

(No Model.)

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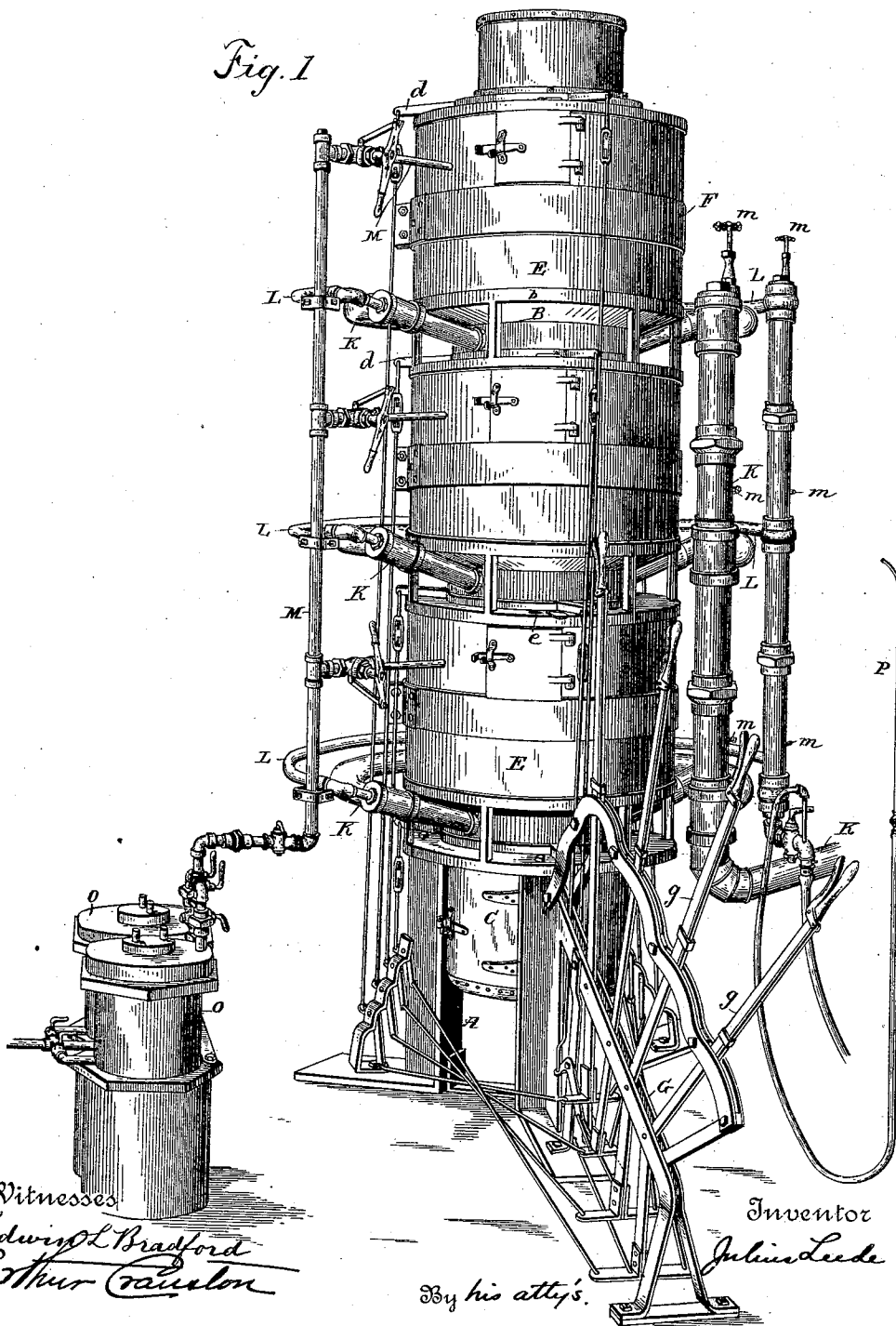
J. LEEDE.

APPARATUS FOR DESULPHURIZING ORES.

No. 471,618.

Patented Mar. 29, 1892.

Fig. 1



Witnesses

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(No Model.)

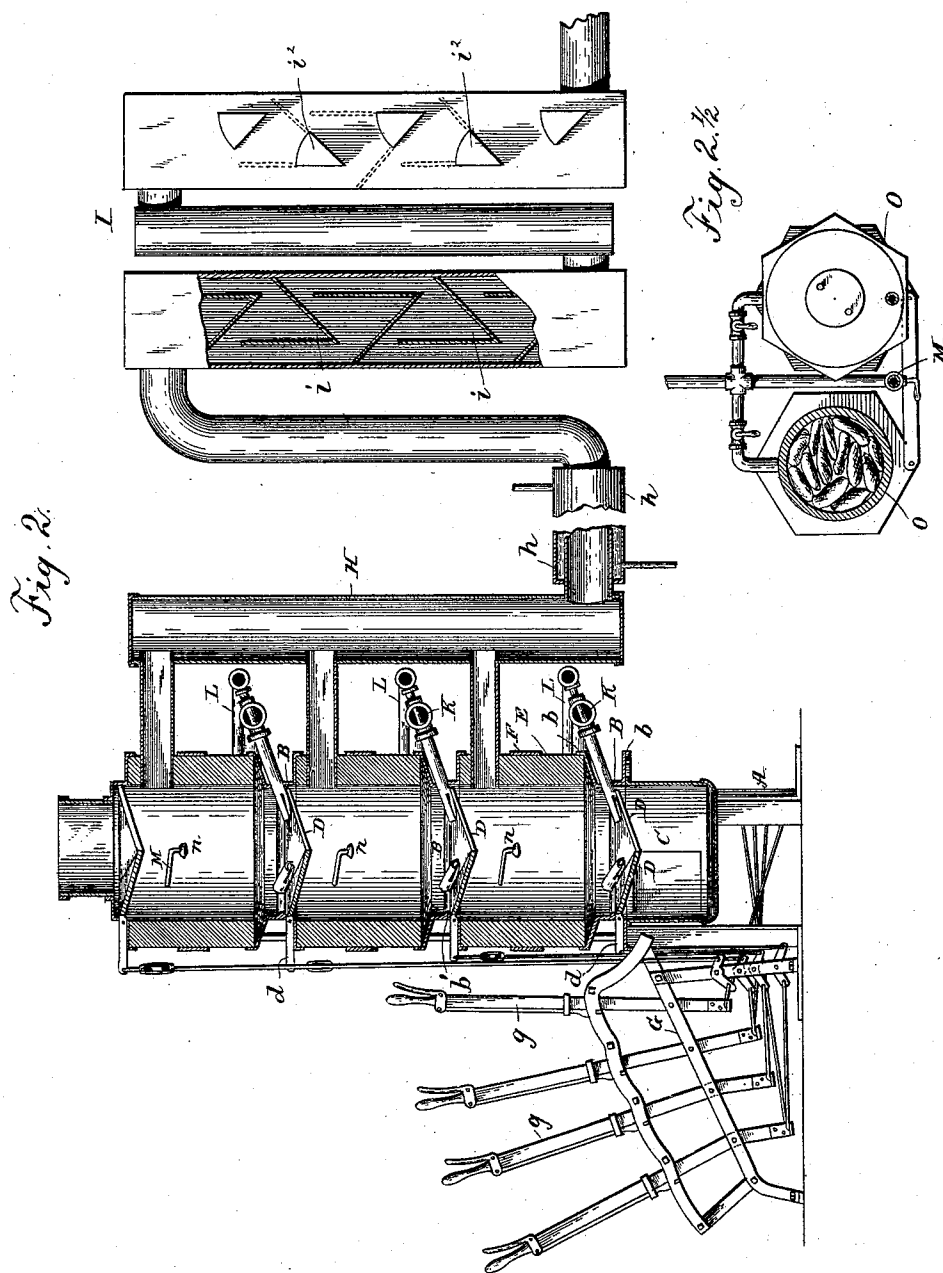
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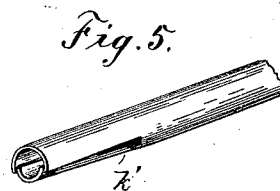
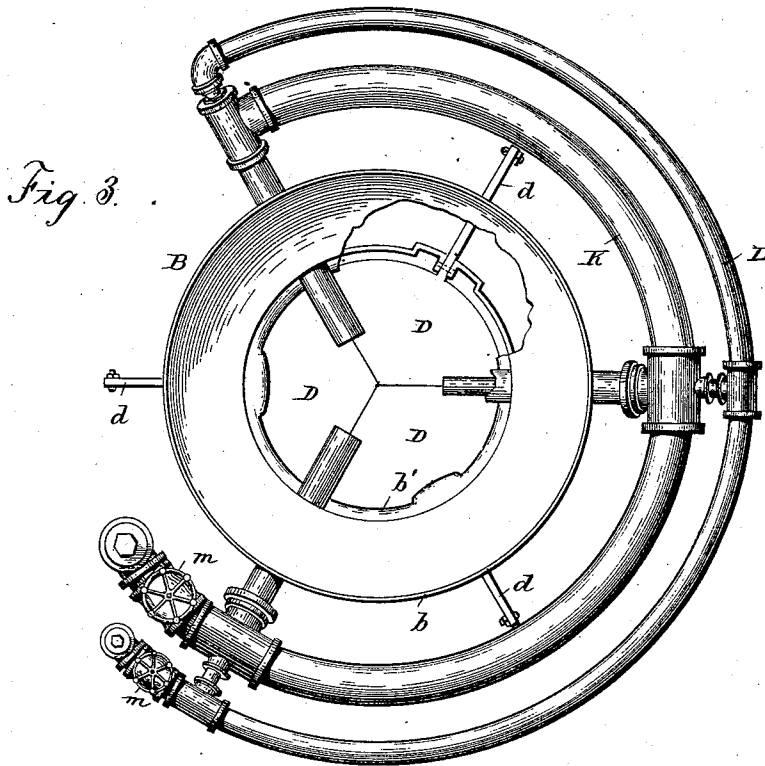
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UNITED STATES PATENT OFFICE.

JULIUS LEEDE, OF MINNEAPOLIS, MINNESOTA.

APPARATUS FOR DESULPHURIZING ORES.

SPECIFICATION forming part of Letters Patent No. 471,618, dated March 29, 1892.

Application filed October 23, 1889. Renewed September 5, 1891. Serial No. 404,823. (No model.)

To all whom it may concern:

Be it known that I, JULIUS LEEDE, of Minneapolis, county of Hennepin, and State of Minnesota, have invented certain new and useful Improvements in Apparatus for Treating Refractory Ores; and I do hereby declare that the following is a full, clear, and exact description thereof, such that others skilled in the art to which it appertains may be able to make and use the same.

As heretofore practiced in the treatment of refractory ores, known generally under the name of "sulphurets," which contain sulphur, arsenic, antimony, tellurium, &c., in varying proportions in connection with the precious metals, it has been difficult, if not impossible, to expeditiously and economically eliminate the base metals and compounds and prepare the ores for amalgamation, lixiviation, or smelting without a large percentage of loss.

The object of my invention is to obviate difficulties heretofore encountered and to produce an apparatus for roasting and treating ores which is equally adapted to the treatment of ores of various kinds and without undue expenditure of time and fuel or loss of mineral arising from inherent defects in prior processes and apparatus.

The invention consists in certain arrangements of instrumentalities and combinations of parts hereinafter more fully described, and set forth in the claims.

In the drawings, forming a part of this specification, Figure 1 is an elevation of my improved apparatus, taken from the front. Fig. 2 is a central vertical section of the same, showing the operating-levers in elevation and the condenser partly in elevation and partly in section. Fig. 2½ is a plan showing one of the chemical chambers in section. Fig. 3 is a plan, a portion of the upper part of the furnace being removed. Fig. 4 is a detail showing the liquid spraying device, and Fig. 5 is a detail of the blast-nozzle.

A is a tripod or support for the furnace, mounted on any suitable platform or foundation. Obviously this support may be made of cast or wrought metal or it may be built up of masonry. Upon this support is mounted a casting B, made in the general form and proportion shown in the section, Fig. 2. This casting is provided with flanges *b b* and with lip

b'. The under flange *b* embraces the walls of a hopper C, from which the ore is removed after treatment by means of a conveyer (not shown) or in any suitable way. The roasted ore may be directly conveyed to crushing or pulverizing rollers and thence to amalgamator, smelter, or other place of deposit in well-known ways.

The hopper C is arranged within the support, as shown.

D D D are plates hinged to the casting B, as shown. These plates form the bottom or hearth of the roasting-chamber, and for convenience I will hereinafter call them "dumping-plates." Each bottom section is provided with an outwardly-projecting arm *d*, through which they are operated to open and close by means of operating-levers and connecting-rods, hereinafter described. These plates are triangular in form and are inclined downward toward the center of the furnace, thus forming a bottom of general conical shape. This is for the purpose of preventing binding by reason of expansion from the intense heat. In case they should expand, however, they may be relieved by means of the turn-buckles shown.

Within the upper flange *b* of the casting B fire-brick E are arranged and form the outer walls of the fire-chamber of the furnace. The height of this chamber is usually made about twenty inches or the length of two ordinary fire-brick. Obviously this may be greater or less, and brick of the required dimensions to use a single course may be made for the purpose. A tie-band F is adjusted around the brick at the joint or about midway between the top and bottom of the chamber, as shown in Fig. 1. Instead of such band the brick may be surrounded and supported by a cylinder of cast, sheet, or plate metal. Mounted on the top of the brick is another similar casting B, and a second fire-chamber with dumping-grates is formed in all respects like the first. It is my purpose to have three or more fire-chambers, one above another, and above all a hopper of suitable capacity to hold a charge of ore for one chamber of the furnace, each compartment having dumping-plates for discharging the ore to the chamber next below.

Doors for ingress to the fire-chambers for

the purpose of igniting the fuel are provided, and a peep-hole *e* for each fire-chamber is arranged so that the operator may observe the condition of the interior.

- 5 Reflectors may be arranged for convenience of inspecting the upper chambers. The lip *b'* forms a shelf over the outer edge of the dumping-plates and prevents clogging upon the return of the grate to its normal condi-
10 tion.

- G* is a segmental frame or support, to which is pivoted a series of operating-levers *g g*, through which and the connecting-rods and crank-levers shown the grates are opened and
15 closed. Turn-buckles are used for adjusting the length of these connecting-rods to insure the exact throw to fully close the grates.

- H* is the flue common to all the fire-chambers through which the products of combustion
20 pass to the condenser *I*. The flue is jacketed, as seen at *h*, for the circulation of water to cool and condense the escaping fumes.

- The condenser *I* is provided with zigzag passages and with settling-pockets *i i*, as shown,
25 and the side boundaries of the pockets are provided with removable caps *i'* or with doors through which the deposits may be readily inspected and removed from time to time.

- K* is an air-blast passage leading from a
30 suitable power-driven blower to each fire-chamber at three or more points, and *L* is a gas or fuel pipe leading from a suitable source of supply under pressure to and through the air-discharge passages within the fire-chambers.

- 35 The nozzles of the blow-pipe are made by sawing or slitting the end of a pipe below a diametrical line and then bending the under lip or jaw up against the longer part, leaving the lateral openings *k' k'* in the form shown,
40 so that the discharge of gas and air will be freest near the circumference of the fire-chamber, in order that the flame may reach all parts of the ore with approximately the same force and effect.

- 45 Cocks *m m* are arranged, as shown, so that either the gas or air, or both, may be shut off or turned on to either or to all of the fire-chambers as may be desired.

- M* is a steam or liquid-supply conduit leading from any suitable supply under pressure.
50 This conduit is provided at its extremity within the fire-chambers with a perforated nozzle *n* for spraying liquid or distributing steam throughout the fire-chamber for chill-
55 ing the ore, cooling the chamber or the introduction of reducing or converting agents as may be desired. Interposed between the source and discharge and connected with the conduit *M* by branch pipes are one or more
60 chemical chambers *O*. Cocks are arranged so as to divert the steam or liquid past or through either or all of these chambers, one of which is designed to contain salt and the others such chemical or mixtures of chemicals
65 or solvents as may be desirable in the treatment of the character of ores herein contemplated.

P is a torch or gas-burner flexibly connected with source of supply for use in igniting the burners in the fire-chambers.

The operation of my apparatus is as follows: Ores reduced to about the size of stove-
70 coal or less are introduced in any approved way to the hopper at the top of the furnace, gas is turned on to the upper chamber and
75 lighted, and the blast is started. The ore is then dumped into said chamber and the upper plates returned to normal position. The ore is then heated by the blow-pipe flame to a proper heat and held in the chamber until
80 the surfaces within the range of the flame have come approximately to the proper condition. In the meantime, if the ore gets too hot or if for other reasons it is desirable for
85 disintegration or decomposition jets or sudden dashes of water or chemically-charged water or steam are admitted to the chamber. The gas is then lighted and the blast turned
90 on in the next chamber and the partially-treated ore is dumped to said chamber and a new charge is introduced from the hopper to the upper chamber. The dumping mixes
95 and turns the ore so as to present new surfaces to the flame, and the treatment is continued or modified in the second chamber, according to the judgment or instructions of
100 the operator and the character and condition of the ore. In some instances when the ore contains a large amount of sulphur the gas is used only to bring said ore to such heat as
105 will ignite the sulphur, after which it (the gas) is cut off and the blast continued, thus oxidizing the mass. Again, should the mass become too hot it may be cooled by reducing the blast or by the introduction of water or steam.

It is observed that the operations are severally under the direct control of the attendant, and that the heat, the amount of fuel introduced, the relation of blast to fuel, and of
110 both to the character of the ore, the cooling in case of great rise in temperature or the chilling in case it be desired to suddenly chill the mass for disintegrating the same or for
115 other purposes, as well as the introduction of chemical reagents, is absolutely under the will of the operator. The time of treatment in each chamber may be made to correspond, and thus a charge of ordinary ore may be introduced and discharged every few minutes.
120

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

1. In an apparatus for treating refractory
125 ores, the combination of an ore and combustion chamber having a closed bottom or hearth, gas-burners extending into the bottom of and close to the hearth of said chamber, separate air and gas conduits communicating with said burners, and a source of gas
130 and air supply under pressure communicating with the conduits, whereby a blow-pipe flame is caused to extend entirely within the combustion-chamber, across the hearth, and

beneath the body of the ore, substantially as described.

2. In an apparatus for treating refractory ores, the combination of an ore and combustion chamber, gas-burners leading to said chamber, separate air and gas conduits communicating with said burners, a source of gas and of air supply under pressure communicating with the conduits, and means, substantially as described, for introducing chemicals at will, whereby the mass is subjected to an oxidizing flame and chemical reagents, substantially as described.

3. In an apparatus for treating refractory ores, the combination of a series of combustion-chambers, one above another, movable hearths or dumping-plates pivotally supported in the walls of the chambers, operating-levers at the side of the furnace, and connecting devices between the levers and plates, substantially as described.

4. In an apparatus for treating refractory ores, the combination of a fire-chamber, hearth, or dumping-plate sections pivotally supported

in the fire-chamber, and an internally-projecting lip in the fire-chamber above the dumping-plate sections, substantially as described.

5. In an ore-treating apparatus, the combination of a fire-chamber, a chemical chamber communicating with said fire-chamber, a pipe for steam or liquids extending from a source of supply to said chemical-chamber, and means, substantially as described, to divert the steam or liquid past or through the said chemical chamber, as specified.

6. In an apparatus for treating refractory ores, the combination of a fire-chamber, inclined dumping-plates pivotally supported within the walls of the fire-chamber to form a conical bottom or hearth, and means for operating said plates, substantially as described.

In testimony whereof I have hereunto affixed my name in the presence of two witnesses this 1st day of October, A. D. 1889.

JULIUS LEEDE. [L. S.]

In presence of—

JOHN P. GRIST,

V. D. STOCKBRIDGE.