

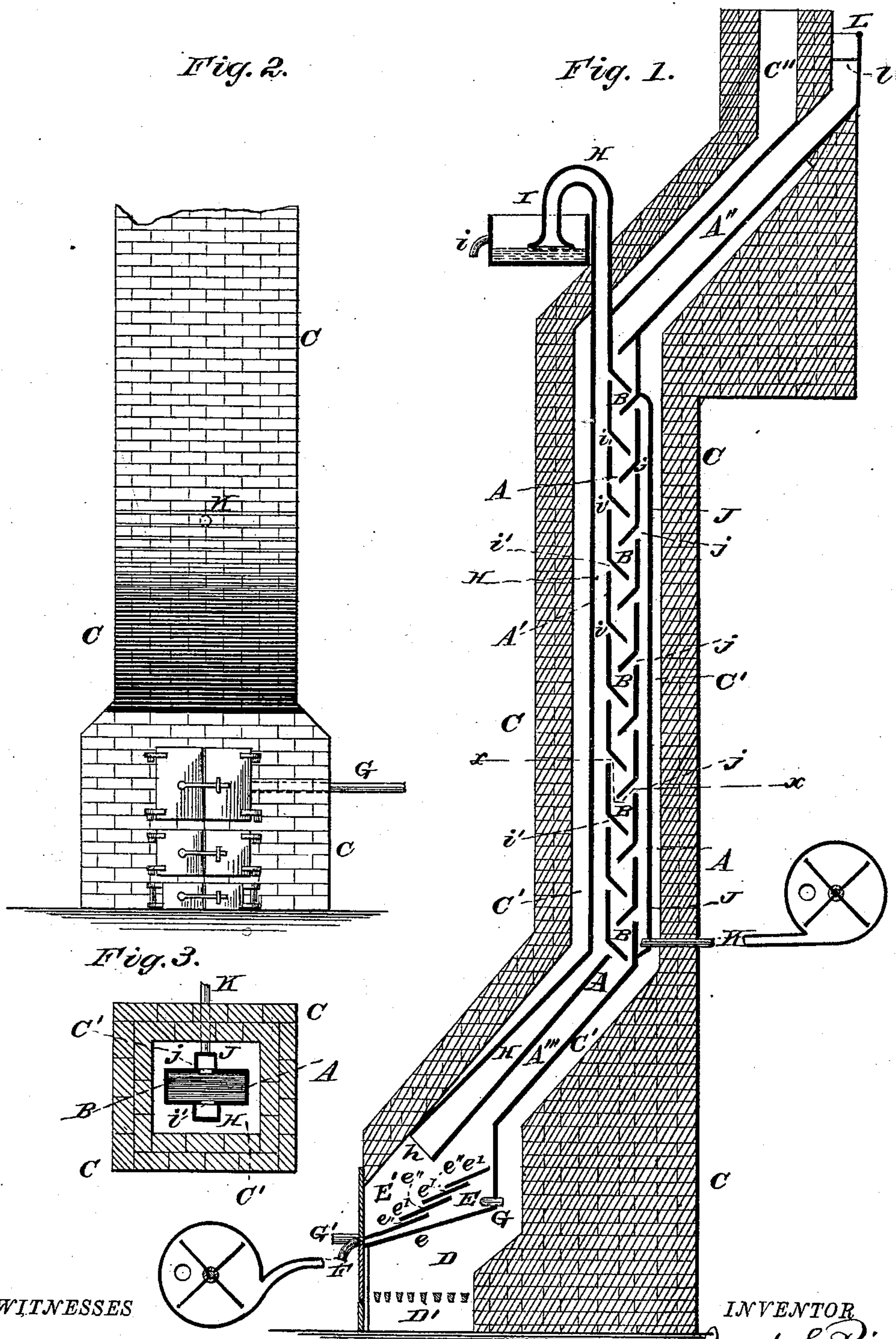
(No Model.)

J. E. RICE.

ROASTING AND REDUCING FURNACE FOR GOLD AND SILVER ORES.

No. 275,272.

Patented Apr. 3, 1883.



WITNESSES

Ad. L. Dietrich
P. C. Dietrich

INVENTOR

Jacob E. Rice

By *W. B. Richard*
Attorney

UNITED STATES PATENT OFFICE.

JACOB E. RICE, OF TWIN LAKES, COLORADO.

ROASTING AND REDUCING FURNACE FOR GOLD AND SILVER ORES.

SPECIFICATION forming part of Letters Patent No. 275,272, dated April 3, 1883.

Application filed September 30, 1881. (No model.)

To all whom it may concern:

Be it known that I, JACOB E. RICE, a citizen of the United States, residing at Twin Lakes, in the county of Lake and State of Colorado, have invented certain new and useful Improvements in Roasting and Reduction Furnaces for Gold and Silver Ores; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification, in which—

Figure 1 is a vertical sectional elevation from front to rear, of a furnace embodying my invention. Fig. 2 is a front elevation of the lower portion. Fig. 3 is a transverse sectional elevation in the line *xx* in Fig. 1.

My invention consists in a retort for roasting ores, consisting of a main body, an inclined feed portion, and a lower portion or hearth provided with a vapor-pipe and air-pipe, communicating with the main body by means of openings.

It also consists in providing the hearth with an inclined grate.

It also consists in providing said main body with zigzag shelves on opposite sides; and it consists, further, in certain details of construction, as will be more fully described hereinafter.

Referring to the parts by letters, the same letter indicating the same parts whenever used, letter A represents the ore-conducting shaft, constructed of any suitable material, and consisting of a vertical portion, A', upper portion, A'', inclined at an angle of about forty-five degrees to the part A', and lower portion, A''', inclined similarly to the upper part, A'. The vertical part A' of the shaft A is provided with slanting plates B, the lower portion of each plate sloping at an angle of about forty-five degrees and arranged on opposite sides of the interior of shaft A, so that the inclined portions alternate with each other, forming inclined shelves, which cause the material to flow in a zigzag direction down through said shaft, as plainly shown at Figs. 1 and 3 of the drawings.

C is an interior casing, of brick or other suit-

able material, with central flue, C', in which the shaft A is fixed, so as to leave flue-space surrounding the shaft A.

D is the fire-chamber, made in the casing C and arranged to communicate with the flue C', but having no communication with the interior of the shaft A, the flame and heat from the chamber D passing up the flue C' around and in contact with the pipe A, and the unconsumed portions pass out at the exit C''.

D' is an ash-pit.

E is a chamber having a closed bottom, *e*, immediately over the fire-chamber D, and a higher bottom, E', formed of overlapping inclined plates *e'*, with spaces *e''* between them, as shown at Fig. 1 of the drawings.

F is a tuyere leading through a casing, C, from a fan-blower, and communicates with the space between the floors *e* and E'.

G is an exit-pipe leading out from the chamber E. The chamber E, the fire-chamber, and the ash-pit are provided with suitable doors, as shown in the drawings.

H is a pipe placed in close proximity to one side of the shaft A, and with its lower end opening at *h* into the upper part of the chamber E, and its upper end extending outward through the casing C and curved downward to near the bottom of a condensing-chamber, I, which chamber has a discharge-spout, *i*. Beneath each of the plates B, on the side of the pipe A next the pipe H, is an aperture, *i'*, in the pipe A.

J is a pipe attached to the vertical portion of the shaft A on the opposite side from the pipe H, and communicates with the interior of the pipe A' by means of apertures *j*, beneath each shelf B on that side of said shaft A.

K is a tuyere leading from a fan-blower through the casing C and to the interior of the pipe J.

The upper end of the pipe A' is exterior to the casing C, and is provided with a charging-box, L, having a suitably-perforated bottom, *l*.

In operation the ore in a proper condition is fed to the shaft A through the charging-hole L, whence it passes down the incline A'', and thence passes to the upper plate B, the inclination of which allows it to slide slowly off of it and fall upon the next plate B below, and thus continuously until it passes over all the plates B, and, falling from the lower one,

passes through the inclined lower end, A''', from which it falls upon the upper plate e', and thence slides slowly downward over the plates e' to the spout G', through which it may
 5 be removed as desired. During the passage of the ore through the shaft A it is heated by the surrounding flue C' by radiated heat and without contact with the flame or draft from the fire-chamber D, and a constant supply of
 10 air under pressure is forced in through the tuyere K, the oxygen of which unites with the sulphur, phosphorus, carbon, arsenic, zinc, and all volatile matters, and passes off through the openings i' into the pipe H, whence they are
 15 carried upward and discharged into the condensing-chamber I, in which the valuable portions that usually pass away in the vapors will be collected, and may be taken therefrom for further treatment. In the passage of the ore
 20 through the pipe A it will be very thoroughly desulphurized and oxidized; but to bring the oxidation to the highest degree of perfection and to metallize the ore, I provide the chamber E, where the ore may be held, if desired,
 25 and subjected to the heat of the fire-chamber below the bottom E, without contact with the flame or fire, while air under pressure is forced through the tuyere F into the space between the floors e E', and, passing through the spaces
 30 e' between the plates e', comes in contact with the ore. Any remaining volatile portions being discharged from the ore, after it reaches the chamber E, will pass into the discharge-pipe H at h, and thence to the condensing-chamber I.
 35

I am aware that furnaces for reducing ores in which a vertical shaft in which is arranged a pipe surrounded by the products of combustion, so that the radiated heat acts on the
 40 descending ores; also that furnaces for desulphurizing ores in which the flues are heated by the hot gases from a heating-furnace flue inclosing them and the drying-floor and roasting-chamber are heated by said gases; also

that a vessel with diaphragms and heated by
 45 gases from the furnace on its outer side; also that an ore-furnace having a vertical retort surrounded by an annular heating-flue communicating with a furnace, and also that a furnace with a series of incline shelves of inverted-V shape, upon which the ore was dropped
 50 before reaching the fire-place, are old, and I therefore disclaim all such; but,

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

1. An ore-roasting retort consisting of a main body, A', an inclined feed portion, A'', a lower portion or hearth, A''', vapor-pipe H, and air-pipe J, both communicating with said pipe A' by means of openings, substantially as shown
 60 and set forth.

2. An ore-roasting retort consisting of a main body, A', an inclined feed portion, A'', a lower portion or hearth, A''', the portion A''' consisting of an inclined pipe, and a hearth, E, provided with inclined grate e' e'', the main body having a vapor-pipe, H, and air-pipe J, substantially as specified.
 65

3. An ore-roasting retort consisting of a main body, A', an inclined feed portion, A'', a lower portion, A''', said part A' provided with zigzag shelves B, a vapor-pipe, H, and an air-pipe, J, all substantially as described.
 70

4. The ore-furnace herein described, consisting of an inclosing-shaft, a fire-box, an ore-roasting retort, A', having inclined portion A'', a lower portion or hearth, A''', said part A' provided with zigzag shelves B, a vapor-pipe, H, and air-pipe J, with blast-pipes F K, all
 75 substantially as set forth.
 80

In testimony whereof I affix my signature in presence of two witnesses.

JACOB E. RICE.

Witnesses:

GEO. D. TALBOT,
 LOUIS J. LAWS.