(No Model.)

C. L. COFFIN.

APPARATUS FOR ELECTRICALLY WELDING METAL.

No. 512,604. Patented Jan. 9, 1894.

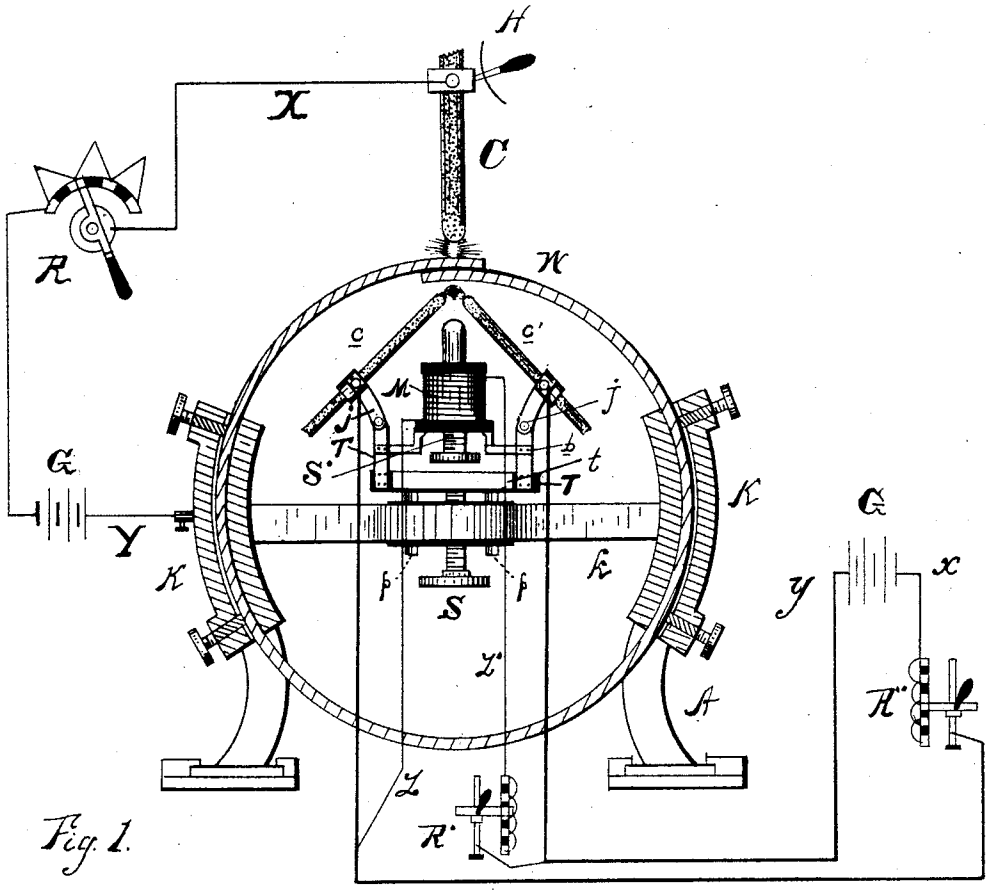

Fig. 1.

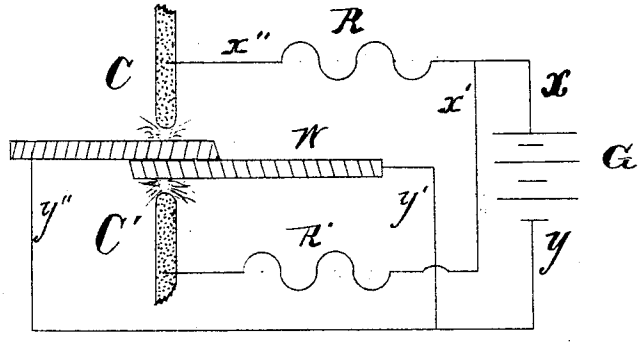

Fig. 2.

WITNESSES

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APPARATUS FOR ELECTRICALLY WELDING METAL.

SPECIFICATION forming part of Letters Patent No. 512,604, dated January 9, 1894.

Application filed March 9, 1893. Serial No. 465,325. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. COFFIN, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Apparatus for Electrically Welding Metal, of which the following is a specification.

My invention consists in an improved apparatus for heating or welding metals electrically, hereinafter fully described and claimed.

Figure 1 is an end elevation, partly in section, of an apparatus which may be used to practice my invention, and Fig. 2 is a diagram showing a modification in the electrical circuit.

A represents legs or supports, each of which carries a clamp K, made of such form as to receive the work to be operated upon, which in the illustration is shown as a tube or ring, and provided with set screws by which the work may be fastened in the clamp.

W represents the material to be heated or welded, shown as a tube or ring which is to be welded together with a lap joint.

C represents an extraneous conductor or carbon held in an insulating handle H and connected by conductor X with one terminal of a source of electricity G, the other terminal of which is connected by a conductor Y with the material W, the connection shown in Fig. 1 being through one of the clamps K, or it may be made with the material direct.

R represents a variable resistance interposed in conductor X, by means of which the current can be regulated.

k represents a cross-bar supported at its ends on the two clamps K K, and S represents a screw shaft threaded through bar *k* and swiveled at its upper end into a plate *t*.

T T represent standards secured to, but insulated from plate *t*, to the upper ends of which are pivoted two carbon holders *j*, carrying carbons *c c'*.

M represents a magnet carried on a support *b*, secured to arms T T and the core of magnet M is threaded as shown at S' and provided with a thumb piece, whereby said core may be adjusted with relation to the meeting point of the carbons *c c'*, as shown in Fig. 1. Carbons *c c'* are connected by conductors *x* and *y* with the terminals of a generator G, a variable resistance R'' being inserted in one of said conductors, and the terminals of the electro-magnet M are connected by shunt circuits Z Z' with said conductors *y* and *x*, a variable resistance R' being introduced into said circuits.

I have shown the carbon C and the carbons *c c'* in circuits connected with the separate generators, but it is evident that they may be all connected with the terminals of one generator.

In the diagram of Fig. 2, a carbon C above the joint and a similar carbon C' below the joint are connected in parallel by conductors *x*, *x'*, *x''* with one terminal of the generator G, while the material on the two sides of the joint is connected by conductors *y*, *y'* and *y''* with the other terminal of said generator. R and R' represent variable resistances in said circuit.

Referring to Fig. 1, a current being passed through conductors *x* and *y*, carbon C and material W, by bringing carbon C in contact with the material and then slightly raising it a voltaic arc is formed between said carbon and the material. A current being passed through conductors *x* and *y* and carbons *c c'* (said carbon being in contact) by separating said carbons a voltaic arc is formed between them in proximity to the under side of the material W, and this arc may be thrown toward said material by magnet M as described in one of my previous patents. The result is that the outer side of the upper lap and the inner side of lap are simultaneously heated by independent voltaic arcs, and both are rapidly brought to a welding heat, and may be welded in any desired manner, while if it be attempted to make a lap joint on metal of any appreciable thickness, say one-quarter of an inch, by means of one arc applied either to the outer or inner lap, said lap will be melted before the other lap approaches a welding heat.

The operation in Fig. 2 is simply a duplication of the operation on the outer lap in Fig. 1, the carbon C' forming an arc under the inner lap in precisely the same way as the carbon C forms an arc outside of the other lap. The arc between carbons C C' and the material being applied to the outer surfaces of the laps the "steelifying" effect is confined to said outer surfaces, and does not injure the weld, as is

the case where a butt weld is made by a voltaic arc sprung between the material and an extraneous conductor, for in such case the arc seems to have the effect of partly converting iron into steel, and this converted metal lies in the weld, thus preventing a homogeneous weld.

What I claim as of my invention, and desire to secure by Letters Patent, is—

1. In an apparatus for electrically heating metal, the combination of means for connecting the metal to one terminal of a source of electric energy, an extraneous conductor connected to the other terminal of said source of electric energy, two extraneous conductors, and means for maintaining an electric arc between said electrodes within the field of force of a magnet.

2. In an apparatus for heating metal for making a lap joint consisting of a clamp for holding the material with the lap in position, mechanism for maintaining a voltaic arc on the outer side of the outer lap, and mechanism for simultaneously maintaining a voltaic arc on the inner side of the inner lap, within the field of force of a magnet, substantially as shown and described.

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Witnesses:
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