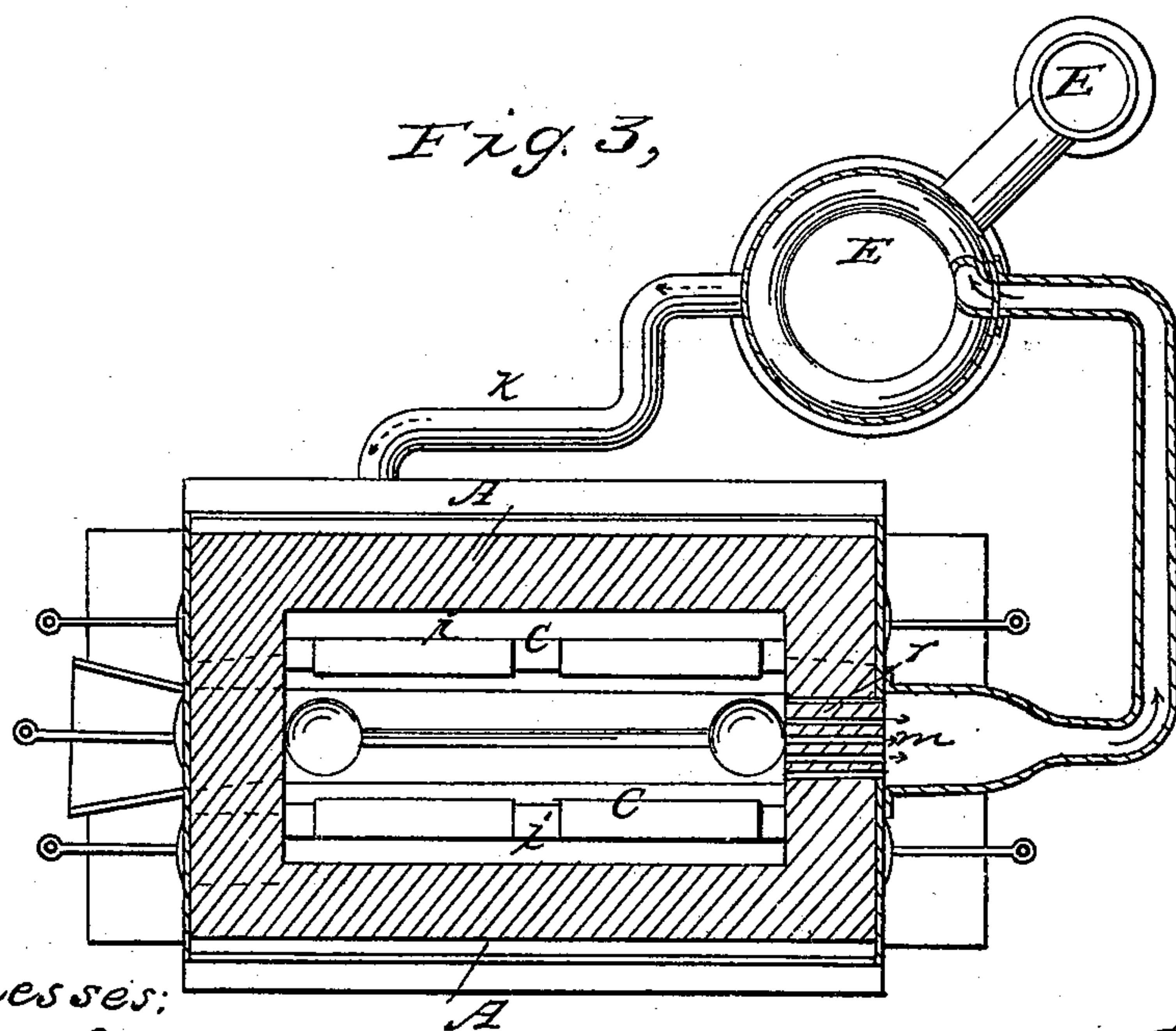
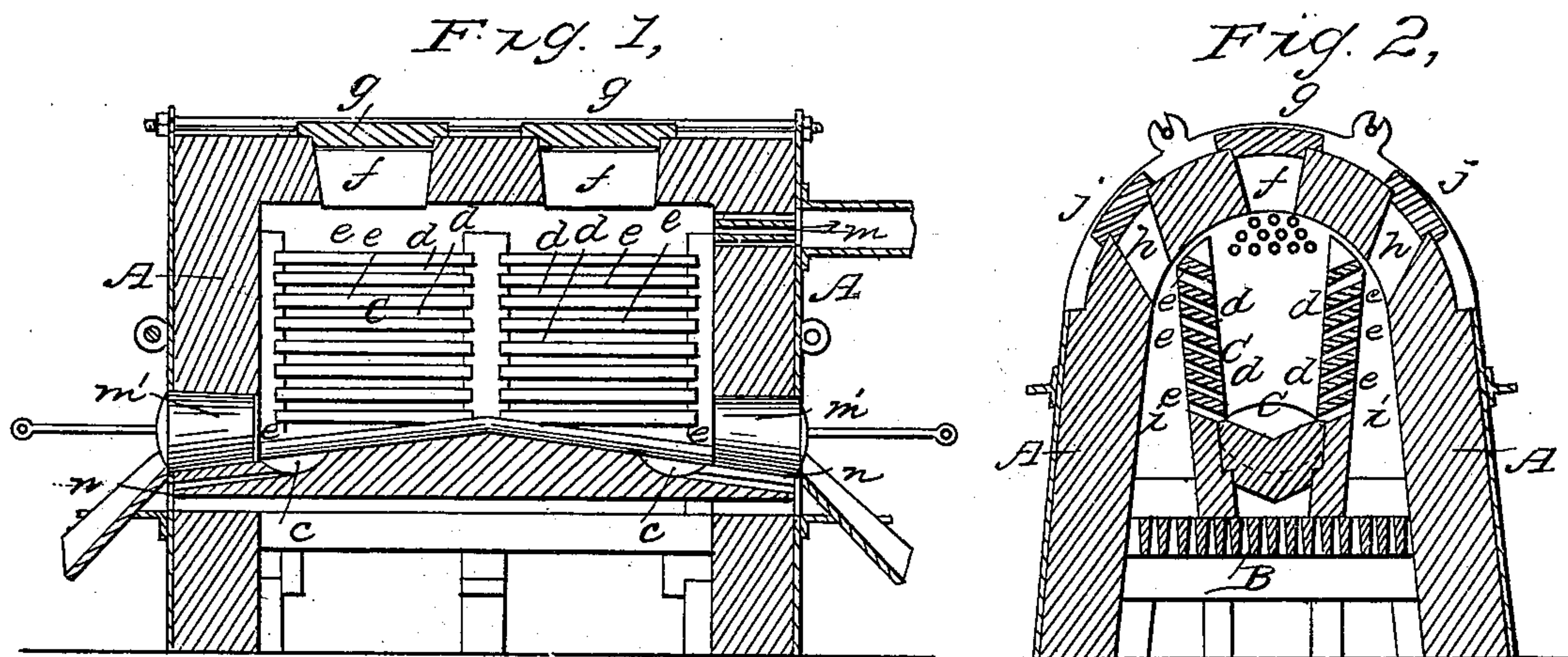


J. WINCHESTER.

Roasting Ores.

No. 43,061.

Patented June 7, 1864.



Witnesses:
Henry Morris
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UNITED STATES PATENT OFFICE.

JONAS WINCHESTER, OF NEW YORK, N. Y.

IMPROVEMENT IN FURNACES FOR SMELTING ORES.

Specification forming part of Letters Patent No. 43,061, dated June 7, 1864.

To all whom it may concern:

Be it known that I, JONAS WINCHESTER, of the city, county, and State of New York, have invented a new and useful Improvement in Furnaces for the Smelting or Reduction of Metals from their Ores; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to construct and use the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figures 1 and 2 are vertical sections at right angles to each other of a furnace constructed according to my invention. Fig. 3 is a horizontal section of the same.

Similar letters of reference indicate like parts.

This invention consists in the employment, for the smelting or reduction of iron, copper, lead, silver, gold, and other metals from their ores, of a crucible or other vessel, chamber, or receptacle for containing the ore, so placed in a furnace as to be wholly or for the most part surrounded by the fuel, and so provided with openings or perforations that the flame and heated gaseous products of combustion from the fuel are forced into it, upon, into, and through the ore.

It also consists in the introduction of the blast to the furnace containing such crucible, vessel, chamber, or receptacle through a grate or slotted or perforated bed, whereby it is carried upward with an equally-distributed pressure upon and among the fuel, and the flame is so forced in jets through the openings of the said crucible, vessel, chamber, or receptacle that the said openings have the effect of so many tuyeres or blow-pipes.

A is the furnace, which may be of oblong form in its horizontal section, and have its top arched as represented, or be of any other suitable form. Piers *a a* are constructed for the support of the grate B, of fire-brick or other suitable material, and of the crucible C, the bottom or sole of which is arranged at a short distance above the grate. This crucible is made of the full length of the interior of the furnace, the ends of which, forming also the ends of the crucible, consist of solid walls of mason-work. The bottom or sole of said crucible has a slope or pitch of about one in eight from the middle of its length toward either

end. In the center of the sole is a groove which serves more freely to convey the fixed metal or ore to the "sumps" *c c*—one at each end, as is common in the best approved smelting-furnaces. The sides of the crucible slope from the sole outward, as shown in Fig. 2, and have from the sole to the point where they meet the arch of the furnace louver-like interstices or openings *d d*, of varying width and length, according to the strength of the refractory material of which the intervening slats *e e* are composed. These slats may be composed of separate pieces of any desirable length—say about one foot—and supported at their ends by grooved posts, from and into which they may be slid when necessary for removal, repair, or renewal. Between these sides of the crucible and the side walls of the furnace are spaces *i* for fuel extending from the grate B up to the arch, and wide enough to contain such quantity as may be necessary to effect in its combustion the complete fusion of or reduction of the ore. The side walls of the furnace may be perpendicular, but should, preferably, have an outward slope to give them greater stability. The sides of the crucible may be supported or strengthened by small transverse arches set into their grooved posts on the one hand and the side walls of the furnace on the other, at as many points as may be desirable, to enable the crucible to bear without sagging the pressure from the body of the ore within, and at the same time leave the fuel chambers or spaces free for the circulation of the flame. There is also a space beneath the sole of the crucible and the grate B, so that the fuel to be used in the treatment or reduction of the ore shall surround the same, except as to the ends and the crown of the arch.

The crucible, as well as the whole interior of the furnace, is constructed of or lined with fire-brick or other material, which will bear the degree of heat necessary for the smelting of the mineral or ore. The arch of the furnace should be entirely of fire-brick. The grate B may be of either cast-iron or fire-brick; but the latter is preferable on account of its greater durability.

The ore is supplied to the crucible through one or more openings, *f*, in the top of the arch, covered, when the furnace is in blast, by tiles *g*. This supply may be effected by a movable hopper raised by a crane or derrick and low-

ered to the openings *f*, and the ore discharged by drawing a sliding bottom; or it may be effected by shoveling it in from a platform. The fuel is supplied through similar openings, *h*, in the arch over the spaces *i*, which openings are closed, when the furnace is in blast, by tiles *j*.

In the operation of the furnace the hot-air blast is supplied by the blast-pipe *k* under the grate *B*, all the outer openings being securely closed, and this blast, being distributed through the grate with an equal upward pressure at all parts, carries the flame and heat through the louver-like openings *d d* at a downward angle directly upon and through the body of the ore, the openings thus performing the part of and being equivalent to so many tuyeres, and the flame and heated gaseous products of combustion being delivered from them in such manner as to act with a very high degree of effect for the rapid fusion or reduction of the material subjected to its influence. The waste heat and gasses pass off by a flue, *m*, at one end of the furnace. The fused ore flows to the sumps *c c*, and the slag is drawn out, by suitable means well known to metallurgists, at openings *l l*, and the end of the furnace, furnished with doors *m' m'*, while the valuable metal, owing to its greater specific gravity, is collected at the bottom of the sumps, and is drawn therefrom through openings *n n*, fitted with plugs to be removed when necessary.

The advantages of this furnace over others are—

First. The production of a more intense degree of heat and the consequent more rapid reduction of the ore by reason of the numerous points of projection of the flame upon and through it.

Second. Economy of fuel in the reduction of a given quantity of ore by reason of the minimum waste of heat, the heat-gases being

conveyed by the flue *m* through a large cylindrical chamber, *E*, in which there is a coil of pipe leading from the blower *F*, and connecting with the pipe *k*, hereinbefore mentioned. The chamber *E* should be lined with fire or vitrified brick, and the coil covered with porcelain, in order to resist the destructive action of the sulphurous-acid gases, or other deleterious products from the ores operated upon.

Third. The greater facility of feeding or supplying ore and fuel without loss of heat or time, thus keeping up a long-continued action of the smelting process.

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

1. The employment, in the smelting of ores, of a crucible or other vessel, chamber, or receptacle for containing the ore, so placed in a furnace as to be wholly or for the most part surrounded by the fuel, and so provided with openings or perforations that the flame and heated gaseous products of combustion from the fuel are forced into it, upon, into, and through the ore, substantially as herein specified.

2. In combination with a crucible, vessel, chamber, or receptacle for ore, so constructed and applied within a smelting-furnace, introducing the blast beneath and through a grate or its equivalent, whereby it is carried upward with an equally-distributed pressure upon and among the fuel, and the flame is so forced in it through the openings of the said crucible, vessel, chamber, or receptacle that the said openings have the effect of so many tuyeres or blow-pipes, substantially as herein described.

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