J. W. MIDDLETON.

Refining Iron.

No. 107,942. Patented Oct. 4, 1870.

Fig. 1

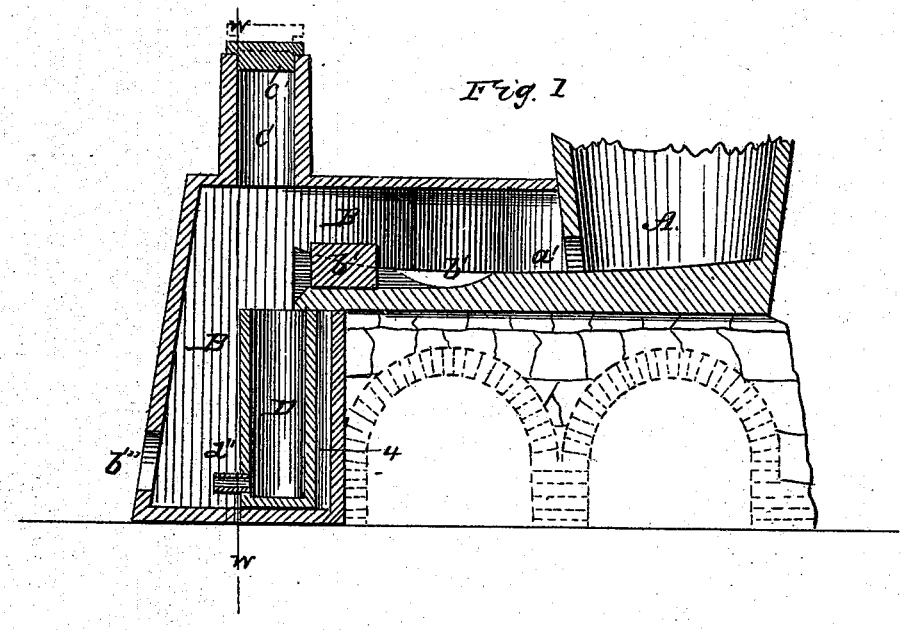
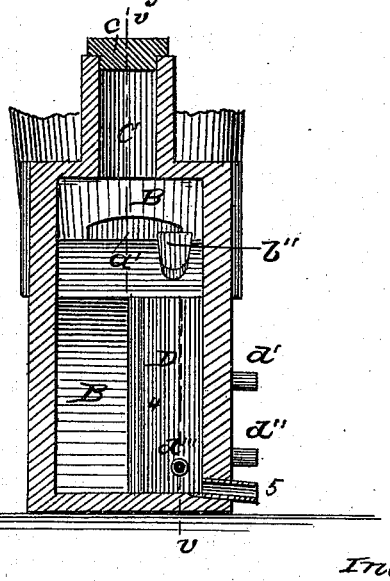


Fig. 2



Witnesses

Benj. Morrison

Wm. H. Morrison

Inventor

John W. Middleton

UNITED STATES PATENT OFFICE.

JOHN W. MIDDLETON, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF PURIFIED CAST-IRON FROM THE ORE.

Specification forming part of Letters Patent No. **107,942**, dated October 4, 1870; antedated September 24, 1870.

To all whom it may concern:

I, JOHN W. MIDDLETON, of the city of Philadelphia, in the State of Pennsylvania, have invented certain improvements in the apparatus and mode of feeding blast-furnaces with heated air or other aeriform or gaseous fluids, and of running off the iron therefrom, of which the following is a specification:

Nature and Object of the Invention.

My invention relates to the combination, with the lower part of a blast-furnace, of a capacious hot-air or gas chamber provided with a concave bottom, having a sluice, with an adjustable stop, communicating with a receiver for separating the melted metal from the slag by gravitation, and distributing the contents, when required, in such a manner that the hot blast, heated by a special furnace or otherwise, will serve the purposes, first, of keeping the concave bottom of the hot-air or gas chamber and the receiver for the melted metal and slag within the chamber in a strongly-heated or fluid condition as the said blast passes through it into and upward through the furnace; second, of allowing the usual hot blast of the furnace to be driven downward from its mouth through the same into the hot-chamber, so that it will cut away any arch or other obstruction that may at any time have formed in the furnace, and at the same time keep-up the hot condition required in the heated chamber below for receiving the melted metal and slag and keeping them fluid; and, third, of allowing the communication between the blast-furnace and the said heated chamber below to be cut off as occasion may require, the object of my invention being to facilitate the production of purified cast-iron direct from the ore.

Description of the Accompanying Drawings.

Figure 1 is a vertical longitudinal section, in the dotted lines *v v* of Fig. 2, of my improved apparatus. Fig. 2 is a transverse section, on the dotted line *w w* of Fig. 1, of the same.

General Description.

A represents a section of the lower end of a blast-furnace provided with an opening, *a'*, which may be in width about forty per cent. of the circumference of this part of the furnace, and permitting the usual modes of blowing into the furnace by tuyeres, and the closing up of this opening *a'* in such latter case. It gives entire control of the furnace by using tuyeres, stocking the tunnel-head to suit, and forcing the blast down through the furnace, and through the opening *a'* when open, and along the passage from the latter, over the bottom of the hot-chamber B, to and through the damper-flue C, raised partially for the purpose.

The partially-liquidated stock lies in the mouth of the opening *a'*, and the fluid metal and slag flow into a pool, *b'*, which is a little below and near the middle of the concave bottom of B, and is kept heated in the said pool by the blast until a quantity sufficient for use is let run by moving a stop, *b''*, into the receiving-vessel D, wherein the pure iron gravitates toward the bottom of the said vessel and the slag floats upward toward the surface of the metal.

Access for removing the stop *b''* is intended to be provided by an adjustable opening in the top of the chamber B or in one side of the flue C.

The receiving chamber or vessel D may be either vertical or inclined, has a flue-space, 4, partly around it, to keep it hot, and is provided, also, with outlet-spouts *d' d'' d'''*, for drawing off the iron and slag as wanted, for casting or other purposes. Two of these spouts, *d' d''*, open on the outside of the chamber, and one of them, *d'''*, on the inner side. One of the objects of the inner one is to enable the workmen to pass the hot blast through it and upward through the receiver, for the purpose of heating it more effectually preparatory to letting the fluid iron into it; and another object is to permit the fluid iron to run into a gutter in the chamber and through the opening *b'''*, or through a spout, 5, in the side wall of the chamber. These spouts are provided with clay stops, to be used, when necessary, to close them.

The vessel D is substantially the same as that described in my application filed February 23, 1870.

When the hot blast and the heat of any

special furnace are being driven into the blast-furnace A through the chamber B, the damper c' in the flue C is to be closed; but when the hot blast is being driven into the chamber B through the blast-furnace, the said damper is to be partially opened and the mouth b''' of the chamber B closed.

All the different parts are to be made sufficiently tight and strong to support the liquid iron and slag and the pressure of the blast.

Claims.

I claim as my invention—

1. The combination, with a blast-furnace, of the hot-chamber B and the receiving-vessel D, arranged to operate substantially as and for the purpose hereinbefore set forth.

2. The process consisting in the employment of heated air or other aeriform or gaseous fluids, or the intense heat of a special furnace, or both together, driven into the blast-furnace through a hot-chamber containing a pool or cavity for the reception of the fluid iron and slag from the said furnace, and a vessel for receiving the same from the pool or cavity and separating the slag and iron by gravitation therein, substantially as and for the purpose hereinbefore set forth.

3. The process consisting in the forcing of a blast into the upper portion of the furnace and downward through the same into a hot-chamber provided with a pool or cavity for receiving the fluid iron and slag, and a vessel for separating the same by gravitation, substantially in the manner hereinbefore set forth.

JOHN W. MIDDLETON.

Witnesses:

BENJ. MORISON,

WM. H. MORISON.