

(No Model.)

R. BONEHILL.

FURNACE FOR SMELTING AND REDUCING ORES.

No. 387,043.

Patented July 31, 1888.

Fig. I,

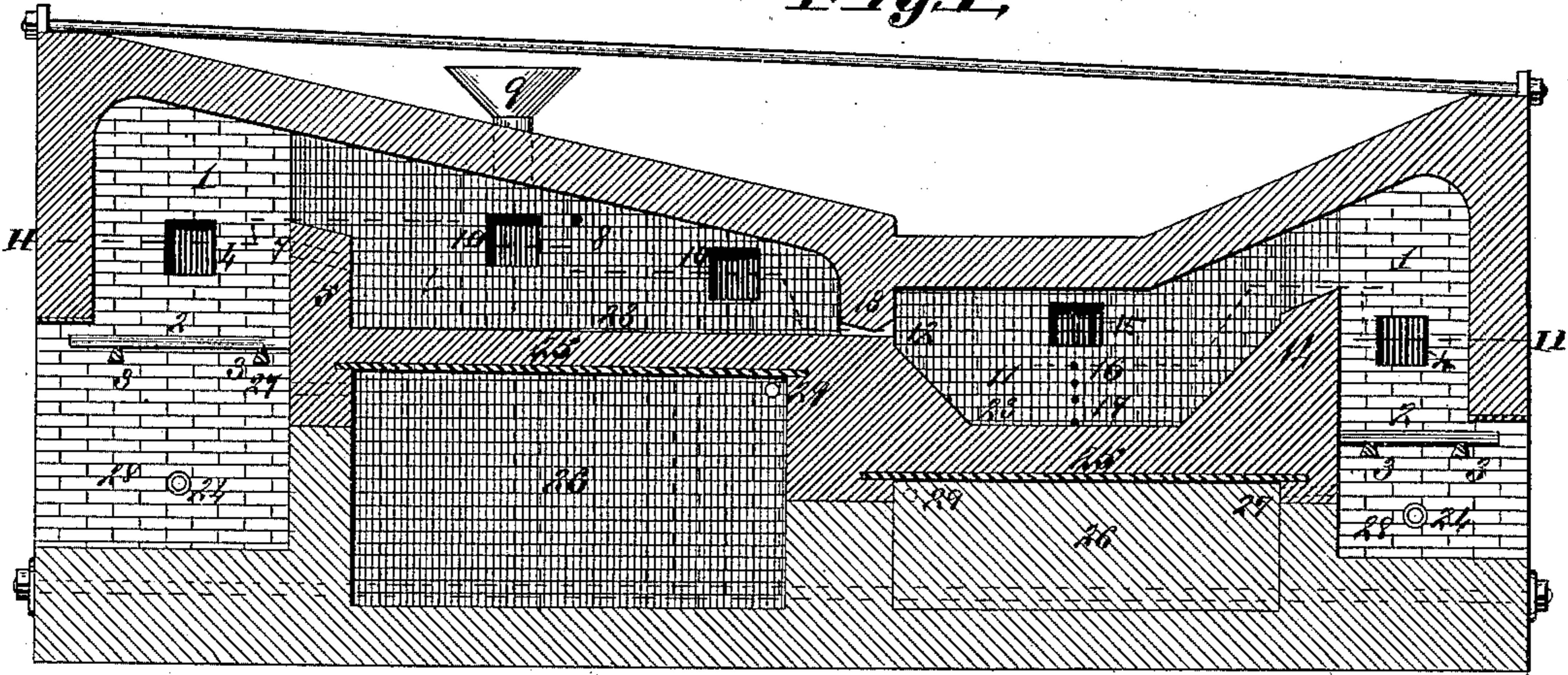
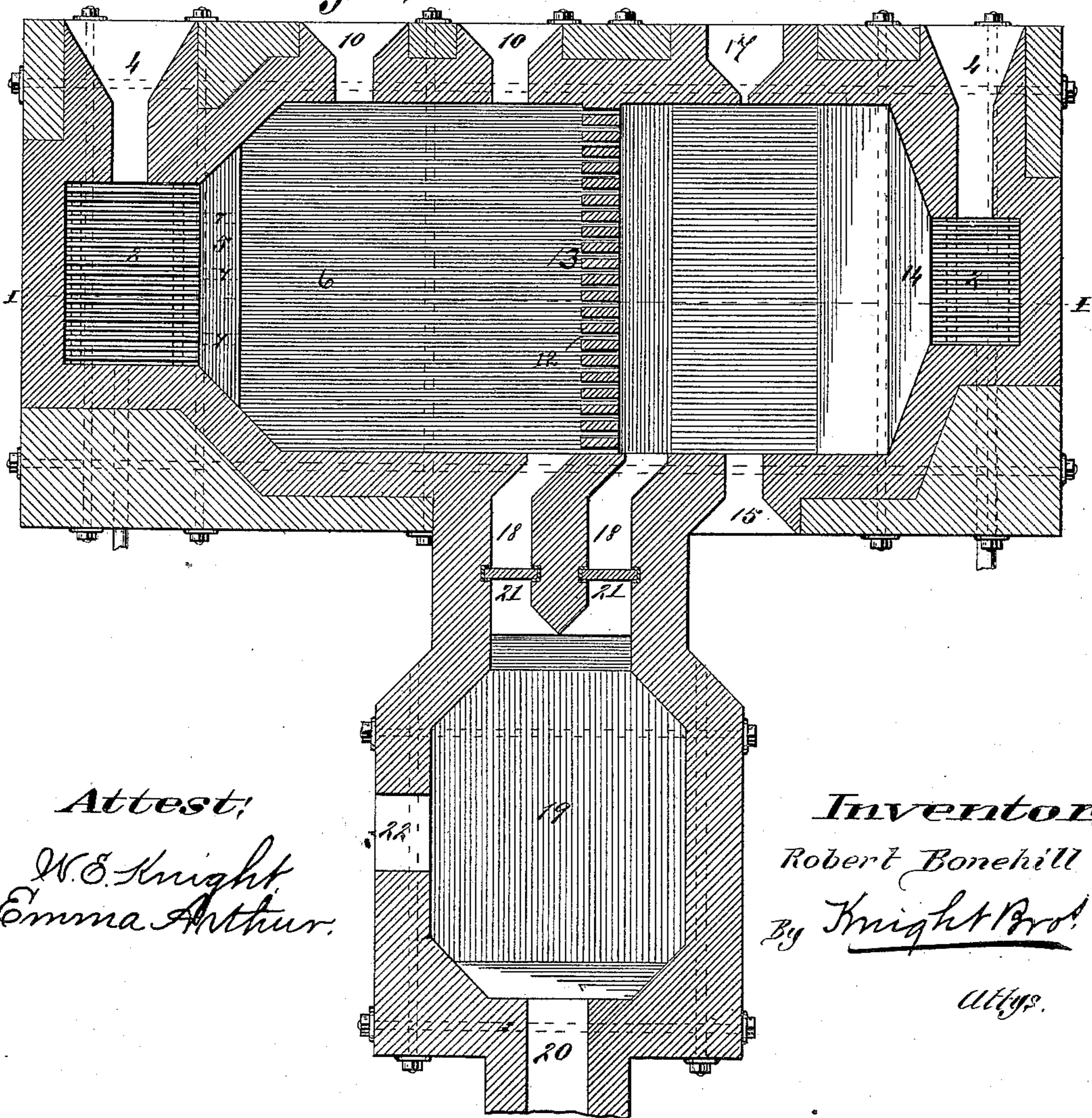


Fig. II,



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UNITED STATES PATENT OFFICE.

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FURNACE FOR SMELTING AND REDUCING ORES.

SPECIFICATION forming part of Letters Patent No. 387,043, dated July 31, 1888.

Application filed June 18, 1887. Serial No. 241,769. (No model.)

To all whom it may concern:

Be it known that I, ROBERT BONEHILL, a citizen of the Republic of France, residing at the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Furnaces for Smelting and Reducing Gold, Silver, and Copper Ores, &c., of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure I is a vertical section taken on line I I, Fig. II, showing the fire-boxes into which the fuel is fed, the smelting and refining chambers, and the openings in partition-wall between said chambers, through which the molten mass passes from the smelting-chamber to the refining chamber. It also shows the openings by which the slag above and the pure metal beneath are withdrawn from the furnace; and Fig. II is a horizontal section, taken on line II II, Fig. I, showing the fire-boxes and openings through which the fuel is fed, also the smelting and refining chambers with the openings for working the mass. It also shows its means for utilizing the waste products of combustion by the provision of flues from the smelting and refining chambers into a calcining-chamber, in which the ores are roasted and desulphurized preparatory to smelting.

This invention relates to devices for calcining and afterward smelting and refining metals from ores by one process without the loss of time, labor, and caloric, caused by the transmission from one separated furnace to another; and the invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Referring to the drawings, in which figures of reference indicate like parts in all the views, 1 1 represent the fire-box at each end of the combination-furnaces; 2 2, the grates that rest on transverse bars; 3 3 and 4 4, the feed-openings to said fire-boxes.

5 represents the bridge-wall that separates the smelting-chamber 6 from its adjacent fire-box. Openings or slots 7 pass through said bridge-wall from the fire-box into the smelting-chamber, and a hot blast passes through said openings with great force, concentrating

its heat, as from blow-pipes, on the ore in the smelting-chamber.

8 represents peep-holes for observing the heat and interior of the smelting-chamber. 55

9 represents the hopper, through which the reverberatory-chamber is charged, and 10 the openings into said chamber for puddling or working the mass.

11 represents the refining-chamber, into which the molten mass runs through slots 12 in the base of the partition-wall 13 that separates the smelting-chamber from the refining-chamber. 60

14 is the bridge-wall between the refining-chamber and its fire-box. 65

15 is the opening for working the mass during the refining process.

16 are the openings for drawing off the slag, and 17 the opening through which the pure refined metal is run into the molds when said opening is tapped. 70

It will be seen by the drawings and the description that there is no blast-connection between the smelting-chamber and the refining-chamber, the only connection being the shallow channels at the base of the partition-walls, through which the molten metal runs from the former chamber into the latter. In consequence there is no blast interference between the two furnaces, and when occasion requires either furnace can be run separately, and they each have their separate flues 18 18, leading from them at remote points from the fire-boxes, through which the exhaust or waste products of combustion find their way into the calcining-chamber 19 after having traversed the chambers 6 11, and are there utilized to roast the ore and reduce the sulphurets therein, preparatory to its introduction (after desulphurization) through the hopper 9 into the smelting-chamber for smelting. The flue 20 discharges from the calcining-chamber into the chimney. Dampers 21 in the flues 18 regulate the exhaust-draft. 80

The calcining-chamber is charged and the desulphurized ore extracted through the opening 22 in the side of the chamber. 85

The floors 23 23 of both the smelting and refining chambers are preferably built of fire-brick, that of the smelting-chamber being slanted, as shown, toward the partition-wall 100

13, in which are the slots 12, through which the molten mass runs into the refining-chamber to facilitate its passage. If desired, the floor of the refining-chamber also may be inclined toward the opening 16, through which, when tapped, the refined molten metal runs into the molds.

24 24 are the suction-flues that furnish the air-blast to the two furnaces.

25 25 represent iron basins or plates stationed beneath the fire-brick floor, relatively, of the smelting and refining chambers, to prevent the flow of the molten mass in that direction in consequence of cracks or leaks that may arise from the intense heat on the fire-brick floor above or the partial burning out of the floor. To further guard against this fruitful cause of disaster, I provide the cooling-chamber 26 under the iron dish 25 beneath the floor of the smelting-chamber. The blast for the cooling-chamber is furnished through the opening 27, that connects from over the ash-pit 28 beneath the grates with said cooling-chamber.

29 is the exit-vent for the escape of air from said chamber.

When desired, there may be a like cooling-chamber and similar supply and exit air-vent beneath the refining-chamber, as shown and indicated by like numbers.

Among the many advantages of the invention presented in the present application are:

First. The uninterrupted working and smelting, which itself insures numerous advantages.

Second. The avoidance of loss of material always engendered by cooling off and subjecting it to a reblast.

Third. The saving of labor, the smelting chamber or furnace itself charging the refining-chamber, the short slotted apertures 12 through the partition-wall between the two chambers not even requiring to be tapped.

Fourth. The economy of fuel in various ways, especially in the blast from the two furnaces, charging in a direct line toward each other and concentrating their united force with intense heat in the short apertures or channels through which the molten metal passes from the smelting to the refining chamber.

Fifth. The iron basins beneath the fire-brick floors of the aforesaid chambers preventing loss from leakage of the molten metal.

Sixth. The cooling chamber or chambers beneath said basins and the air-blast through them for cooling the iron basins and floors above and preventing their burning out under the intense heat of the furnaces.

Seventh. The avoidance of all flue-blast

between the furnaces, the only connection between the smelting and refining chambers being the shallow apertures or channels occupied by the running molten metal. In consequence, either section of the furnace can be worked without stopping the blast in the other section, and, also, either can be worked separately, each having separate exit-flues.

Eighth. The principal working-points being all located in front of the furnaces, insuring a saving of time and labor.

Ninth. The utilization of the waste products of combustion by their discharge through their twin exit-flues into a calcining-chamber, in which the ore is desulphurized previous to smelting.

I claim as my invention—

1. In a furnace for smelting and reducing minerals, the combination of the fire-boxes, smelting-chamber, the refining-chamber, the division-wall dividing said refining and smelting chambers from top to bottom, the calcining-chamber, and the flues 18, connecting the calcining-chamber with the smelting and refining chambers at points remote from the fire-boxes, whereby the products of combustion will pass from either the smelting or refining, or both the smelting and refining, chambers into said calcining-chamber after having traversed the former chambers, substantially as and for the purpose set forth.

2. In a furnace, substantially as described, the combination of two fire-boxes, a smelting-chamber communicating with one of said fire-boxes, and a refining-chamber arranged in a lower plane than the smelting-chamber and communicating with the other fire-box, a partition, 13, dividing said chambers from top to bottom and provided at its base with one or more leak-holes, a calcining-chamber, and a flue from each of the aforesaid chambers to said calcining-chamber.

3. The combination, with two fire-boxes, of a smelting and refining chamber arranged between said fire-boxes and having a perforated partition-wall dividing said chamber from top to bottom, a calcining-chamber arranged in the vicinity of the aforesaid chambers, and flues 18, leading from both the smelting and refining chambers into said calcining-chamber and adapted to convey products of combustion from either or both of the fire-boxes into the calcining-chamber.

ROBERT BONEHILL.

In presence—

GEO. H. KNIGHT,
BENJN. A. KNIGHT.