(No Model.)

J. P. WITHEROW.

PROCESS OF MAKING STEEL BY THE PNEUMATIC OPERATION.

No. 327,419. Patented Sept. 29, 1885.

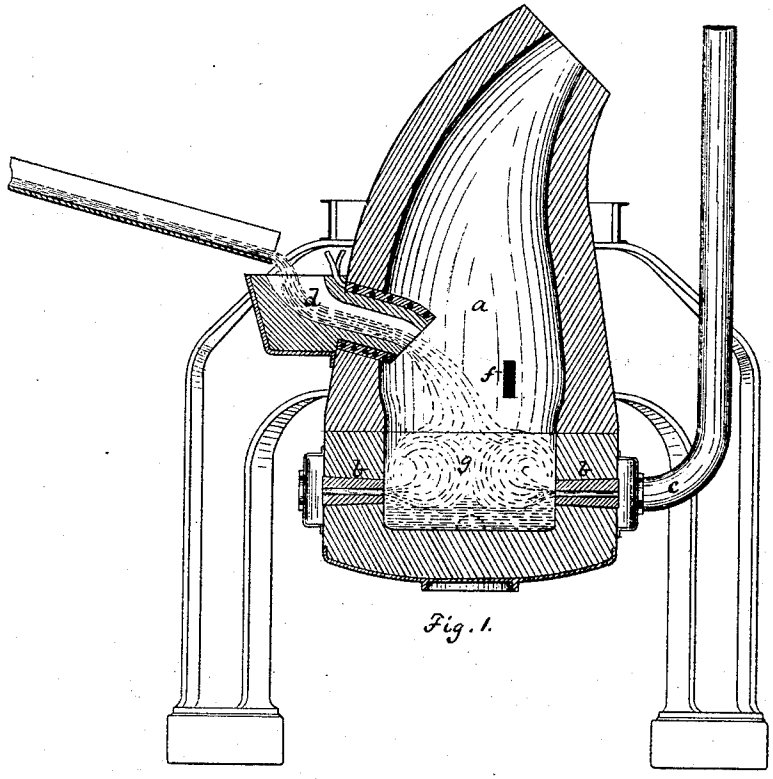
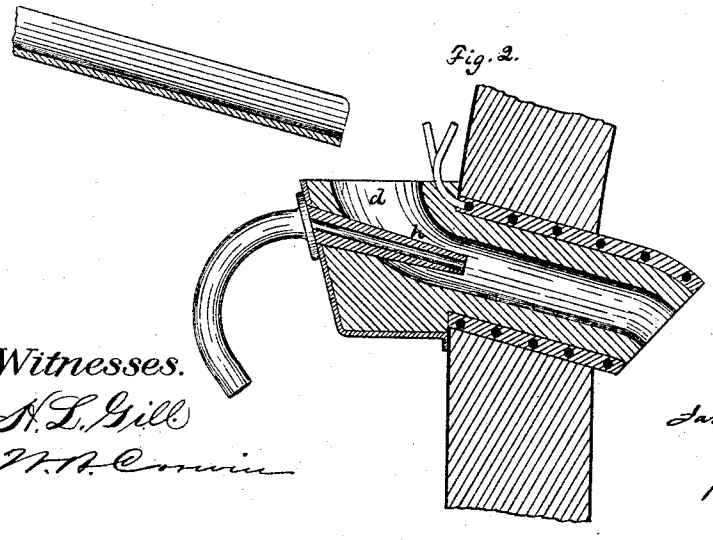


Fig. 1.

Fig. 2.



Witnesses.
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UNITED STATES PATENT OFFICE.

JAMES P. WITHEROW, OF ALLEGHENY CITY, PENNSYLVANIA.

PROCESS OF MAKING STEEL BY THE PNEUMATIC OPERATION.

SPECIFICATION forming part of Letters Patent No. 327,419, dated September 29, 1885.

Application filed July 3, 1885. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. WITHEROW, of Allegheny City, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Processes of Making Steel by the Pneumatic Operation; and I do hereby declare the following to be a full, clear, and exact description thereof.

In the manufacture of steel by the pneumatic or Bessemer process, as practiced by me in Letters Patent No. 314,504, dated March 24, 1885, I oxidize a portion of the charge for the purpose of providing a base with which the metalloids of the charge shall unite and form a slag, whereby they are separated from the metal and may be removed from the converter at any desired period of the blow.

My present improvement relates to the formation of the oxide at the beginning of the operation, or in the earlier stages of the blow, so that a base is provided from the first for union with the silicon or other metalloid contained in the charge. The oxide of iron thus formed, not passing through the bath of metal, does not come in contact with the carbon of the pig metal and become deoxidized or reduced to a metallic condition, but rises with or floats on top of the charge, furnishing a base for the silicic acid formed during the progress of the operation. In this process the blast of air is turned on as the molten metal is being charged into the converter, so as to come in contact with and oxidize the same more or less as it descends into the vessel and as it rises to the metal line. The oxide of iron is thus formed on the outside or exposed surface of the bath, and floats on top of the same as it rises to its proper height above the tuyeres, so that from the very beginning of the operation there is a constant base for the reception of the silicic acid which is not again reduced, so that the impurities which have become united therewith will not again be returned to the charge.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying drawings, in which—

Figure 1 is a view of a converter in which my invention can be carried into practice. Fig. 2 is a view of a modification.

Here *a* indicates a converter having tuyeres *b*, blast-pipe *c*, charging-hole *d*, metal-tap *e*, slagging-hole *f*, and metal-line *g*. The metal being poured into the converter, as shown, the currents of air from the tuyeres *b* impinge upon and oxidize it as it descends, producing a base with which the silicic acid unites and forms a slag. The oxide of iron thus formed remains on the surface of the bath as it rises in the vessel, so that when the bath rises above the mouths of the tuyeres and the period of active conversion begins the basic slag is already formed and in place to take up the free silicic acid which then begins to be eliminated rapidly. In order to effect the more perfect action of the blast on the metal as it falls in the converter, I provide the charging-hole *d* with a spout, *d'*, which projects into the interior of the vessel and permits the stream of metal to fall clear of the side of the vessel. The currents of air from the tuyeres encounter the falling stream of metal on all sides and disperse it, so that it is acted on in a finely-divided state and the oxidation is very complete.

If it is desired to increase the oxidizing effect of the blast, it may be done by providing the charging-spout *d* with an air-tuyere, *h*, as shown in Fig. 2. The blast from this tuyere *h* still further separates or divides the charge as it descends in the converter, and also effects a partial oxidation. The oxidation does not stop with the fall of the metal, because the blast continues to act with a greater or less effect on the surface of the agitated charge as it rises to and above the level of the tuyeres. The result is that a proper proportion of the charge is oxidized before the metal rises above the tuyeres to form a sufficient base for the reception of free silicic acid from the instant of earliest disassociation of the metalloids and other impurities, and the oxide thus formed is not deoxidized and the impurities associated therewith returned to the charge, as in case the metal is first blown from the bottom up through the charge.

Another advantage is that the volatilization of certain impurities is facilitated when the charge is treated with the blast in a divided state. The charge is then blown in the usual way, and the slag, as desired, is tapped off during the intermediate stages of the blow, as stated in my said former patent.

I do not limit my invention to use with the particular form of vessel shown, but include all other forms of converting-vessels in which the same may be practiced.

I am aware that in the Bessemer process as heretofore practiced the oxide of iron formed in the charge of metal by blowing air through it is an active agent of the purifying operation, and I make no claim thereto; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

As an improvement in the art of converting metal by the pneumatic process, the method herein described, which consists in first oxidizing a portion of a charge to form a base by treating it with a blast of air when in a divided state, and then blowing the charge in a converter to eliminate the impurities and effect the conversion of the same, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 30th day of June, A. D. 1885.

JAMES P. WITHEROW.

Witnesses:

THOMAS B. KERR,

W. B. CORWIN.