

C. ADAMS.

Deoxidizing and Carbonizing Iron Ores.

No. 100,095.

Patented Feb. 22, 1870.

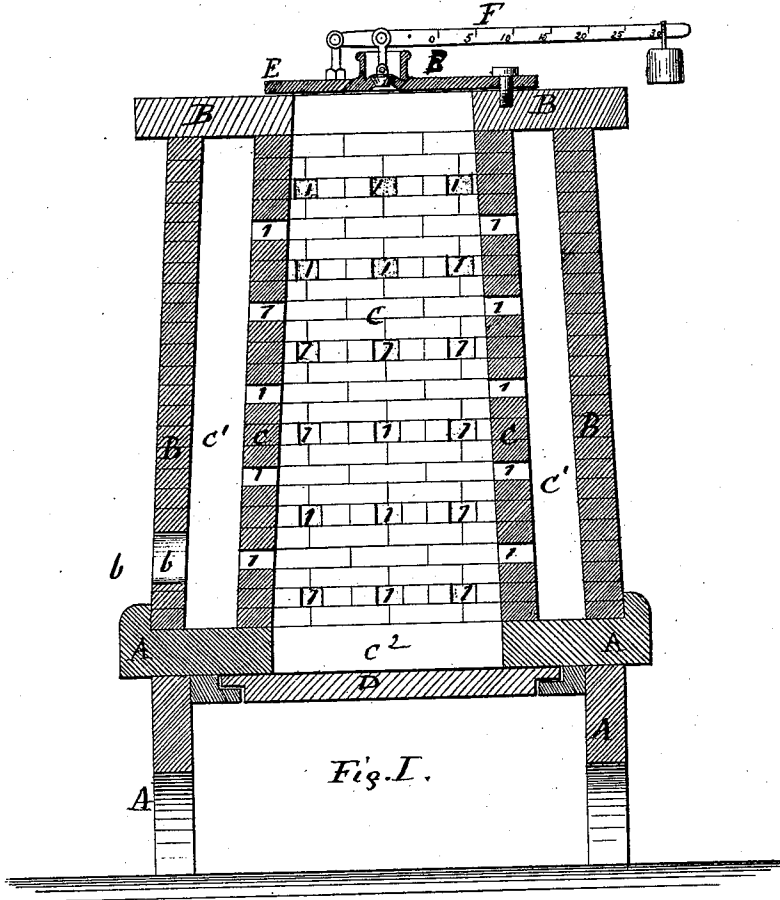


Fig. I.

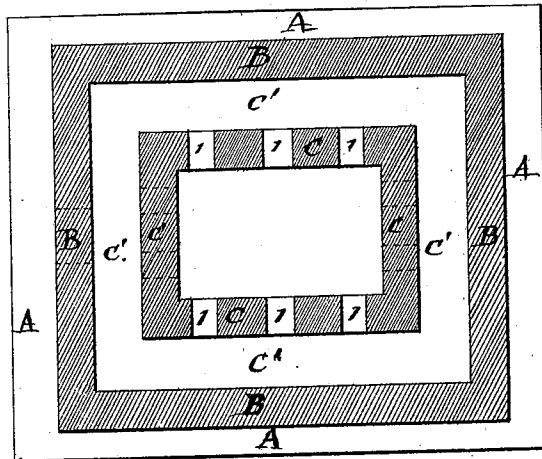


Fig. II.

Witnesses.
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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN DEOXIDIZING AND CARBONIZING IRON ORES.

Specification forming part of Letters Patent No. **100,095**, dated February 22, 1870.

To all whom it may concern:

Be it known that I, CHARLES ADAMS, of Philadelphia, in the State of Pennsylvania, have invented a new and useful Apparatus or Furnace and Process of Deoxidizing and Carbonizing Ores Containing Iron or other Metals; and I do hereby declare that the following is a full and exact description of my said invention, reference being had to the accompanying drawings, making part of this my specification.

My invention consists in subjecting the ores, in the condition in which they come from the mines, (or those more hard and refractory being crushed or pulverized,) to the action of carbonic-oxide gas, at the required degree of temperature, within an apparatus or furnace so constructed as to envelop the ores with the carbonic oxide under a suitable graduated pressure, and depriving the iron of its oxygen by its combination and affinity with the carbonic oxide, and by also carbonizing the iron after the oxygen has been extracted.

My apparatus or deoxidizing and carbonizing furnace is shown in the accompanying drawings, in which—

Figure I represents a vertical section through the middle of the furnace in the line of its greatest width. Fig. II represents a plan view of the furnace, and partly, also, a horizontal section.

In each of the figures similar letters represent similar parts.

My furnace is constructed upon a suitable raised platform, A A, sufficiently high to permit the contents of the furnace to fall into the space underneath, so as to discharge the ores after treatment. The form of the furnace is at the base a narrow parallelogram, and the parallel sides approach each other toward the top in a pyramidal form.

The furnace is composed of two similar shells or walls, B B C C, the inner, C C, to contain the ores, and the outer one to inclose the inner and furnish a closed space or chamber within which to force and hold the gases under pressure. The interior shell or wall, C, is pierced on all sides with a suitable number of openings, I I, &c., to admit the gases from the space or chamber C' to enter the interior chamber or body of the furnace, where the ores are placed, and completely fill it under suitable pressure, and surround and permeate the ores

in every part. Upon the top of the outer shell is an opening for the charging-hole, which is directly over the open top of the interior chamber or shell, and through which the ores are placed in the furnace. This opening is provided with a suitable close-fitting cover, E, by which it is closed, and upon the cover is placed the pressure-valve with graduated arm and sliding weight F, and constructed in the usual manner.

The form of the body of the furnace above described is adopted as the best for subjecting the ores to treatment, because it holds the ores in a space sufficiently thin or narrow for their being thoroughly acted upon by the gases through the mass; but this form and these proportions may be varied to square, round, or other forms. The amount of the pressure within the furnace must be graduated to the character of the ores to be acted upon, and also to the quantity of ores and width or body of the mass of ore in the furnace, the greater body or quantity of ore requiring a greater pressure, and the less the width and consequent reduced thickness of the mass of ore the less the amount of pressure required.

Underneath the furnace is a horizontal sliding door, D, (or other suitable opening,) which, when closed, shuts the opening C' in the bottom of the furnace and sustains the ores, and which, being withdrawn, allows the ores to fall through and the furnace to be discharged. *b* is a circular opening near the base in the outer shell, B, to admit a pipe, through which the carbonic oxide is forced or drawn into the body of the furnace from any suitable generator or reservoir.

In operating the furnace the process is as follows: The bottom of the furnace being closed by the sliding door D, and the charging-door E at the top being removed or turned aside from the opening, the furnace is charged with the ores until the interior chamber, C, is filled. Under some conditions of the ores—as where very hard or refractory—I think it advantageous to crush or pulverize them before charging, and also to intimately mix the ores so pulverized with carbonaceous matter—such as tar, oil, rosin, or any carbon-producing material. The furnace being charged, the door or cover is replaced and the valve closed and set at the desired pressure. The carbonic oxide is then driven or forced in through pipe *b*

by pumping, fan-blast, or any other suitable arrangement, filling the space C' between the two walls, and thence through the apertures 1 1 into the interior chamber and upon the ores. As the ores become thereby heated by the high temperature of the carbonic oxide, they expand and become porous. The oxygen, having a stronger affinity for the carbon of the carbonic oxide than for the iron, leaves the ore and seizes upon the carbon of the carbonic oxide. As the pressure of the carbonic-oxide gas is brought to bear upon the ores as they become porous from the heat of the carbonic oxide, the gases permeate the ores, and thereby deprive the iron of its oxygen. In this manner the ores become deoxidized and are now ready for balling into merchant iron.

In order to make steel or cast-iron "sponge," (so called,) the operation before described is continued a little longer, in order to give the desired amount of carbon, and after the iron

has given off all its oxygen it becomes carbonized very rapidly by the effect and absorption of the carbonic oxide.

My furnace is thus a deoxidizing and carbonizing furnace, and may be used as well for deoxidizing iron as for carbonizing iron into steel adapted for railway-bars or iron-forgings.

Having thus described my furnace and process and manner of constructing and operating the same, what I claim therein as my invention, and for which I desire Letters Patent, is—

The deoxidizing of ores and carbonizing iron by the use of carbonic oxide at the required degree of temperature, under regulated and measured pressure, within and by means of a furnace or apparatus constructed and operating substantially as described.

CHARLES ADAMS.

Witnesses:

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