E. C. ATKINS.

Cupola-Furnace.

No. 221,995. Patented Nov. 25, 1879.

Fig. 1.

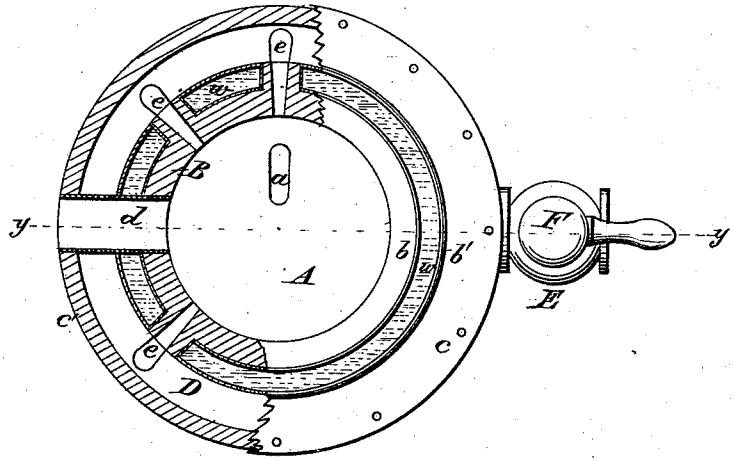
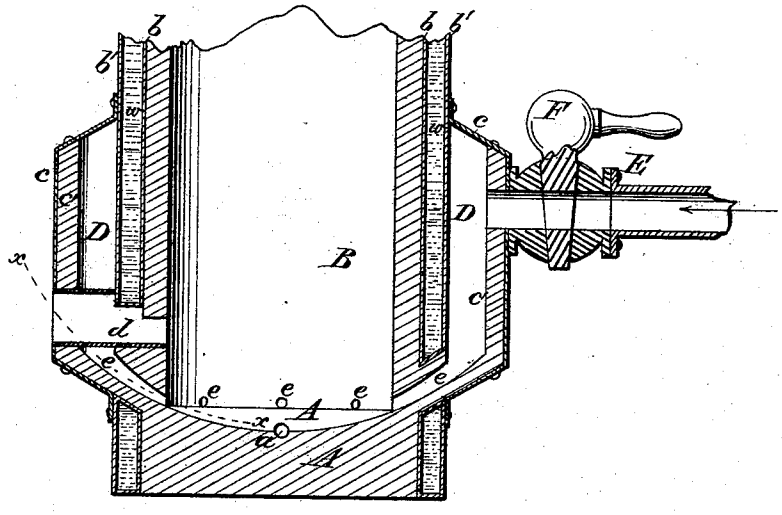


Fig. 2.



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ELIAS C. ATKINS, OF INDIANAPOLIS, INDIANA.

IMPROVEMENT IN CUPOLA-FURNACES.

Specification forming part of Letters Patent No. **221,995**, dated November 25, 1879; application filed May 1, 1879.

To all whom it may concern:

Be it known that I, ELIAS C. ATKINS, of the city of Indianapolis, county of Marion, State of Indiana, have invented certain new and useful Improvements in Blast-Furnaces for the Reduction of Metalliferous Ores, of which the following is such a full and exact description as will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, similar letters of reference indicating like parts in the different figures—

Figure 1 being a plan view, partly in section, on the line *x x* of Fig. 2. Fig. 2 is a vertical section on the line *y y* of Fig. 1.

The object of this invention is to produce a furnace in which the process of reducing ores and refining their metallic product can be carried on without shifting such product to another furnace for refining, as has commonly been done in the plant heretofore employed for these purposes; and the invention consists in the construction of a blast-furnace with a series of radiating curved tuyeres surrounding and entering the hearth at a point near its bottom, by which a blast of air may be forced through the molten metal within the furnace, and in certain other details of construction, which will be hereinafter fully described, and then specifically pointed out in the claims.

The hearth or crucible A of the furnace is made slightly concave, and of any suitable refractory material. It is provided at its lowest point with a tap-hole, *a*, through which the molten metallic contents are withdrawn whenever desired.

The outer casing of the furnace is formed of two concentric cylinders, *b* and *b'*, having, preferably, a water-space, *w*, between them. Within the cylinder *b* is placed the furnace-lining B, constructed of fire-brick or other suitable material.

Concentric with the outer casing, *b'*, is an additional metallic case, *c*, which incloses the air-chamber D. This chamber is also further inclosed in a refractory non-conducting covering, *c'*, which lines its inner surfaces and prevents injury from the influx of molten metal when the blast is shut off, and further prevents loss of heat when a hot-blast is employed for working the furnace.

To one side of the air-chamber is attached the inlet-pipe E, through which the supply of compressed air in the air-chamber is kept up. This pipe E is provided with a stop-valve, F, by means of which the supply of air is regulated or wholly shut off at will.

From the concave hearth A of the furnace extends a series of radial curved tuyeres, *e*, their outer ends enlarged and terminating in the bottom of the air-chamber D, the curvature of which bottom, as well as that of the tuyeres, being substantially the same as that of the hearth A.

The holes through the water-jacket *w*, through which the tuyeres pass on their way from the air-chamber to the furnace, are much larger than the tuyeres, so as to allow the latter to be completely surrounded by a layer of refractory material continuous with the lining of the furnace and air-chamber.

An opening, *d*, through the several casings of the furnace, forms a slag-hearth, through which the slag and scoria are allowed to flow off as produced during the working of the furnace.

It will be evident that the water-jacket may be dispensed with, if desired, and its place supplied by fire-brick or other refractory material, without departing from the principle involved in my invention; but I prefer the water-jacket, as it produces a more durable and pleasant-working furnace.

The method of operating this furnace is as follows: The charge is put in in the ordinary manner of charging blast-furnaces, and as the fused metal reaches the bottom it is continually agitated by the blast, which enters at its very bottom with sufficient force to prevent the molten metal from backing up the tuyeres.

The action of the air upon the fused mass of metal causes a partial separation of the baser portion, which will be thrown to the top, and will pass off with the slag, which is drawn off after first closing the stop-valve, thus leaving the air-chamber filled with air of a density sufficient to prevent the metal from entering the tuyeres. The metal being thus left at rest, the slag and oxidized portions of the base metals, which have risen to the top, are drawn

off through the slag-hearth. The blast is then again turned on and the operation repeated.

When it is desired to draw off the refined metal, the tap-hole *a* is opened and the metal drawn off into suitable molds. The tap-hole is then closed and the operation of the furnace continues.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

The combination, in a blast or cupola furnace, of the concave hearth, curved inclined tuyere, entering near the bottom, the direction whereof corresponds with the curvature of the hearth, blast-box, and water-chamber intervening between the blast-box and interior lining, substantially as and for the purpose specified.

ELIAS C. ATKINS.

Witnesses:

MERRITT POTTER,

GEORGE G. EARLE.