

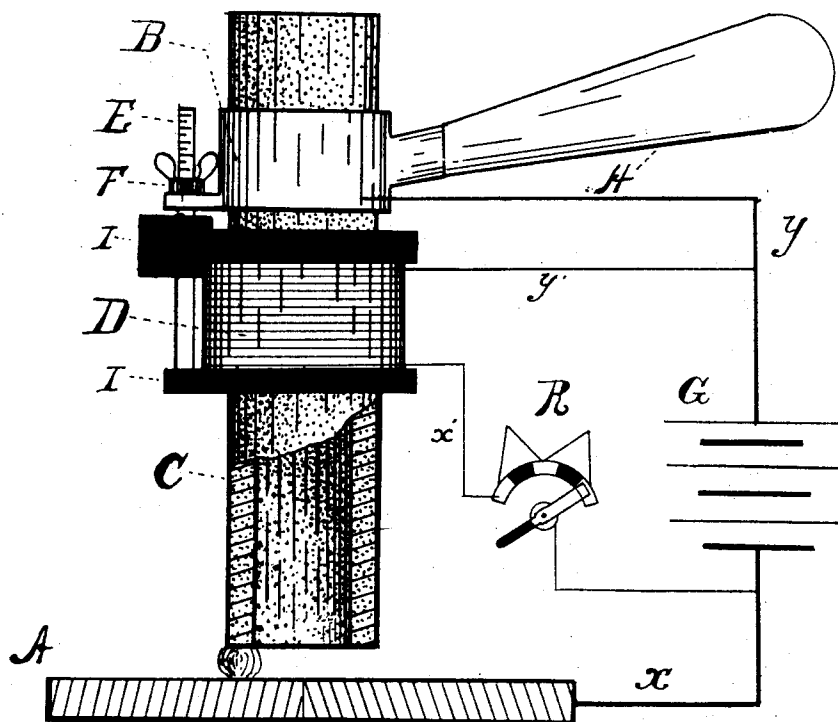
(No Model.)

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APPARATUS FOR HEATING METALS ELECTRICALLY.

No. 510,777.

Patented Dec. 12, 1893.



WITNESSES

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APPARATUS FOR HEATING METALS ELECTRICALLY.

SPECIFICATION forming part of Letters Patent No. 510,777, dated December 12, 1893.

Application filed July 8, 1893. Serial No. 479,959. (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 Heating Metals Electrically, of which the following is a specification.

My invention consists in an improved apparatus for heating metal electrically, herein-after fully described and claimed.

The drawing is an elevation, with the electrode partially in section.

In heating metal by that method in which a voltaic arc is sprung between the metal and an extraneous conductor, both being in circuit, it is desirable to increase the area affected by the arc by causing it to rotate or reciprocate, and it has been proposed to do this by mechanically moving the conductor or by a moving magnet. I have discovered that the arc can be caused to rotate by using an annular conductor and a stationary magnet.

A represents metal to be heated, and C represents a hollow, annular conductor, preferably of carbon, which may be provided with a clamp or holder B, having an insulating handle H, by which conductor C can be operated. Metal A and conductor C are connected by conductors x and y with the terminals of a generator of electricity G.

D represents an electro-magnet whose core is preferably made hollow to slip over conductor C. Magnet D may be supported in any suitable manner, the mode shown being to provide it with flanges I I of insulating material, in which is secured a screw-bolt E passing through a lug on clamp B and provided with a thumb-screw F. This arrangement permits adjustment of the magnet, but it may be varied, or any other mode of securing the magnet may be adopted.

The coil of electro-magnet D is connected by conductors x' and y' with conductors x and y , the circuit x' and y' being of higher resistance than conductors x and y .

R is a resistance switch of any known construction interposed in the magnet circuit, and may be used or not, at will.

Electro-magnet D may be placed below

metal A, instead of on conductor C. If, however, A is a magnetic metal, magnet C operates better in the position shown, but with diamagnetic metal it is immaterial whether the magnet is above or below the metal. On passing a current through conductors x and y and springing a voltaic arc between metal A and conductor C, and energizing magnet D by an electric current, the magnet causes the arc to rotate around the end of conductor C, thus covering an area of metal A equal to, or somewhat greater than, the area of conductor C. The rapidity of rotation of the arc depends upon the strength of magnet D, and may be increased by increasing the strength of said magnet, or bringing the magnet nearer the arc, and decreased by doing the contrary. D may be a permanent magnet.

The upper end of conductor C may be closed by a stopper to prevent drafts through said conductor.

D may have a core, or it may not; in the latter case it might be more properly called a solenoid, which is a form of electro-magnet, and is, for the purposes described, the equivalent of an electro-magnet.

I believe that the rotation of the arc is caused in the following way: The electric arc obeys the laws of Ampère in precisely the same manner as an ordinary electric current; that is to say, it is attracted or repelled by electric or magnetic currents passing through metallic conductors in various directions. The arc can be made to revolve around an axis under the influence of a magnet or solenoid, the arc revolving in the direction corresponding to that of the current passing through the coil of the magnet or solenoid.

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

1. In an apparatus for electrically heating metal by means of the voltaic arc, the combination with a hollow conductor of a stationary magnet for directing and rotating the arc a voltaic arc being sprung between said conductor and the metal to be operated upon, substantially as shown and described.

2. In an apparatus for heating metal by means of the electric arc, the combination of

a hollow conductor, a magnet for rotating the arc, and means for connecting the metal to be operated on and conductor with the terminals of a source of electric energy, substantially
5 as shown and described.

3. In an apparatus for heating and welding by means of the electric arc, the combination

with a hollow electrode of a magnet for rotating the arc and a variable resistance in circuit with said magnet.

CHARLES L. COFFIN.

Witnesses:

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