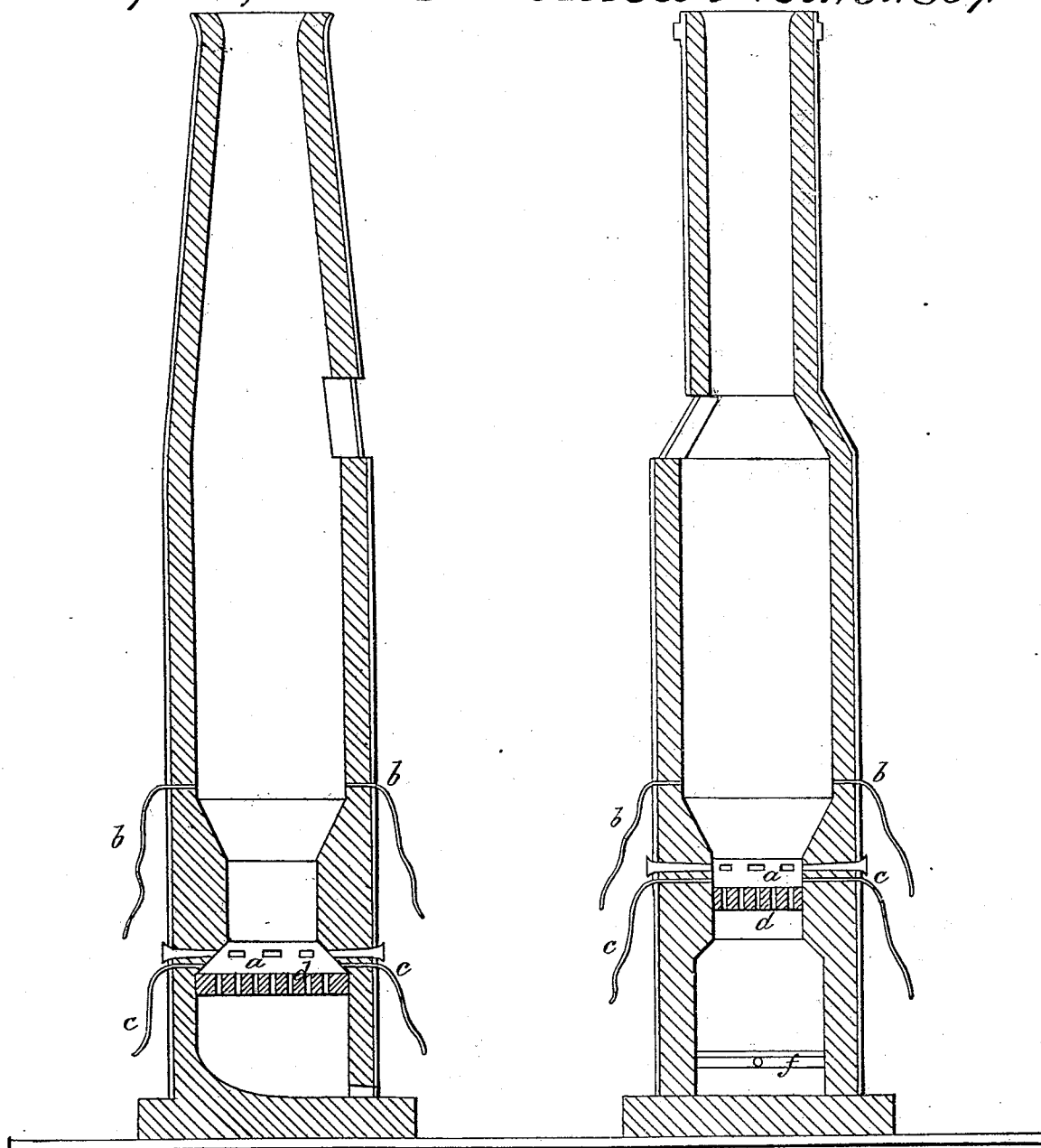


C. M. Nes.
Manufacture of Pig Iron.
N^o 96827. Patented Nov. 16. 1869.



Witnesses.

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Inventor.

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UNITED STATES PATENT OFFICE.

CHARLES M. NES, OF YORK, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF PIG-IRON.

Specification forming part of Letters Patent No. 96,827, dated November 16, 1869.

To all whom it may concern:

Be it known that I, CHARLES MOTIER NES, of York, county of York and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Iron; and I hereby declare the following to be a full clear, and exact description of the same.

My invention relates to a mode of facilitating both the production of pig-iron from the ore and the melting and purification of the pig in puddling-furnaces. It is based, first, upon the employment of a concentrated blast analogous to the blow-pipe; secondly, upon the combination of the concentrated blast and electricity to effect the rapid reduction of the ore or the melting of the pig.

The invention further consists in employing, in the blast or cupola furnace for reducing the ore, a soap stone or other perforated bottom, which permits the passage of the melted iron, while it keeps it removed from cinder and other impurities.

In the drawing or diagram which accompanies this specification I have represented, in order to more fully illustrate the manner in which my invention is or may be carried into effect, two cupola-furnaces. My invention, however, is applicable to furnaces of any other suitable construction, and I do not limit myself to the precise form of apparatus herein shown. In each of the furnaces it will be noted that the blast is concentrated at *a*, the long flat tuyeres (this being the form preferred) being arranged on all sides of the furnace, and placed close together—say about six inches apart—so that a most powerful and concentrated blast from the engine will be brought to bear upon the ore. In furnaces where the ordinary blast is employed, only the exterior portions of the charge or burden are usually affected directly by the blast, while the melting of the central portion is due in great measure to contact with the outer melted portions; but with a concentrated blow-pipe blast, such as I obtain, the whole portion of the charge on a level with or just above the blast seems to be about equally affected in every part, and a very rapid reduction of the ore results. Experiment has demonstrated that a charge of five hundred pounds of ore can, by the use of the concentrated blow-pipe blast, be reduced in twenty-five minutes; and I myself have

tapped off from the furnace about two hundred pounds of metal (the production of a charge of five hundred pounds of ore) within twenty-five minutes after the charge was subjected to the blast.

In connection with the concentrated blow-pipe blast, I propose to use electricity as an agent to facilitate the reduction and purification of the metal. To this end I introduce the wires into the furnace at points which will allow them to be inserted into the molten or semi-molten metal, as shown at *b c*. As the metal (which is a conductor) completes the connection between the two wires, currents of electricity will be constantly passing through the burden of the furnace while the melting is going on, facilitating the melting and purification of the ore or iron. The wires should, of course, be connected with a suitable electrical apparatus, and I have contemplated deriving the electricity from the band-wheel of the blast-engine.

Between the ore and the chamber in which the molten metal is received I place a soap-stone or other suitable perforated bottom, *d*, which allows the molten metal to pass through without intermixture with cinder and other impurities, keeping it separated from the coal and ore, and this aids considerably in improving the quality of the pig. The bottom can be made removable, and so as to slide in and out, if desired.

In working the furnace, charges of five hundred pounds of ore, with coal and flux, are put into the furnace in the usual way—say every twenty-five minutes. The effect of the concentrated blow-pipe blast is, as above stated, to cause the melting to begin almost instantaneously, and the use of the electricity aids in this operation, and tends to purify the metal. The molten metal drops or runs through the soap-stone bottom into the lower chamber, whose capacity should be about sufficient to contain the metal melted from one charge. From this chamber the metal is tapped off, and the charge is then renewed.

The chamber can have a drop-bottom, *f*, if desired.

The composition of the ore with which I usually work is as follows: Silica, 40.80; metallic iron, 36.07; alumina, 8.65; magnesia, a trace; phosphorus, 0.22.

An analysis of the pig produced from this ore fails to disclose any phosphorus, and this absence of phosphorus I attribute to the effect of the concentrated blow-pipe blast.

It will, of course, be understood that the process is applicable to other ores as well as that which I have specified. I have found, also, that the use of the concentrated blast and electricity will greatly facilitate the melting and purifying of pig-iron in puddling-furnaces. The manner in which these means can be employed with such furnaces will be readily understood by those skilled in the art to which my invention relates, and requires no further explanation, for the principle, whether applied to blast, cupola, or puddling furnaces, will be essentially the same.

Having now described my invention, and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is—

1. The use of the concentrated blow-pipe

blast in furnaces for the production of iron from the ore or in puddling-furnaces, in the manner and for the purposes herein described.

2. The use of the concentrated blow-pipe blast in combination with electricity, in the manner herein shown and described, to facilitate the melting and purification of the iron in blast, cupola, or puddling furnaces, as set forth.

3. The employment, in the blast or other furnace for reducing iron ore, of a perforated bottom or partition of soap-stone or other suitable material, to separate and keep free the molten metal from the cinder, ore, and other impurities, as herein set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

CHAS. M. NES.

Witnesses:

M. BAILEY,

WILLIAM H. M'CABE.