(No Model.)

G. D. BURTON.

WORKING BRASS BY ELECTRICITY.

No. 496,592. Patented May 2, 1893.

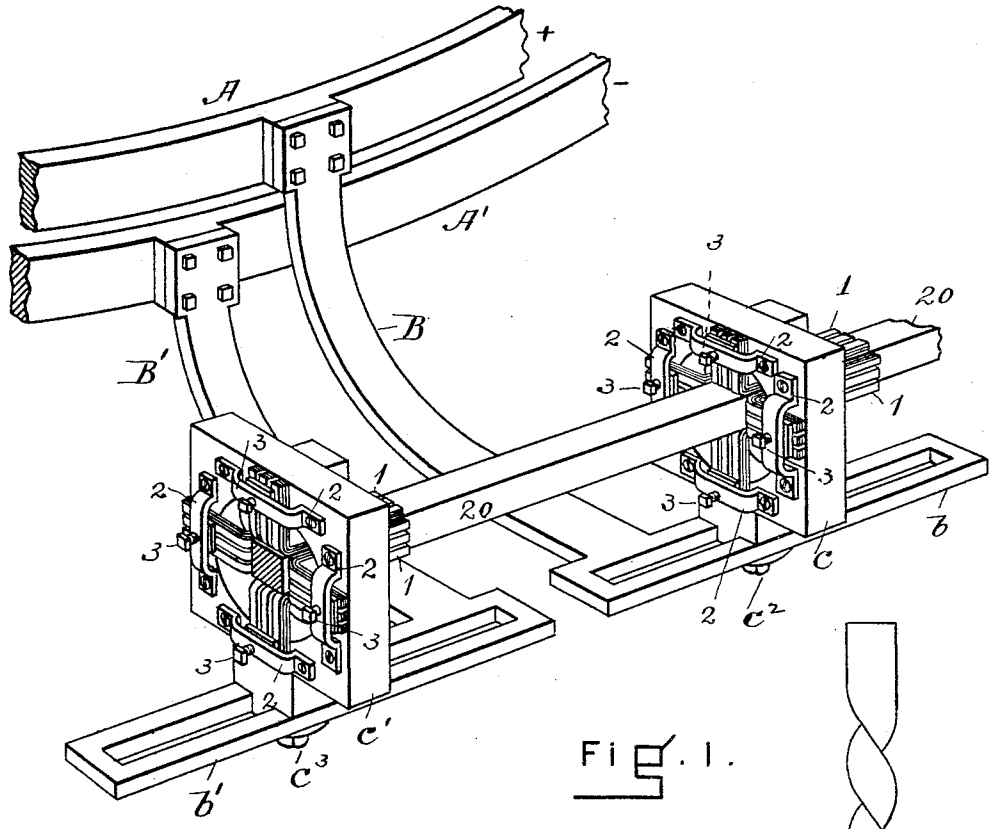

Fig. 1.

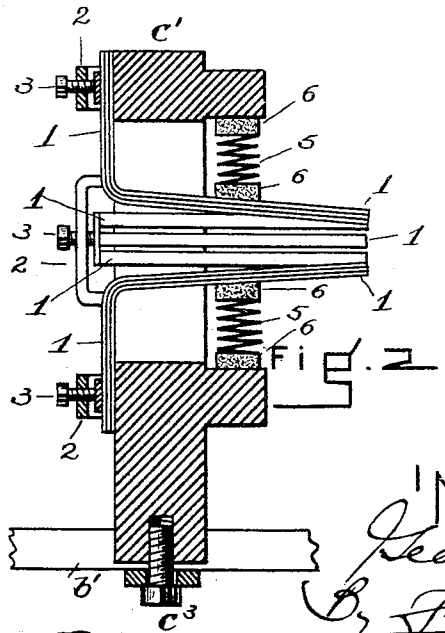

Fig. 2.

Fig. 3.

WITNESSES
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UNITED STATES PATENT OFFICE.

GEORGE D. BURTON, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE ELECTRICAL FORGING COMPANY, OF MAINE.

WORKING BRASS BY ELECTRICITY.

SPECIFICATION forming part of Letters Patent No. 496,592, dated May 2, 1893.

Application filed September 28, 1891. Serial No. 407,018. (No model.)

To all whom it may concern:

Be it known that I, GEORGE D. BURTON, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Methods of Working Brass by Electricity and Apparatus Therefor, of which the following is a specification.

My invention relates to an improved method of heating and working brass by the aid of the electric current, and to an improved apparatus for practicing said process, substantially as hereinafter described and claimed.

Heretofore numerous difficulties have been experienced in bending, twisting and working brass, owing to the impossibility of working or bending it while in a heated state. When a bar of brass of any considerable size was placed in a forge and heated, it at once became so brittle that any attempt to bend or twist it resulted in breaking or cracking the substance of the metal so as to render it almost valueless. In like manner, when brass was attempted to be bent or twisted while cold, it became so hard by the first bending or twisting to a comparatively small degree, that it had to be placed in a furnace and heated to redness and cooled again; or, in other words, as it was called, annealed before any further bending or twisting was possible. These difficulties in working forged or drawn brass have imposed serious limitations upon its use, which my present invention is intended to overcome.

I have discovered that by the use of the electric current for heating brass bars, whether drawn or cast, I am enabled to heat the internal portions of the bars to a degree approximating fluidity while the exterior surface remains exposed to the atmosphere, or other cooling medium, and retain their shape, at a much lower degree of heat than the internal core, and that by thus conducting the heating operation I am enabled to twist, bend and work the brass bars to any desired extent without materially hardening or rendering them brittle by the operation, and I am thus enabled to economically work and form the bars into shapes which have heretofore been considered impracticable.

Various forms of apparatus may be used which are known to electricians, to heat the brass bars or pieces by the electric current previous to bending or working the same. I will now describe one form of apparatus, which I have found effective for that purpose, and which enables me to heat and handle the bar, in the twisting or working of it, rapidly and without allowing any great variation of the heat to which it is raised to affect such working before the latter is completed.

In the drawings:—Figure 1 is a perspective view of a portion of an electric converter for generating and conveying to the metal heavy currents of electricity, with my improved clamps holding the brass bar therein. Fig. 2 is a vertical section through one of the clamps enlarged, showing the construction of the same; the bar being removed therefrom. Fig. 3 represents a side view of one of the bars as twisted or worked into the shape desired, after it has been heated.

A is the positive converter ring and A′ is the negative converter ring, of copper or other like conducting material. The positive and negative terminals of the secondary coils of the converter are connected respectively to these rings in parallel, as is well understood and need not be further illustrated, as it forms no part of the present invention. From the conducting ring, A, the arm B extends downward, carrying upon its lower end the slotted horizontal extension, *b*. From the conducting ring A′ extends downward the conducting arm, B′, carrying upon its lower end the slotted extension, *b*′, horizontally in line with the extension *b*. In the slot of the extension, *b*, is mounted the sliding block, *c*, having a tongue extending into the slot and a set screw, c^2, overlapping the slot in the lower face of the extension and serving to secure the sliding block, *c*, in place at any point desired in the slot. The screw c^2 must be set up solidly when the heating is performed, in order to make the perfect electrical connection required between *b* and *c*.

On four sides of the hole through the block, *c*, are attached to the block the copper spring plates 1, 1, in layers one outside of the other, or inside of the other, for several thicknesses, and these turn horizontally and project

through the hole in the block *c*, so as to converge toward each other at their free ends and form spring clamps, pressing against the opposite faces of the brass bar, 20, when it is shoved endwise through between them. The spring plates 1, 1, are in contact with each other through their entire length, and creep or move against each other to allow of springing outward, while preserving a sufficent electrical contact between themselves to cause the electric current to be conveyed by all of them, so that neither one shall be melted by an excess of current passing through it. They also establish a large length of contact between each laminated spring, which they form, and the surface of the bar to be heated. These laminated copper springs are held in place or made adjustable in the block by the yokes 2, 2, and set screws 3, 3, by which their outer ends are clamped. By loosening the set screw, 3, the group of springs 1 may be pressed outward radially, with relation to the hole through the block *c*, to adjust it to a wider or narrower bar which is to be heated. The slotted extension, *b'*, carries another block, *c'*, having a similar set screw, c^3, to secure it in place, a similar hole through the block, and having its springs 1, 1, projecting in the same direction as those of the block, *c*. The bar may, therefore, be thrust in through the block *c'* from the heel toward the points of the springs 1, 1, and it will pass through the springs of the block *c* in the same direction. When it is to be withdrawn the bar, 20, will be drawn outward by moving it in the same direction and as a continuation of the movement by which it was inserted between the springs. This construction gives great rapidity and facility of inserting and removing the bar, since the aperture into which it is thrust is funnel shaped between the springs in each block. To effect a greater pressure and a longer contact of the springs 1, 1, on the bar the auxiliary coil springs 5, 5, may be used if desired. (Fig. 2.) These are placed between the laminated springs 1, 1, and horizontal extensions from the block, *c'*, so as to exert their compression upon the springs 1, 1, to guard against any heating of the springs 5, 5, and they bear at each end against asbestus washers 6, 6.

Care should be taken to provide a sufficient number of laminations of the springs 1, 1, so that they will not be heated to any great degree in conducting the heating of the bar; the principle to be observed being that the mass of the conducting material, which conveys the heavy electric current to the bar, shall aggregate much larger or better in conducting power than the bar itself, which avoids undue heating. With the apparatus thus constructed the brass bar, 20, is inserted in the spring clamps as shown, and the electric current is turned on so as to bring the portion of the bar between the clamps into the circuit, which heats the brass bar to a much higher degree at its central portion than on its exterior, which is exposed to the atmosphere. When the brass has been heated to redness and the heat is carried somewhat higher, it will be found that the bar may be taken out of the clamps and twisted at one operation, in a few seconds, into the form shown in Fig. 3, without cracking or injuring the external surface and scarcely disturbing the polish thereon, except perhaps to give it a copper tinge, which does not detract from its beauty.

Instead of bending the bar into the form shown, it may be bent or twisted into any other form, or even rolled between rollers. It will be found on cooling the bar, that it retains a large proportion of its ductility after these operations and that it may again be heated and reworked without annealing. I attribute these effects to the raising of the temperature of the core of the bar to a condition approximating a molten state, while it is protected by the cooler external portion of the bar. This prevents the volatilization and escape by evaporation of the zinc, which forms a portion of the brass in its manufacture; it being well known that by reducing brass to a molten state, with a sufficient degree of heat the zinc is volatilized and escapes in greater or less proportion, leaving the brass hard and brittle by so doing. This action is effectively prevented by employing the electric current in the manner I have described.

It is impossible to specify the exact degree of heat to be imparted by the electricity in order to work brass as I have described, but it may be readily ascertained by experiment from the description I have given, and the expert metal-worker will detect by the shade of color which the heated brass assumes on its exterior under the electric current, by a little experience, how to conduct the operation with certainty thereafter. Care should be taken not to raise the heat so high that the molten internal portions of the brass bar burst through the outer cooler shell which incloses them, as will be the case if the heating process is carried too far.

It will be observed that the yokes, 2, and set screws, 3, are so constructed and arranged that the laminated spring, 1, on either side of the bar, may be set with its face at any angle to accommodate itself to any irregular shape of the bar in its cross section, and that the series of springs in each yoke may have their faces set at various angles with relation to each other.

What I claim as new and of my invention is—

1. The method of working brass in a hot state, which consists in subjecting the bar or piece of brass to the action of an electric current until its interior or core is raised to a temperature approximating fluidity and maintaining the temperature of the exterior so far below that of the interior as to preserve its form and homogeneous character and prevent the escape of volatilized zinc; and then bending or shaping the bar or piece of

brass into the desired form without breaking or destroying the skin thereof, substantially as set forth.

2. The combination, in an electrode, of the block *c* in connection with the source of electric energy, and a series of spring contact plates secured therein, arranged to bear upon different sides of the bar to be heated, and each formed of two or more spring plates superimposed upon another, substantially as described.

3. The combination in an electrode, of the block *c*, in connection with the source of electric energy, and a series of contact plates secured therein, and arranged to be respectively and independently adjusted inward or outward and at different angles to each other to bear upon the bar to be heated, substantially as described.

4. The combination, in an electrode, of the block *c*, the yoke 2, the set screw 3, and the contact springs, 1, arranged to be adjusted at different angles to accommodate them to the faces of different bars, substantially as described.

5. The combination in an electric heating apparatus, of the blocks *c*, *c'*, placed opposite to each other, with apertures through them in line with each other and each provided with elastic contact springs projecting in the same direction, and arranged to form tapering openings between those on each block, through which the bar to be heated may be thrust and withdrawn by a longitudinal movement, substantially as described.

6. The combination in an electrode, of the block *c'*, the contact bearing pieces 1 arranged therein to make an electrical contact upon the bar placed between them to be heated, and reinforcing springs 5, 5, arranged outside of the contact pieces to press the same upon the bar, substantially as described.

7. The combination in an electrode, of the block *c'*, the contact bearing pieces, 1, arranged therein to make an electrical contact upon the bar placed between them to be heated, and reinforcing springs 5, 5, placed between non-combustible washers, and arranged outside of the contact pieces to press the same upon the bar, substantially as described.

8. An electrode for an electric metal heating apparatus consisting of a frame, a tapering expansible socket the sides of which are composed of superimposed metallic spring plates attached to said frame, and lateral springs interposed between said tapering socket and said frame.

GEO. D. BURTON.

Witnesses:
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