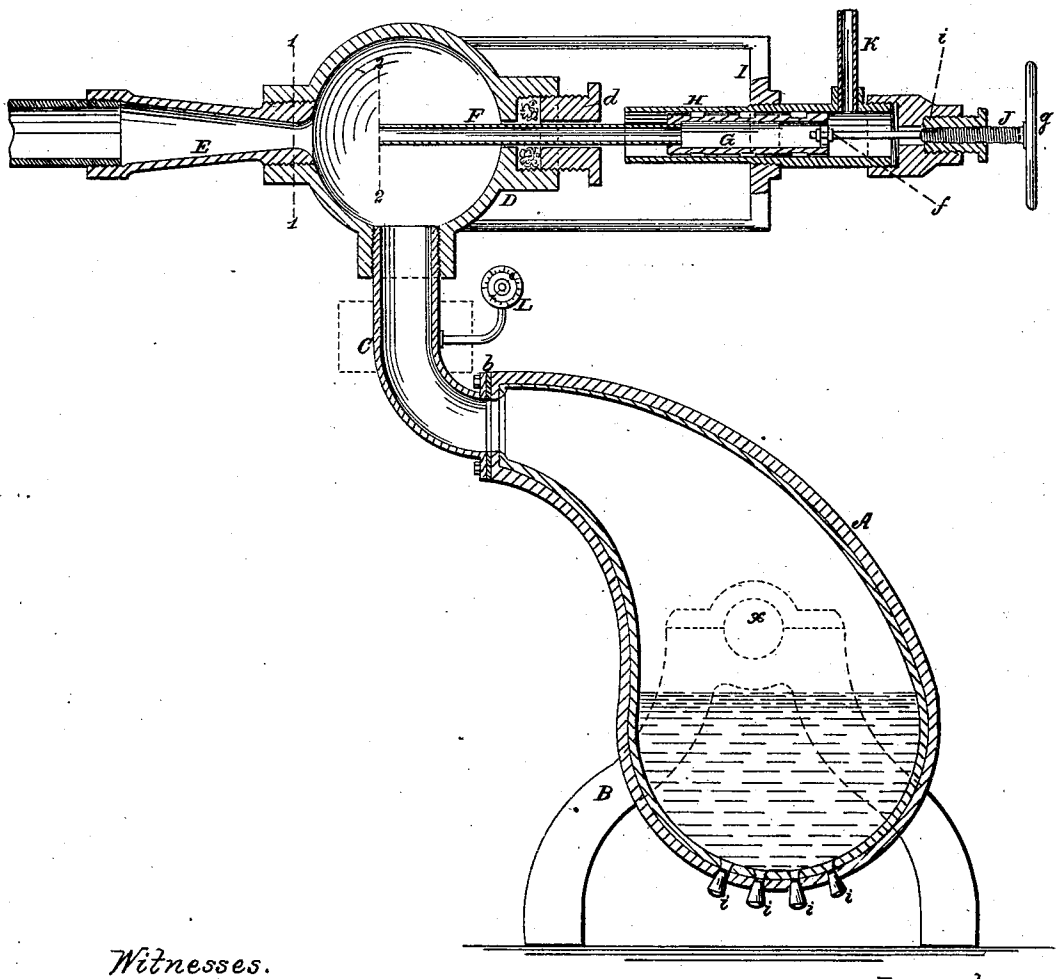
J. ABSTERDAM.

Making Bessemer Steel.

No. 84,333. Patented Nov. 24, 1868.



Witnesses.
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JOHN ABSTERDAM, OF NEW YORK, N. Y.

Letters Patent No. 84,333, *dated November* 24, 1868.

IMPROVEMENT IN APPARATUS FOR REFINING IRON AND MAKING STEEL.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, JOHN ABSTERDAM, of the city, county, and State of New York, have invented a new and improved Apparatus for Refining Iron and Making Steel *in vacuo;* and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing, forming part of this specification, which drawing represents a sectional side elevation of this invention.

This invention relates to an apparatus which I have found to be of particular advantage in carrying out a process for refining iron and making steel *in vacuo*, for which a patent was granted to me, January 23, 1866, No. 52,121.

This improved apparatus consists in the arrangement of an adjustable nozzle, which extends across the mouth of the pipe that connects with the converter or refiner, and terminates opposite to a conical spout, in such a manner, that, by passing a current of steam through said nozzle, a partial vacuum is produced in the converter, and, by adjusting the position of the nozzle in relation to the discharge-spout, the effect of the exhauster can be regulated according to the heat to which the nozzle is exposed, and according to the degree of the vacuum desired. A vacuum-gauge attached to the exhauster indicates the state of the vacuum in the converter.

A represents a retort, which is intended for converting iron into steel, or for refining iron, and which I term the converter or refiner.

This converter is provided with trunnions, *a*, which have their bearings in suitable standards, B, so that the same can be turned to an upright, inclined, or horizontal position, as may be required during the subsequent stages of the refining or converting-process.

The neck of the converter is curved, as shown, so that, when the same is brought in the position shown in the drawing, it will match the flange *b* of the suction-pipe C.

When the apparatus is in operation, the suction-pipe is firmly secured to the neck of the converter, and the joint between the two parts is rendered air-tight by suitable packing.

The suction-pipe C extends from the globe-shaped chamber D, into one side of which is secured the spout E, while through its opposite side enters the nozzle F.

The spout E is conical, its largest end being turned outward; and the axis of this spout coincides with the prolongation of the axis of the nozzle, so that a jet of steam, injected through said nozzle, will strike the centre of the spout.

The nozzle F is a cylindrical tube, which passes through a stuffing-box, *d*, in the side of the chamber D, and which is secured to a tubular plunger, G.

This plunger is open at one end, and it is fitted into a cylinder, H, which is supported by a yoke, I, attached to the outside of the chamber D.

The outer end of this cylinder is closed by a stuffing-box, *e*, through which passes the screw-spindle J, the inner end of which is attached to a bridge, *f*, on the open end of the plunger G, while its threaded part is tapped into the screw-cap or gland of the stuffing-box *e*, and on its outer end is mounted a hand-wheel, *g*.

The connection between the screw-spindle and the bridge *f* is such that the spindle is free to turn in the bridge, but it is not permitted to move therein in the direction of its axis, and, consequently, by turning the screw-spindle in the gland of the stuffing-box *e*, the plunger G, and with it the nozzle F, is drawn in or out, according to the direction in which the hand-wheel *g* is turned.

In the side of the cylinder H is secured the steam-pipe K, which connects with a suitable steam-generator, and which can be opened or closed by a stop-cock.

To the suction-pipe C is secured a vacuum-gauge, L.

When the apparatus is to be put in operation, and after the converter A has been charged with metal and connected with the flange of the suction-pipe, the steam-pipe K is opened, and the steam, rushing through the nozzle F, and out through the spout E, carries with it a portion of the air contained in the converter, so that a partial vacuum is produced therein, and if the plugs in the bottom of the converter are removed, a current of air is caused to pass through the molten metal by suction, in contradistinction to the impelled current of air as now employed in the Bessemer process. As the operation progresses, the nozzle F becomes heated, and the steam, in passing through it, is superheated, so that its pressure, and consequently its air-exhausting effect, are changed. This effect can be observed by the vacuum-gauge, and in order to obtain the best possible effect, it is necessary to move the nozzle F in or out until the desired vacuum is attained.

Instead of making the nozzle adjustable, however, the spout E could be made adjustable, the effect of the apparatus being dependent upon the distance of the inner end of the nozzle F, and the narrowest portion of the spout E, as indicated by the lines 1–1 2–2 in the drawing.

As these lines approach, or are moved apart, the exhausting effect of the jet of steam changes. If the spout is made adjustable, the nozzle F remains stationary, and all the mechanism shown for moving the same can be dispensed with, but a hand-wheel or other device must be connected to the spout.

The position of the nozzle is adjusted by turning the hand-wheel G, and, in order to prevent the cylinder H and plunger G from getting overheated, I have secured the same in the yoke I, which allows a free circulation of air round the cylinder.

During the process of refining or converting iron, a large quantity of cinders and other solid impurities is

disengaged from the molten metal and carried off by the current of air, and I propose to provide the suction-pipe C with a reservoir, as shown in red outlines, for the purpose of catching and retaining such cinders and impurities, so as not to obstruct the spout E.

By the aid of this air-exhausting apparatus, I am enabled to carry out my process for refining iron and making steel, as described in my patent dated January 23, 1866, No. 52,121, with great success.

It is obvious, that, in carrying out my present invention, the form of the converter may be changed as circumstances may make desirable, and I do not wish to confine myself to the precise form or shape of the converter shown in the drawing.

Having thus described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

The combination of the nozzle F and conical spout E, either one or both of which may be made movable towards or from each other, with the suction-pipe C and converter A, substantially as and for the purpose herein shown and described.

JOHN ABSTERDAM

Witnesses:

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