(No Model.)

A. C. BRADLEY.

PROCESS OF MANUFACTURING OXIDE OF IRON.

No. 385,235. Patented June 26, 1888.

Fig. 1.

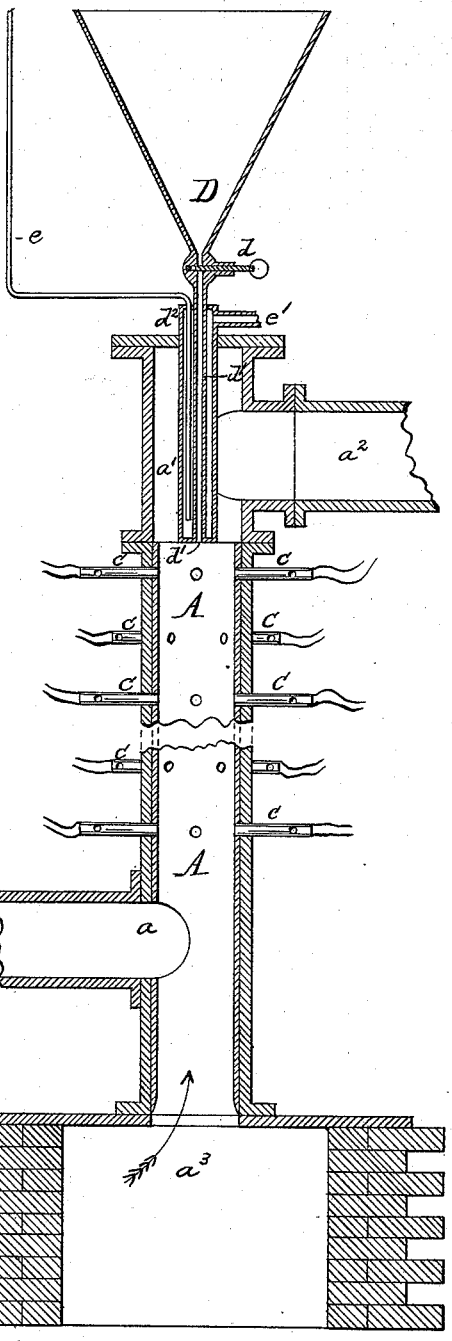
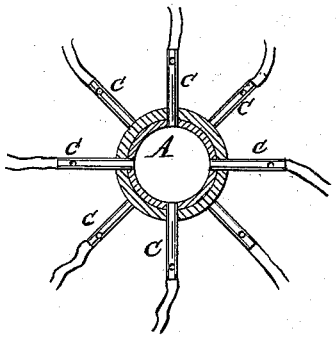


Fig. 2.



Witnesses
F. C. Frost
Jas. C. Warner

Inventor
Arthur Crosman Bradley
By his Attorney
C. L. Renwick

UNITED STATES PATENT OFFICE.

ARTHUR CROSSMAN BRADLEY, OF BROOKLYN, NEW YORK.

PROCESS OF MANUFACTURING OXIDE OF IRON.

SPECIFICATION forming part of Letters Patent No. 385,235, dated June 26, 1888.

Application filed August 12, 1887. Serial No. 246,796. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR CROSSMAN BRADLEY, of Brooklyn, in the county of Kings and State of New York, have made an invention of a new and useful Process of Manufacturing the Oxides of Readily-Oxidizable Metals for Paints and for other Purposes; and I do hereby declare that the following, in connection with the accompanying drawings, is a full, clear, and exact description and specification of the same.

In an application for a patent, the specification of which is dated the 17th day of February, A. D. 1887, the serial number of which is 228,290, I have described and claimed a process of manufacturing the oxides of metals, and the invention which constitutes the subject-matter of this patent is a modification of the said process involving the invention of that application but restricted to a special mode of treatment of the metals to be oxidized, as set forth in the claims at the close of this specification.

In order that this invention may be fully understood, I have represented in the accompanying drawings and will proceed to describe the form of a furnace which I prefer to use in practicing my said invention.

Figure 1 of said drawings represents a central vertical section of said furnace, and Fig. 2 represents a transverse section of the same at one of the sets of gas-burners.

In practicing my invention, the metal in a comminuted condition is subjected to the action of a gas-flame—such as that produced from natural gas (or gas from coal)—burned with an excess of air, the mixed atmosphere of flame and air being at a temperature sufficient to burn the comminuted metal. The resultant oxide is then collected in a pulverulent condition.

In the form of oxidizing-furnace represented in the drawings the oxidizing-chamber A is upright. At the upper end of this chamber there is an escape-passage, a^2, through which the spent products of the combustion of the gas and the pulverulent oxide carried with them can pass to a dust-collector, and it is fitted near its lower end with an inlet-passage, a, through which air may, if necessary, be introduced. The lower end of the oxidizing-chamber terminates, preferably, in a receptacle, a^3, to receive any unoxidized metal. At the upper end of the oxidizing-chamber there is a charger, D, by means of which the metal to be oxidized is fed to the inclosed oxidizing-chamber, and the neck of this charger is preferably fitted with a sliding gate or valve, d, by means of which the supply of metal can be regulated. The neck d' of the charger is preferably extended into the oxidizing-chamber sufficiently to have the lower end of the neck below the orifice of the escape-pipe a^2; and, as it is desirable to prevent the metal when previously comminuted from melting in the neck of the charger, the extension of the neck into the said chamber is surrounded by a water-jacket, d^2, through which a current of water is caused to pass, the water being supplied by means of a water-supply pipe, e, and the warm water being permitted to escape through an escape-water pipe, e'.

The gas-flame may be made directly in the oxidizing-chamber by means of burners inserted in its walls, or may be made in a preliminary combustion-chamber and introduced into the oxidizing-chamber through one or more of the inlet-passages a, above described.

In the furnace represented in the drawings the oxidizing-chamber A is fitted with burners c, through which natural gas is introduced, these gas-burners being of the construction of the well-known Bunsen burner, so that the gas is mixed with air. The action of the Bunsen burners introduces an excess of air and creates a strong draft upward through the oxidizing-chamber, and whatever additional air may be required to thoroughly oxidize the metal is admitted through one or more orifices, a, beneath the gas-burners, a forced current being introduced if a current strong enough to make the operation practically successful is not obtained by draft. The gas-burners must be of sufficient capacity to heat the atmosphere within the oxidizing-chamber and the current of air passing through that chamber to the requisite temperature for the rapid oxidation of the metal.

The dust-collector may be one of the varieties mentioned in my said previous application. In practicing my invention with the gas-furnace above described I prefer to heat

the atmosphere within the oxidizing-chamber by means of the gas-flame to a temperature somewhat higher than that at which the metal to be treated will burn in air. The comminuted metal to be oxidized, which may be lead, is placed into the charger D, and is permitted (by opening the gate *d*) to flow into the oxidizing-chamber. The comminuted metal falls through the said chamber in a shower, so that the atmosphere therein has free access to its particles, which are acted upon simultaneously by heat and the current of air. Consequently the metal burns or oxidizes rapidly, and is converted mainly into a pulverulent oxide. As the current of hot air in which the metal is burned is inclosed or confined by the walls of the oxidizing-chamber, the pulverulent oxide produced cannot escape from the current, but is carried off by the current and is deposited in the dust-collector, whence it may be removed through the doorways or openings provided for the purpose. If a bag dust-collector be used, its bags must be made of cloth porous to air, so that the air will filter through the cloth of the bags, leaving the oxide within them to be withdrawn at intervals, as is customary with this class of dust-collectors. Such larger particles of the comminuted metal as are not fully oxidized drop into the receiver a^3 at the lower end of the oxidizing-chamber, and may be removed at intervals through a doorway provided for that purpose.

The oxidizing-chamber should be formed of a material that will withstand the heat, it having been constructed by me of fire-brick material, and it should, if necessary, be lined or coated on its interior with some material that will not melt readily when acted upon by the metallic oxide. When lead is the metal that is oxidized, I have found that it is expedient to line the inside of the oxidizing-chamber with bone-ashes, which may be moistened and rammed in around a wooden former or core, which is subsequently withdrawn.

In this process the comminuted metal is subjected directly to the action of an inclosed gas-flame, with excess of air in a current. Consequently the high temperature required can be readily maintained without the external heating of the oxidizing-chamber, and the oxidation is rapid. Moreover, as the gas-flame is inclosed, the diffusion of the oxide in air is avoided, and the oxide may be collected by the dust-collector.

My process therefore differs from the preceding process of heating fine metal in the open air in the respect that in such case the metal was not subjected to an inclosed gas-flame. It also differs from the manufacture of a metallic oxide by burning a mixture of powdered metal with coal-dust in the respect that the comminuted metal is by my invention subjected free of earthy matter directly to the gas-flame. It also differs from the process of roasting ores in flame in the respect that according to my process the material operated upon is already in the metallic condition and is free from mixture with earthy matter, which, when ores are treated, produces a mixed product of earthy and metallic matter, and also in the respect that the comminuted metal itself, as distinguished from a compound of it, is directly operated upon by the heat and the oxidizing agency of the air.

I do not claim in this patent the process of oxidizing comminuted metal and collecting the pulverulent oxide, as claimed in my previous application, dated the 17th day of February, A. D. 1887, the serial number of which is 228,290, or the process claimed in my application No. 228,496, filed February 23, 1887.

I claim as my invention in this patent—

1. The process, substantially as before set forth, of manufacturing an oxide directly from a metal, which consists in subjecting the metal, in a comminuted condition and free from earthy matter, directly to the action of an inclosed gas-flame, with an excess of highly-heated air and in collecting the pulverulent oxide from said current.

2. The process, substantially as before set forth, of manufacturing an oxide directly from a metal, which consists in subjecting the comminuted metal free from earthy matter in a shower directly to the action of an inclosed gas-flame and heated air, and in collecting the pulverulent oxide from said current.

In witness whereof I have hereto set my hand this 8th day of August, A. D. 1887.

ARTHUR CROSSMAN BRADLEY.

Witnesses:
WALTER STABLER,
JAS. E. WARNER.

Correction in Letters Patent No. 385,235.

It is hereby certified that in Letters Patent No. 385,235, granted June 26, 1888, upon the application of Arthur Crossman Bradley, of Brooklyn, New York, the title of the invention was erroneously written and printed "Process of Manufacturing Oxide of Iron," whereas the said title should have been written and printed *Process of Manufacturing Metallic Oxides;* and that the said Letters Patent should be read with this correction therein to make the same conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 10th day of July, A. D. 1888.

[SEAL.]

D. L. HAWKINS,
Assistant Secretary of the Interior.

Countersigned:

BENTON J. HALL,
Commissioner of Patents.