

(No Model.)

J. L. THOMSON.

APPARATUS FOR HEATING BLAST FOR SHAFT FURNACES.

No. 377,819.

Patented Feb. 14, 1888.

Fig. 1.

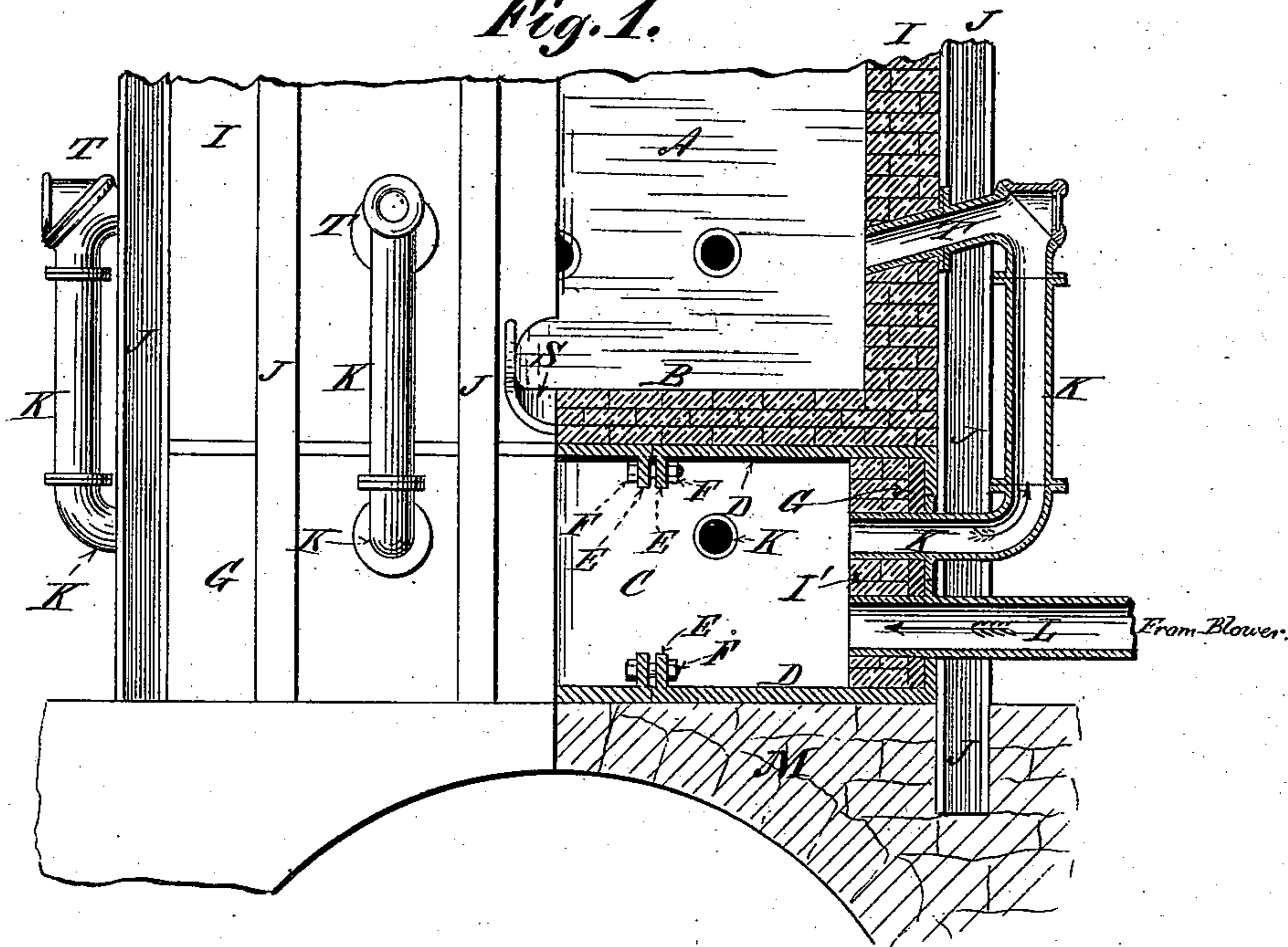
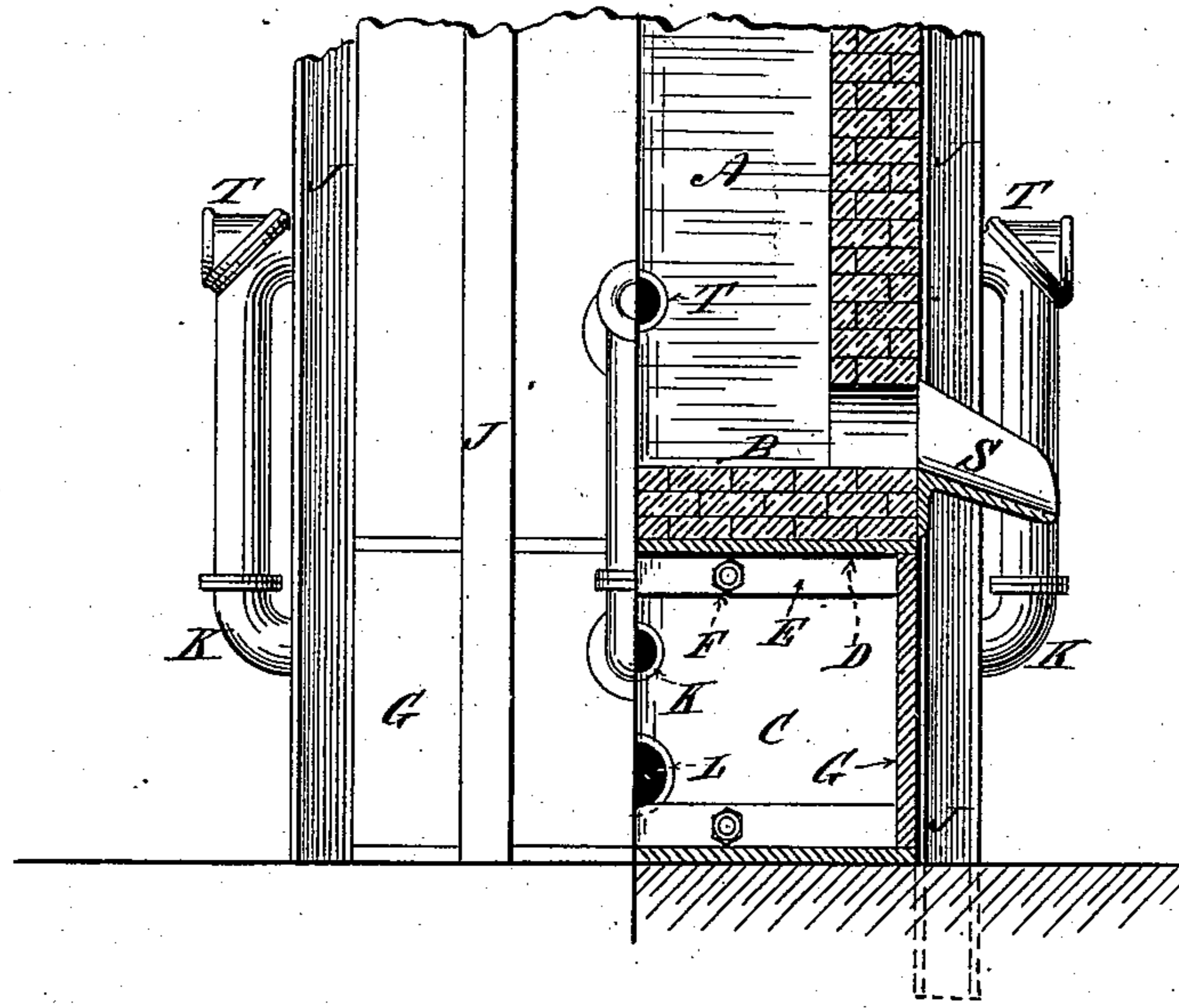


Fig. 2.



Witnesses:

Geo. H. Miatt.
Wm. Gardner.

Inventor:

John L. Thomson
By his Attorney
Willard Parker Buller

UNITED STATES PATENT OFFICE.

JOHN L. THOMSON, OF BERGEN POINT, NEW JERSEY, ASSIGNOR TO WALTER B. DEVEREUX, OF ASPEN, COLORADO, AND THE ORFORD COPPER COMPANY, OF NEW JERSEY.

APPARATUS FOR HEATING BLAST FOR SHAFT-FURNACES.

SPECIFICATION forming part of Letters Patent No. 377,819, dated February 14, 1888.

Application filed May 6, 1886. Serial No. 201,261. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. THOMSON, a subject of the Queen of Great Britain, and a resident of Bergen Point, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Heating Blast for Shaft-Furnaces, of which the following is a specification.

My invention relates to an apparatus for cooling the bed of shaft-furnaces by means of a blast of cold air, which is supplied to the furnace-tuyeres, and of utilizing the heat which is imparted to the air in this manner for the purpose of heating the blast, and thereby increasing the smelting power of the furnace.

The object of my invention is to afford a ready means of accomplishing this purpose with economy in space and in furnace construction.

In the smelting of copper and other ores it is very often advisable to provide some ready means of cooling the bottom of the furnace, and I have discovered that where the ordinary form of crucible usually employed in blast-furnaces is dispensed with, the bottom of the furnace placed close up the fusion-zone, and a hollow box placed directly under the same, with which box the furnace-tuyeres are connected, I am able, by passing the blast through this box directly to the tuyeres, to obtain a great reduction of heat at the furnace-bottom and a considerable degree of heat at the furnace-tuyeres, and to obtain much more favorable conditions in smelting.

The invention will be best understood by reference to the accompanying drawings, in which—

Figure 1 represents a sectional elevation of the furnace on a line drawn at right angles to the direction of the tap-hole, and Fig. 2 a sectional elevation of the furnace on a line drawn lengthwise through the tap-hole.

Similar letters refer to similar parts throughout the several views.

In the views, A represents the ordinary form of shaft-furnace, which is either rectangular or square in cross-section, according to circumstances, with walls composed of fire-brick or of water-jackets and with any convenient number

of tuyeres. In the furnace shown in the drawings seven tuyeres are used—three at the back, two on the tapping side, and one on each end.

I represent the walls of the furnace, and B the bottom, which may be of fire-brick or other heat and fire resisting material, and may be made flat, as shown, or so as to incline slightly toward the tap-hole.

S is the ordinary form of furnace spout or tap-hole, which may be placed at both sides in cases where the furnace is very large, thus affording two points of tapping.

The furnace-foundation consists of a hollow metal box, C, of any convenient construction, resting upon a suitable foundation, M, as shown in the views. In practice the box will be constructed of flat sections of iron D, provided with the flanges E, and riveted together by the bolts F. The ends and sides G of the box are made of ordinary plates bolted to the flanges E, or held in position by the weight of the top plates. At either end of the furnace the end walls may be strengthened by introducing into the box a wall of masonry, I'. The furnace is supported upon the box C by means of any convenient form of guides, preferably, however, by means of the heavy I-beams J. (Shown in the views.)

T represents the tuyeres, which are connected with the interior of the box C by means of the pipes K, which enter the same at or near the top, which is the point where the temperature is the greatest, and which are of any of the ordinary patterns, and may be horizontal or slightly inclined, as shown in the views, as may be found most convenient.

The cold blast is supplied to the box by means of the supply-pipe L, which enters the same at any convenient point, preferably near the bottom, as shown in the views, and is attached at its other extremity to the blowing-fan.

The method of operation of the invention is substantially as follows: As is well known, that portion of a smelting-furnace which is below the fusion-zone will be the hottest portion, and where the crucible or hearth is dispensed with and a flat bottom is used close up to the fusion-

zone, that bottom will during the operation of smelting become intensely hot. In some form of furnaces now in use an iron bottom is used having a crucible of sufficient depth to collect
 5 a small amount of metal below the slag, which metal is tapped off at intervals separate from the slag. The invention may be applied to this form of furnace in substantially the same manner and with equally good effect. If, now,
 10 the air which is supplied to the tuyeres is caused to traverse the bottom of the furnace in its way to the tuyeres, that air will become heated, and its efficiency for purpose of smelting thereby increased. In my invention the
 15 cold blast enters from the blower through the pipe L, and from this pipe is distributed to the tuyere supply-pipes K. The iron sections D D, being on top in direct contact with the bottom of the furnace, become extremely hot,
 20 and in turn impart their heat to the sheet-metal heating-boxes. The sections D D may form the bottom of the furnace without any superimposed layer of refractory material, in which case a portion of the charge will be allowed to
 25 cool upon the bottom of the furnace, and thus form of itself a refractory layer.

I am aware that it is not new to pass air not under pressure under the bottom or bed of a reverberatory furnace for the purpose of cool-
 30 ing the bed and heating the air as it enters the fire-box, and that it is not new to heat air for cupola-furnaces by passing it through pipes running vertically around the furnace; but I believe, however, that it is new to eliminate
 35 the crucible in the bottom of a shaft-furnace and to replace it by a bottom composed of a hollow box, through which the entire volume

of the blast passes for the purpose of heating the same. The great advantage of this form of construction consists in the fact that as the
 40 bottom of the furnace is perfectly flat and close up to the fusion-zone a uniform temperature is maintained at the bottom of the furnace, whereby the formation of accretions is avoided and
 45 better results are obtained in smelting, and the blast as it passes through the hollow bottom is uniformly and effectually heated, thereby effecting a great saving of fuel and obviating the use of expensive heating apparatus.

I claim as my invention— 50

1. In a system of heating blast for shaft-furnaces by means of the waste heat of the furnace, the combination, substantially as herein-
 before set forth, of a shaft-furnace having a hollow bottom, a blast-pipe connected with
 55 said bottom, whereby the cold blast is supplied thereto from the blower, and a series of pipes whereby hot blast is supplied to the tuyeres from the said hollow bottom.

2. In a system of heating blast for shaft-furnaces by means of the waste heat of the furnace, the combination, substantially as herein-
 before set forth, with a shaft-furnace, of a hollow bottom constructed wholly or partly of
 60 metal for heating the blast supplied to the
 65 tuyeres.

Signed at Butte, in the county of Deer Lodge and Territory of Montana, this 26th day of April, A. D. 1886.

JOHN L. THOMSON.

Witnesses:

W. I. LIPPINCOTT,
 THOS. H. JUDGE.