J. W. MIDDLETON.

Producing Castings Direct from the Blast Furnace.

No. 108,375. Patented Oct. 18, 1870.

Fig. 1.

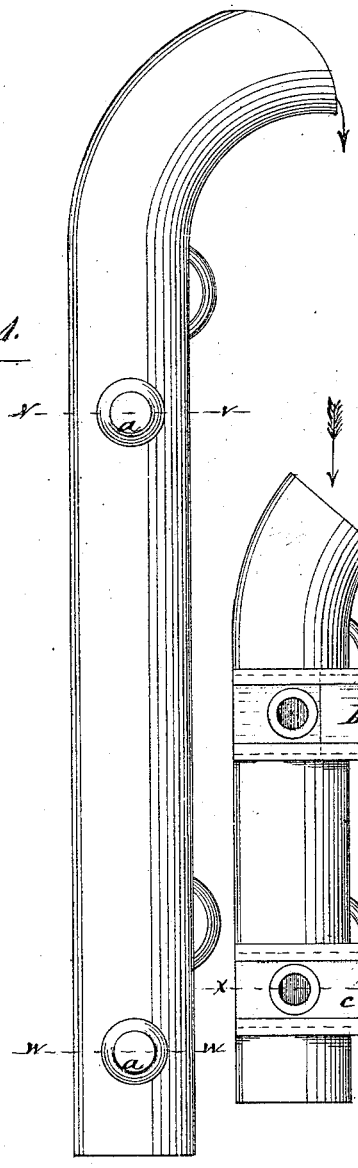


Fig. 2.

Fig. 3.

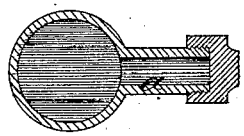
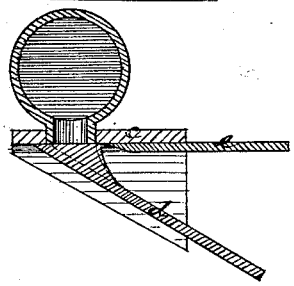


Fig. 4.



Witnesses:

Wm. Morrison

Inventor:

John W. Middleton

UNITED STATES PATENT OFFICE.

JOHN W. MIDDLETON, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN PRODUCING CASTINGS DIRECT FROM THE BLAST-FURNACE.

Specification forming part of Letters Patent No. **108,375**, dated October 18, 1870; antedated October 8, 1870.

I, JOHN W. MIDDLETON, of the city of Philadelphia, in the State of Pennsylvania, have invented certain Improvements in the Mode of Producing First-Class Castings Direct from the Ore-Reducing Blast-Furnace and in the Apparatus therefor, of which the following is a specification:

Nature and Object of the Invention.

The first part of my invention relates to the running of the iron and scoria of ore-reducing furnaces directly into deep narrow receivers or molds made either in vertical or inclined positions below the level of the hearth, the object of this part of my invention being to more effectually separate the scoria and iron by gravitation.

The second part of my invention relates to the employment of lengthy or deep vessels, suspended in an adjustable manner from suitable cranes, for receiving the fluid products of the ore-reducing blast-furnace, and capable of being readily brought into the vertical positions most favorable for the separation of the scoria and slag from the iron, and the condensation of the latter by its superior gravitation in the lower part of the swinging vessels in such a manner that the light scoria or slag, with whatever impure iron may remain with it, will overflow from one vessel into another, if desired, or may be drawn off at any suitable elevated part of the vessel or vessels and the pure condensed iron be run from the lower end of the vessel directly into the flask, the object of this part of my invention being to run into the flask a stream of melted iron entirely free from scoria or slag, and thus produce first-class castings of iron direct from the ore-reducing furnace.

The third part of my invention relates to the gate or stop, whereby the flow of melted iron under a high or heavy head can be readily and effectually stopped, or the size of the current adjusted at pleasure, as occasion may require.

Description of the Accompanying Drawings.

Figure 1 is a side elevation of a primary receiving and purifying vessel; Fig. 2, a like elevation of a similar secondary vessel; Fig. 3, a transverse section of Fig. 1 on the dotted line V or W; Fig. 4, a transverse section of Fig. 2 on the dotted line X.

General Description.

The length and diameter of the vessel, Fig. 1, are intended to be made to suit the particular requirements it is to serve. As a general statement, it may be made from two to twelve feet long and from one to two feet diameter, more or less, of iron, lined with fire-brick or clay, and its tapping-tubes *a a* also lined with clay and fitted with screw-caps or other means for retaining a clay stop.

The vessel Fig. 2 is like that of Fig. 1, except that it is shorter.

In Fig. 2 the stop or gate *b* is simply a slide which covers and opens the outlet. A more perfect gate for retaining the stop-clay and for allowing the iron to flow when required is shown in Fig. 4 and at *c* in Fig. 2. It consists of a wedge-faced slide, *d*, and a flat slide, *e*, fitted in respective grooves in the projecting sides of a plate, *c*, which is fixed to the vessel, so that the outlet opens through it and can be effectually closed by the wedge-gate *d*, which will press the soft-clay stop firmly into it; and the flat slide *e* is used to regulate the size of the stream of iron when the gate *d* is withdrawn and the opening is made for the outflow of the iron.

In using my improved mode and apparatus, say, for cast-iron, I run the melted iron direct from the ore-reducing furnace into the upper end of the vessel, Fig. 1, the vessel being either vertical or inclined and suspended either in an oven heated by a special fire or by a hot-blast, or without regard to being heated, the suspension being from a suitable swinging crane, by means of what are called "Chinese chains," or otherwise, so that the said vessel can be either raised into a vertical position or inclined and brought to the flask, and its outlet adjusted to run the metal into the flask.

As the metal runs into the vessel its fall produces great agitation therein and aids the rising or separating of the scoria and the slag, which, with whatever of impure iron may adhere, will overflow into the secondary tube, if desired, or it may be drawn off through the upper outlet, *a*, and run into molds for architectural purposes.

It will now be understood, without further description, that this process or mode and the apparatus therefor will do away with the necessity of remelting the iron to make first-class castings, because the iron in the lower end of the vessel, Fig. 1, will be pure, or entirely free from scoria and slag—a condition which is not always attainable even after a remelting of the iron in a cupola and pouring from a ladle, as the scoria which rises in the ladle is kept back with a difficulty which often lets pass into the flask portions of the scoria, and thus injures or spoils the casting.

I do not desire to claim the principle of gravitation as now used for separating iron and slag at blast-furnaces; but

I claim as my invention—

1. Running the iron and scoria of ore-reducing furnaces directly into deep narrow receivers or molds, made either in vertical or inclined positions, below the level of the hearth, substantially as and for the purpose hereinbefore set forth.

2. The employment of a deep portable receiving and purifying primary vessel, Fig. 1, provided with outlet-tubes *a a* at different heights from its lower end, and fitted with stop-gates or slides, so that the iron, scoria, and slag run into it directly from an ore-reducing furnace will be separated therein by gravitation, and the pure iron can be run out at the bottom of the vessel, and the scoria and slag overflowed into a secondary or other suitable vessel, Fig. 2, or drawn off through the upper tube, *a*, into any suitable mold, substantially as hereinbefore set forth and described.

3. The stopping and regulating device, Fig. 4, consisting of the plate *c*, wedging-stop *d*, and regulating-slide *e*, in combination with any of the outlets of the vessel, substantially as and for the purpose hereinbefore set forth.

JOHN W. MIDDLETON.

Witnesses:

BENJ. MORISON,

W. H. MORISON.