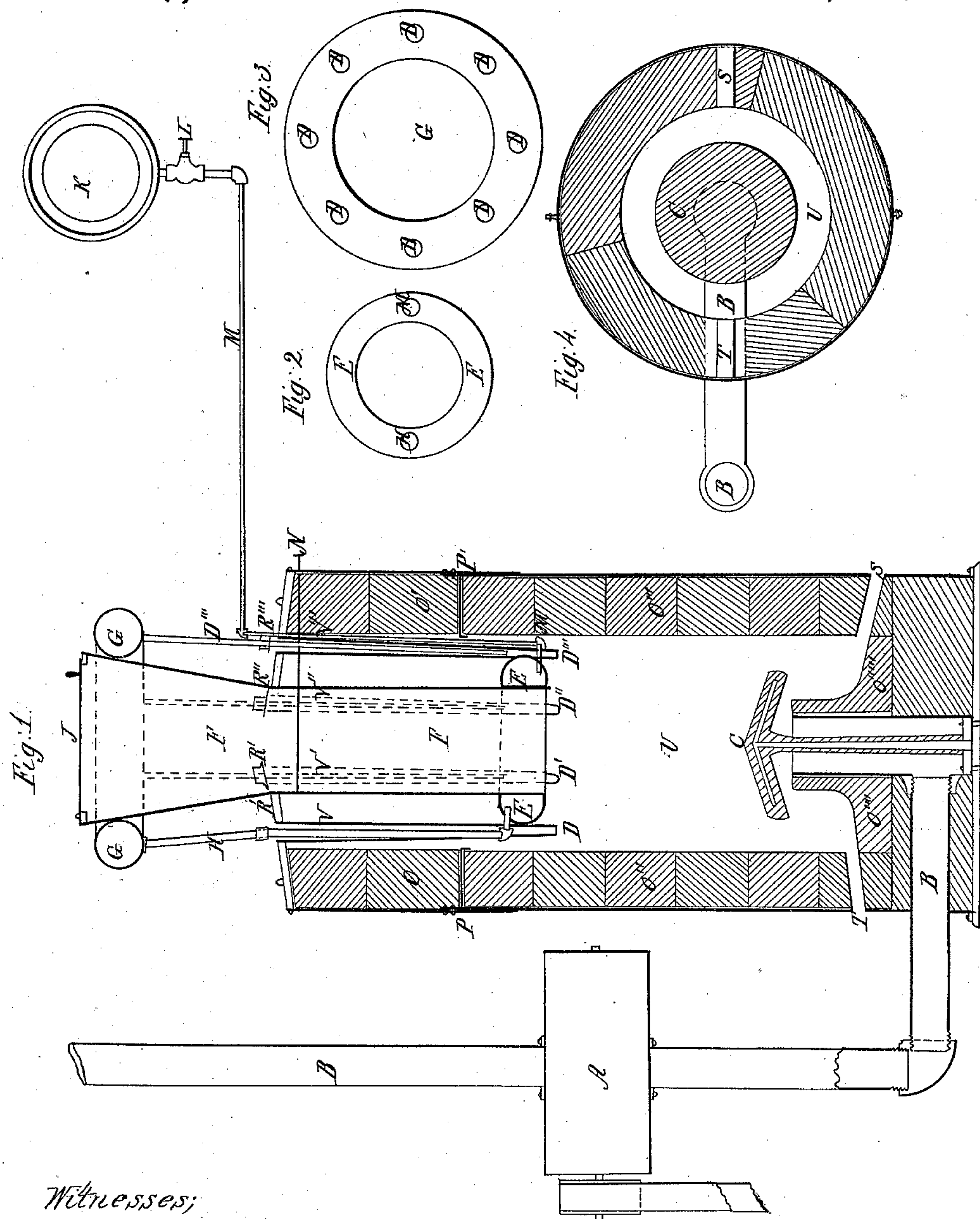


*C. H. Swain.*  
*Smelting Furnace.*

*N<sup>o</sup> 87,725.*

*Patented Mar. 9, 1869.*



*Witnesses;*  
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# United States Patent Office.

CHARLES H. SWAIN, OF BROOKLYN, NEW YORK.

Letters Patent No. 87,725, dated March 9, 1869.

## IMPROVED FURNACE FOR SMELTING ORES.

The Schedule referred to in these Letters Patent and making part of the same.

### To all whom it may concern:

Be it known that I, CHARLES H. SWAIN, of the city of Brooklyn, county of Kings, and State of New York, have invented a new and improved Furnace for Smelting Ores; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of my invention consists in the use of the gas obtained from petroleum or other oil, or any of the products of petroleum-oil, as benzine, naphtha, &c., and in the use of a suction-pump or suction-blower, by which means I propose to cause the fire to pass down and through the ore to be smelted, and by the heat generated from the fire, the oil is vaporized, and passes into a distributing-vessel, and from thence, by pipes, the gas is conveyed down to and around the outside of the receiver containing the oil. There it becomes ignited, and, by its heat, causes a continuous flow of gas, and, at the same time, supplies the requisite heat to smelt the ores.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

Figure 1 is an upright sectional view of a furnace.

A is a suction-pump or a suction-blower.

B B are pipes, through which draught is created by suction, A.

C is a cover, over the opening in pipe B, made of iron, and suitably protected by fire-clay, or other material, this cover being suitably placed to keep the ore from obstructing the draught.

D D' D" D''' are pipes, through which gas is supplied.

E E is a receiver for the oil, supplied from the vessel K, through the pipe M, regulated by the cock L.

F F is the feed, through which ore is supplied.

G G is a receiver, into which the gas flows from the oil-receiver E E, through the pipe H, and from which the pipes D D' D" D''' conduct it back to and around the outside of the oil-receiver E E.

H is a pipe, through which the gas flows from the oil-receiver E E to the gas-receiver G.

J is a cover to feed F.

K is a vessel to contain the oil or other material, connected, by pipe M, with the oil-receiver E E.

L is a cock, to regulate the flow of oil to the oil-receiver E E.

M is a pipe connecting oil-vessel K with oil-receiver E E.

N is a damper, or slide, to regulate the supply of ore to the chamber U.

O O' O" O''' are fire-brick, or other suitable material, to protect the exposed iron of the furnace.

P P' represent the iron sides of the furnace, which, with the fire-brick and other parts, may be made of

any material and put together in any manner suited to the kind of ore to be smelted.

R R' R" R''' are covers over the air-pipes V V' V" V''', to regulate the supply of air.

S is an opening on the side of the furnace, at the bottom, to draw off the metal.

T is an opening on the opposite side from S, a little above the bottom, to draw off the slag, the openings S and T to have plugs, of suitable material, by which the flow of metal and slag may be regulated.

U is the chamber in which the ore is smelted.

V V' V" V''' are pipes through which air is supplied, and mixes with the gas from pipes D D' D" D''', before it passes to the chamber W, from the receiver G G. The pipes D D' D" D''' passing only part of the way through, allow the gas and oxygen from the air to so combine, and by means of the covers R R' R" R''', the quantity of oxygen requisite to obtain perfect combustion is regulated.

Figure 2 is a horizontal view of the oil-receiver.

M is the opening for the supply-pipe from vessel K, in fig. 1.

H is the opening for the pipe, to convey the gas from oil-receiver to gas-receiver.

Figure 3 is a receiver for the gas generated from the oil-receiver E E, fig. 1.

D are the openings for the pipes D D' D" D''', fig. 1.

Figure 4 is a horizontal view of the bottom of the furnace.

B B is the pipe, through which draught is obtained.

C is the cover over the pipe B, more plainly seen in fig. 1.

S and T are openings, to draw off metal and slag.

U is the inside of chamber.

To commence to operate with this furnace, I proceed as follows:

First supply the oil-vessel K with oil, and by means of cock L, partially fill oil-receiver E E. Then open the cover J and damper N, and make up a fire in the chamber U, with some light and combustible material, and create a draught by means of the blower A, using the feed F F as an outlet for smoke, &c. Continue this fire till the oil in the oil-receiver E E begins to vaporize, and the gas from the gas-receiver G G flows into the pipes D D' D" D''', and becomes ignited. Then close the cover J and damper, or slide N, and reverse the blower A, making a suction, and thus cause the air to draw down through the air-pipes V V' V" V''', regulating the quantity of air by means of the covers R R' R" R'''. The fire thus produced in the chamber U, is placed in contact with the oil-receiver E E, and continues to vaporize the oil. The oil-receiver is to be movable, up or down, to bring it to the position where it will receive sufficient heat to generate the gas, and not destroy the receiver.

When a steady supply of gas is obtained, which may be increased or diminished by the cock L, open the



cover J, and close the slide or damper N, and put the ore to be smelted into the feed F. Close the cover J, and open slide N, and allow the ore to fall into the chamber U. Continue this till the chamber U and feed F, below the slide N, are full of ore, and, as the suction is down and through the ore, the fire is brought directly in contact with it, and, as it melts, it runs to the bottom of the chamber, below the top of pipe B, and is drawn off, as desired, at the openings S and T.

The chamber U and feed F, when once filled with ore, are to be kept constantly full, and as the ore melts and settles down, its place is supplied with new ore from the feed F, above the slide N.

I do not confine my invention to the number of pipes or jets by which the gas is distributed, or the position of the oil or gas-receivers and pipes, or the shape of the furnace, or manner of its construction, making it of and lining it with any suitable material, and arranging the pipes for the draught, in any form, at the bottom of the furnace, so that the draught is downward and through the ore to be smelted.

I do not claim the use of petroleum in vapor for roasting ores, as that has been described in the pat-

ent of Simon Stevens, June 7, 1864; but having described my invention,

What I do claim, and desire to secure by Letters Patent, is—

1. Smelting ores of gold, silver, and copper, by means of the vapors of petroleum, or other hydrocarbons, applied substantially as herein described.

2. The use of an exhaust, A, and connecting-pipes B B, by means of which I obtain a partial vacuum, and create a draught downward and through the ores to be smelted.

3. The construction of the oil-receiver E E and gas-receiver G G, around the feed F, and for the purposes as substantially set forth.

4. The protecting cover C over the pipes B B.

5. The arrangement of the feed F F and cover J, with the damper, or slide N, by which means the furnace is made self-feeding, all as substantially set forth, and forming a continuous process for smelting gold, silver, and other ores.

Witnesses:

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