an electric metal-working apparatus, the combination with clamps or supports for the work, of a transformer, and means for freely moving the terminals thereof into and out of electrical circuit with the work.

2. In an electric metal-working apparatus, the combination with clamps or supports for the work, of a number of transformers adapted to feeding current to the same piece of work and movable as to their secondaries into and out of electrical circuit with the work.

3. The combination with an endless core and a single primary wound thereon, of one or more secondary bars common to said core and primary and movable independently of one another and of the primary on radial lines to bring both poles or terminals of each secondary into and out of contact with the work arranged at a common center within the core.

4. In an electric metal-working apparatus, the combination with the source of heating-currents movable into and out of contact with the work, of a terminal contact-block consisting of a metal hemisphere ground into a socket on the terminal whereby it will adjust itself to any angle and will distribute the contact-pressure evenly over the whole surface of contact.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 18th day of November, A. D. 1892.

HERMANN LEMP.

Witnesses:

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