No. 799,542. PATENTED SEPT. 12, 1905.

C. C. DAVIS.

PROCESS OF CEMENTING IRON OR STEEL.

APPLICATION FILED NOV. 15, 1904.

Fig. 1

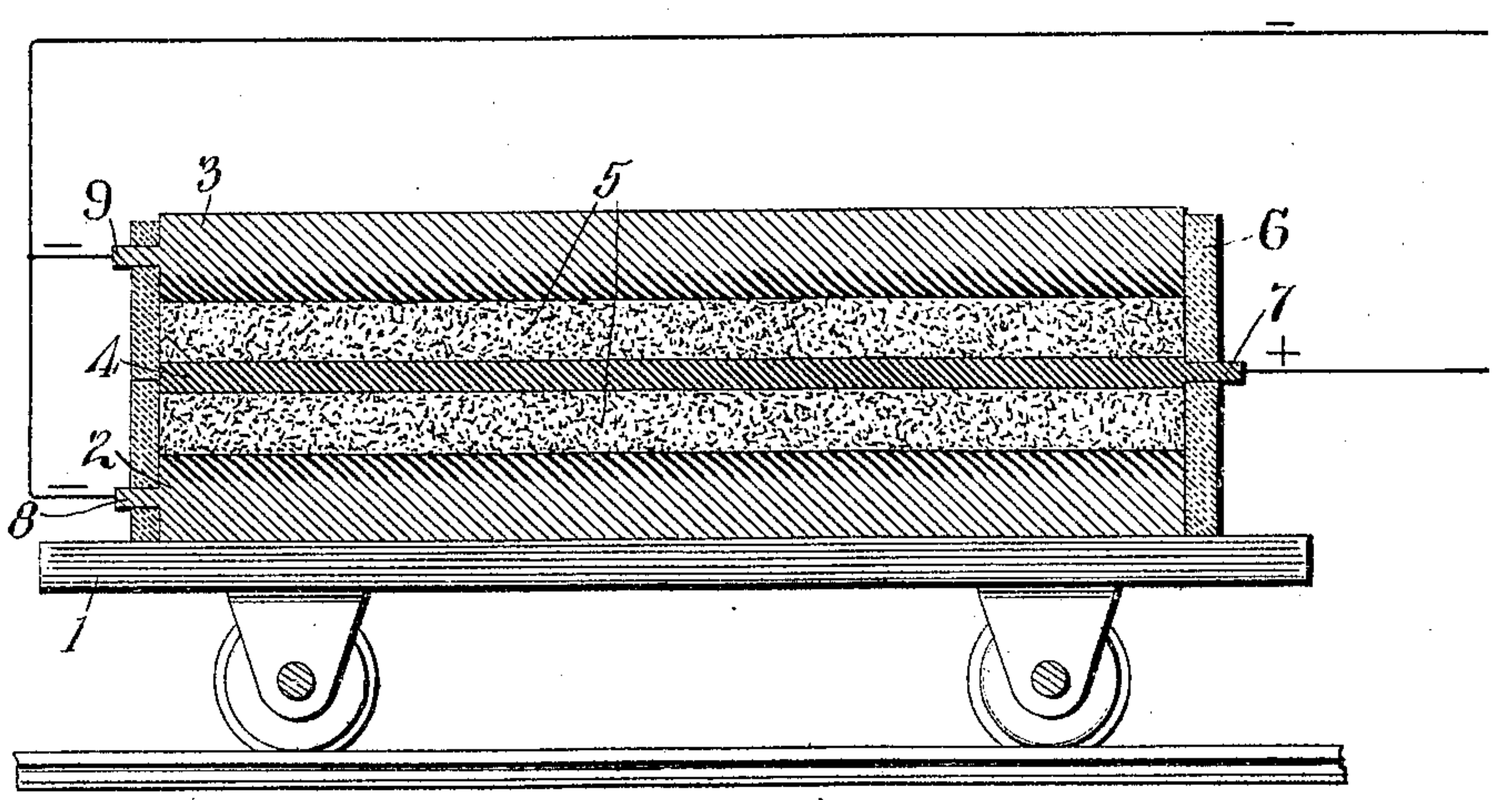
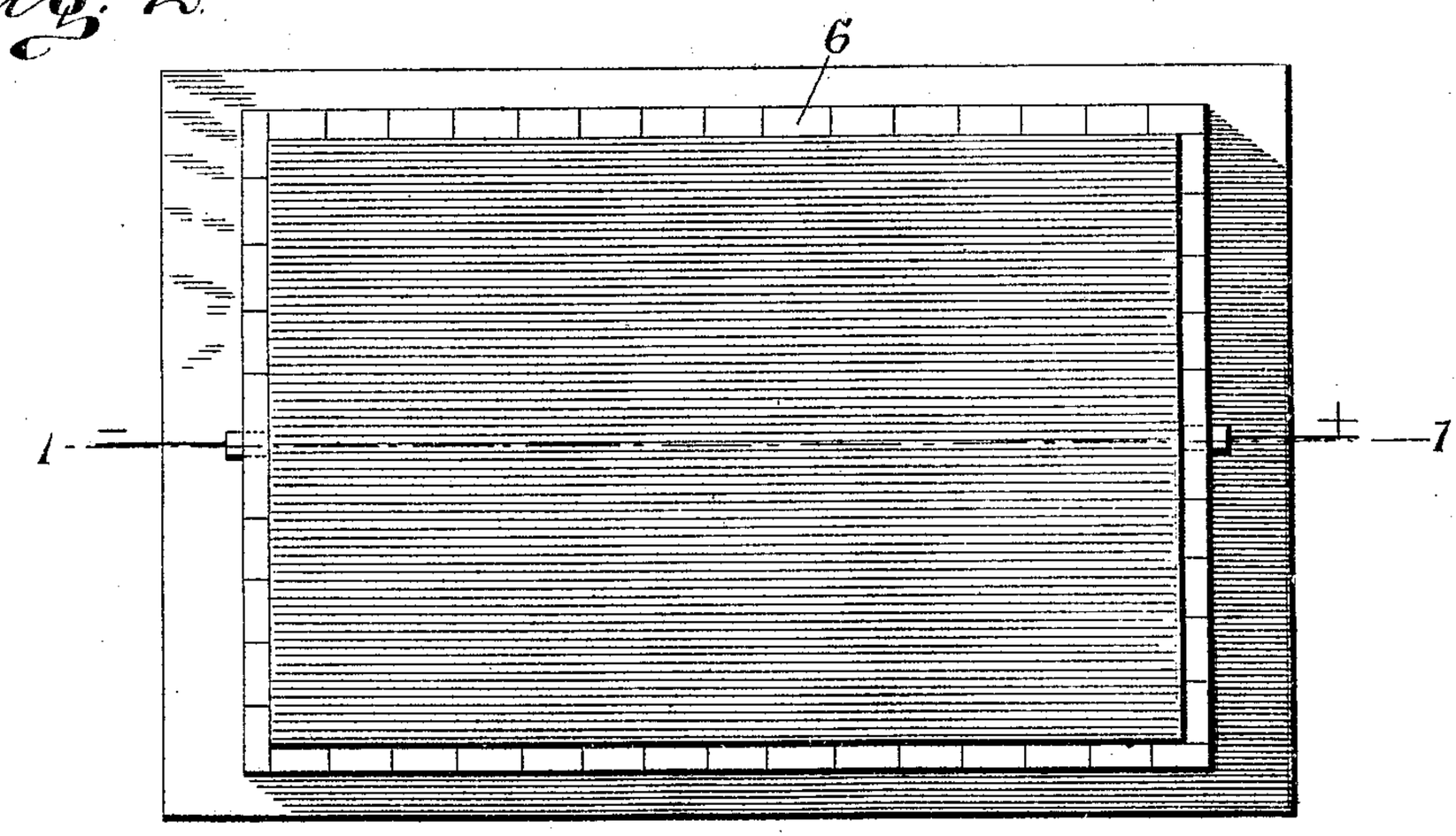


Fig. 2.



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PROCESS OF CEMENTING IRON OR STEEL.

No. 799,542. Specification of Letters Patent. Patented Sept. 12, 1905.

Application filed November 15, 1904. Serial No. 232,787.

To all whom it may concern:

Be it known that I, CHARLES C. DAVIS, a citizen of the United States, residing at Germantown, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Cementing Iron or Steel, of which the following is a specification.

My invention relates to an improved method of cementing or supercarburizing steel or iron articles, especially adapted for producing a decrementally-hardened surface, such as required in armor-plates.

The usual cementing processes, in which the articles under treatment are packed in carbonaceous material and subjected to a temperature somewhat below fusion, are extremely slow and expensive, and many means have been devised for expediting the absorption of carbon in such processes.

Among other expedients the use of an electric current has been contemplated for locally intensely heating the surface of the article under treatment, such local heating being conveniently obtained by establishing an electric arc between a carbon electrode and the surface under treatment or by passing a sufficiently heavy electric current through a layer of granular carbonaceous material in contact with the article under treatment to generate an intense heat by the resistance of such carbonaceous layer. This proposed use of an electric current for the purpose of producing intense local heating of the surface during the cementation process causes burning and deterioration of portions of the surface under treatment and has proven impracticable.

In the operation of my invention the article under treatment is preferably maintained at a nascent cherry heat in contact with suitable carbonaceous material, and a direct electric current is passed through the carbonaceous material and article to cause rapid absorption of the carbon by the latter without raising the temperature in such circuit. The advantageous action of the electric current in the practice of my invention seems to reside primarily in producing a beneficial rearrangement of the atoms of the iron or steel article under treatment and also in producing a more uniformly graduated penetration of the carbon in the said articles, thereby expediting the absorption of carbon and producing a uniform decremental hardening of the entire surface under treatment.

In the accompanying drawings, forming a part of this application, and in which similar reference-numerals indicate corresponding parts in both views, Figure 1 is a vertical sectional view taken on the line 1 1 of Fig. 2, illustrating more or less diagrammatically one arrangement for carrying out my invention; and Fig. 2 is a plan view of the parts shown in Fig. 1.

Referring to the drawings, 1 indicates a steel truck or other suitable carrier supporting two armor-plates 2 and 3, together with an interposed electrode, such as an iron plate 4. A layer of suitable carbonaceous material 5 is packed between the plate 4 and the adjacent faces of the armor-plates 2 and 3. Such carbonaceous material may consist of graphite, coal, or coke, which may be mixed with sand, silica, barium carbonate, or other suitable material for adjusting the electrical resistance of the layer. A wall 6 of fire-brick or other heat-non-conducting material is shown surrounding the several elements for effectively preventing entrance of air to the faces of the plates under treatment. The plate 4 is provided with suitable means, such as a lug 7, for connecting it to the positive pole of a source of electrical energy, and the armor-plates 2 and 3 are provided with similar means 8 and 9 for convenient connection to the negative pole of said electrical supply.

The operation of my invention is as follows: The armor-plates 2 and 3 are placed in a furnace with suitable carbonaceous material 5 packed between them and a common interposed positive electrode 4, means, such as a fire-brick wall 6, being employed to prevent access of air to the carbonaceous material. The parts thus assembled are raised to and maintained at a temperature of approximately 800° centigrade to 850° centigrade. A direct electric current of suitable strength and character is then passed from the common positive electrode 4 through the carbonaceous material and armor-plates to cause a rearrangement of the atoms of said plates and expedite the absorption of carbon thereby without producing an appreciable increase of temperature by the resistance of said circuit. This operation is continued until the desired degree of cementation is produced, after which the plates are slowly cooled in the usual manner to prevent strains and distortion.

I have illustrated and described a single means for carrying out my invention; but obviously it is applicable in other manners.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described process of cementing or carburizing steel or iron, which consists in maintaining the article at a nascent cherry heat in contact with carbonaceous material, and simultaneously passing a direct electric current of suitable strength and character through said carbonaceous material and article to cause a rearrangement of the atoms of said article, substantially as described.

2. The herein-described process of cementing or carburizing steel or iron, which consists in maintaining the article at a temperature of approximately 800° centigrade to 850° centigrade in contact with carbonaceous material, and simultaneously passing a direct electric current of suitable strength and character through said carbonaceous material and article to expedite the absorption of carbon by the latter, substantially as described.

3. The herein-described process of cementing or carburizing steel or iron, which consists in maintaining the article at a temperature of approximately 800° centigrade to 850° centigrade in contact with carbonaceous material, simultaneously passing a direct electric current of suitable strength and character through said carbonaceous material and article to expedite the absorption of carbon by the latter, and excluding the parts under treatment from access of the atmosphere, substantially as described.

4. The herein-described process of cementing or carburizing armor-plates, which consists in packing carbonaceous material between two armor-plates and a common positive electrode interposed therebetween, maintaining the parts so arranged at a temperature approximately 800° centigrade to 850° centigrade, and simultaneously passing from such common electrode through the carbonaceous material and plates a direct electric current of suitable strength and character to expedite the absorption of carbon by the latter, substantially as described.

5. The herein-described process of cementing or carburizing armor-plates, which consists in packing carbonaceous material between two armor-plates and a common positive electrode interposed therebetween, maintaining the parts so arranged at a temperature approximately 800° centigrade to 850° centigrade, simultaneously passing from such common electrode through the carbonaceous material and plates a direct electric current of suitable strength and character to expedite the absorption of carbon by the latter, and excluding the opposing faces of said plates from access of the atmosphere, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES C. DAVIS.

Witnesses:
E. B. PEACOCK,
H. BERENS.