2 Sheets—Sheet 1.

H. H. EAMES.

Smelting Fine or Dust Ores.

No. 216,561. **Patented June 17, 1879.**

Fig. 1.

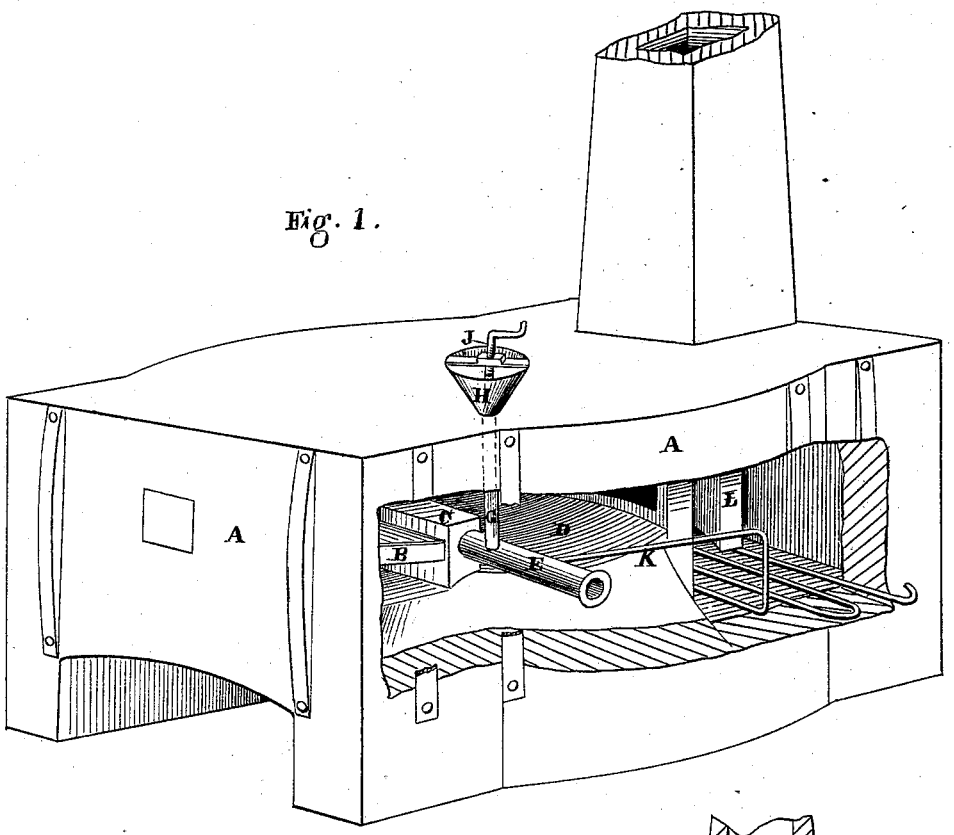
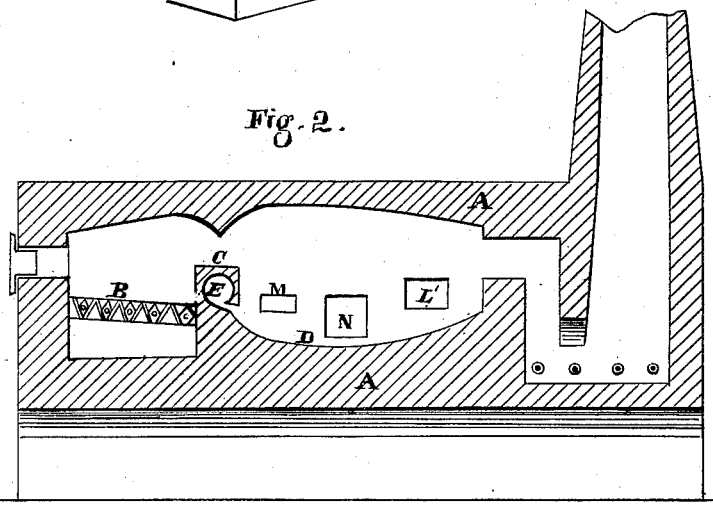


Fig. 2.



Witnesses

Geo. H. Strong.

Frank A. Brooks

Inventor

Henry H. Eames

by Dewey & Co.

Attys

2 Sheets—Sheet 2.

H. H. EAMES

Smelting Fine or Dust Ores.

No. 216,561. **Patented June 17, 1879.**

Fig. 3.

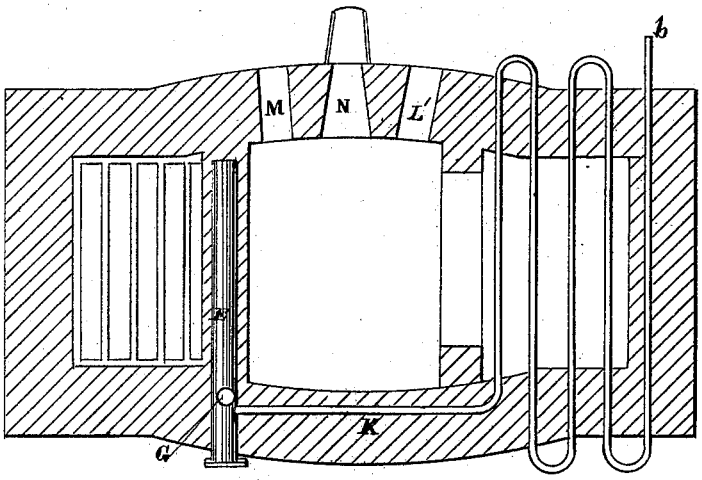
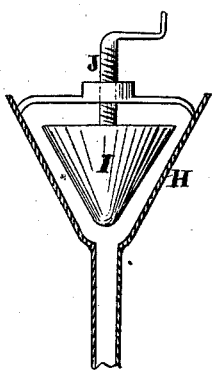


Fig. 4.



Witnesses

Geo. H. Strong.

Frank A. Brooks

Inventor

Henry H Eames

By Dewey & Co

Attys

UNITED STATES PATENT OFFICE.

HENRY H. EAMES, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN SMELTING FINE OR DUST ORES.

Specification forming part of Letters Patent No. **216,561**, dated June 17, 1879; application filed February 27, 1879.

To all whom it may concern:

Be it known that I, HENRY H. EAMES, of the city and county of San Francisco, and State of California, have invented an Improved Method of Smelting Ores; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to smelting ores when in fine division; and it consists in feeding the ore into the furnace by means of a current of aeriform fluid, heated or otherwise, and impinging the current against a body of molten metal or other material, which will seize the ore-dust and prevent it passing with the blast up the stack.

Referring to the accompanying drawings, Figure 1 is a perspective view of a furnace to carry out my process. Fig. 2 is a longitudinal section. Fig. 3 is a plan. Fig. 4 is a view of the feed-hopper with valve.

Let A represent the walls of the furnace, which may be made of any desired shape.

I prefer to use crude petroleum for furnishing the heat necessary to smelt, and have therefore shown in the fire-box a series of peculiar burners, B, for consuming crude petroleum, for which I have applied for Letters Patent.

In the fire-bridge C, between the fire-box and hearth D, is a pipe or tube, E, which projects through the side of the furnace, and has a cap or cover, for the purpose hereinafter described. This pipe continues through the fire-bridge, or the fire-bridge may be made hollow. A slit, *a*, is made along the lower edge of the furnace, level with the hearth of the furnace, the slope of the hearth continuing up into said slit *a*, as shown, so that the ore which comes into the fire-bridge, as hereinafter described, is directed downward into the mass of molten metal and slag on the hearth. Connecting with the tube or pipe E is a vertical feed-pipe, G, extending through the top of the furnace, and having at its upper end a conical hopper, H, into which the fine ore is fed. In this cone-shaped hopper is a correspondingly-shaped gate or valve, I, having a threaded stem, J, on the upper end, said stem passing through a strap or band extending across the hopper, and having a handle or crank on its upper end. By turning this crank or handle the gate or valve is raised or lowered by means of the threaded stem, thus regulating the size of the feed-opening into the feed-pipe. When lowered down there will be a very small opening around the edge of the gate I, and only a small quantity of the fine ore can pass into the feed-pipe. By raising up the gate, however, the size of the opening around the gate is enlarged, and a greater flow of ore admitted into the feed-pipe.

The blast for blowing the ore into the furnace is forced into the pipe K at the opening *b*. The pipe K is led back and forth, in the manner of a superheater-coil, under the stack-opening, and under the fire-wall L, which directs the heat from the reverberatory furnace down onto the pipe K before it passes off up the stack, so as to heat the air in said pipe. This blast or air pipe is then led along through the brick-work of the furnace, as shown, to the pipe or tube E, entering said tube just below and in line with the feed-pipe G. Then, as the ore is fed in through the hopper and falls down the feed-pipe, just as it reaches the tube E, the blast of heated air takes it and forces it out through the tube E, and out of the slot or opening *a* in the fire-bridge, into the mass of molten slag or ore in the body of the furnace.

In starting the furnace a certain amount of metal is put in through the door L′ in the side of the furnace and melted, so as to form a bath of metal, as it were. Then the fine ore coming in by the feed-pipe, as described, is blown into the bath of metal before it has an opportunity of being carried up the flue.

The outlets for the hearth are the same as in any ordinary furnace, the upper one, M, being for slag, and the lower, N, for metal.

The object of the cap or cover for the tube E is to clean out the tube in case of choking, or to look in and see if the feed is satisfactory.

By the use of this furnace I am enabled to smelt fine ores, such as iron sands, flue-dust, &c., without difficulty. One serious defect in the furnaces which were intended for this purpose has been that a great proportion of the fine ore has been carried off by the blast. This difficulty I obviate by the means described. Neither will fine ore clog in feeding to the

furnace, the blast keeping it moving. The ore is heated by the blast to a certain extent before entering the body of the furnace, while no heat is lost in heating the air for the blast, as it collects only waste heat from the position of the air-pipe in the furnace. This heat is again returned to the mass of the ore, being carried back by the air in the pipe, as described.

I am aware that heretofore iron has been decarbonized by injecting into the molten metal by means of a current of air the oxides necessary to seize the carbon, the injected material acting simply as an oxidizing agent.

I am also aware that fine ore mixed with pulverized fuel has been fed by an aeriform current into the body of a smelting-furnace.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The method herein described for smelting fine or dust ores, consisting in feeding the ore into the furnace by means of a current of aeriform fluid, and impinging the stream against a body of molten metal and slag in the body of a smelting-furnace, for the purpose set forth.

In witness whereof I have hereunto set my hand.

HENRY H. EAMES.

Witnesses:
GEO. H. STRONG,
FRANK A. BROOKS.