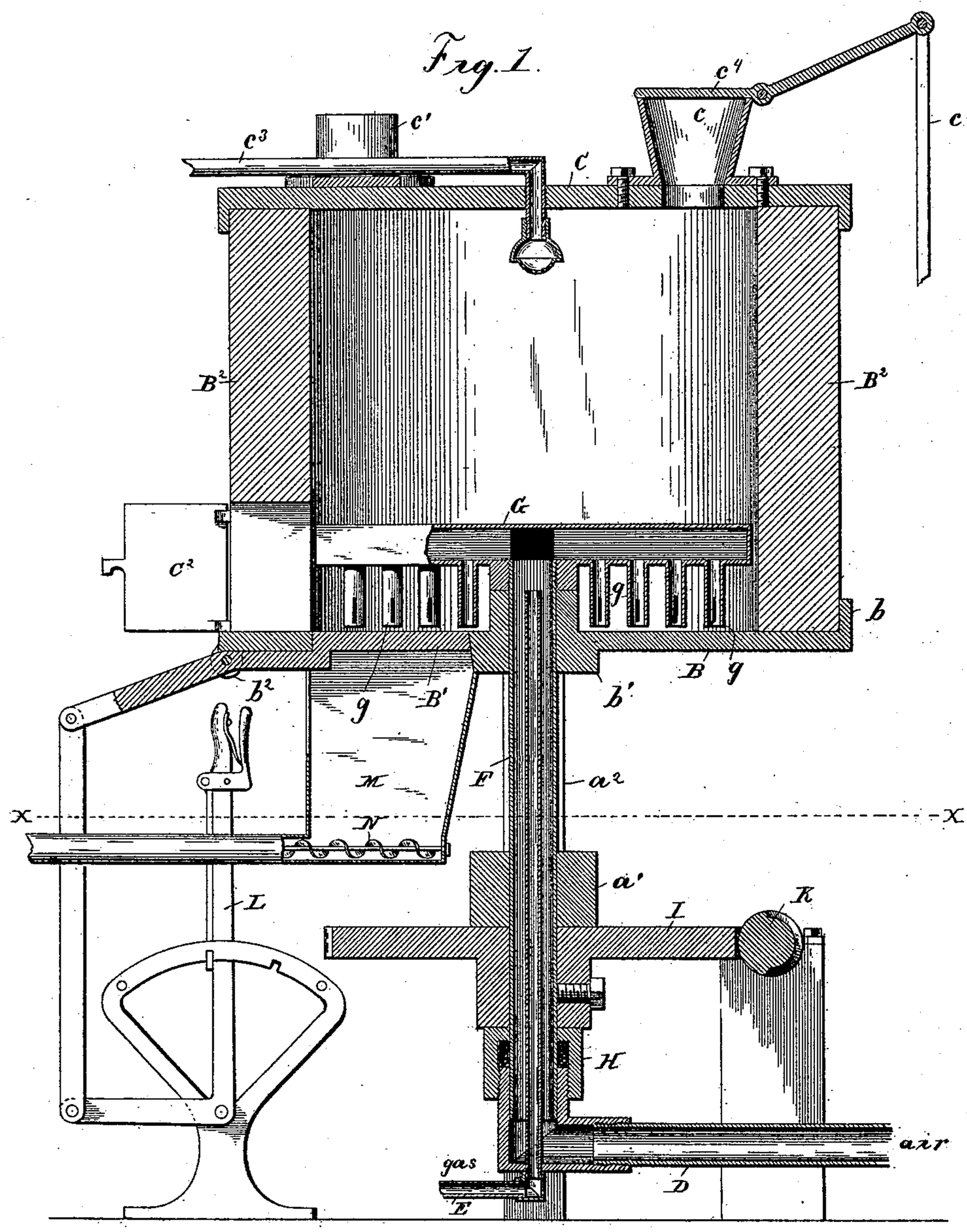
(No Model.) 2 Sheets—Sheet 1.

J. LEEDE.

APPARATUS FOR TREATING REFRACTORY ORES.

No. 471,617. Patented Mar. 29, 1892.

Fig. 1.



WITNESSES:

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ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

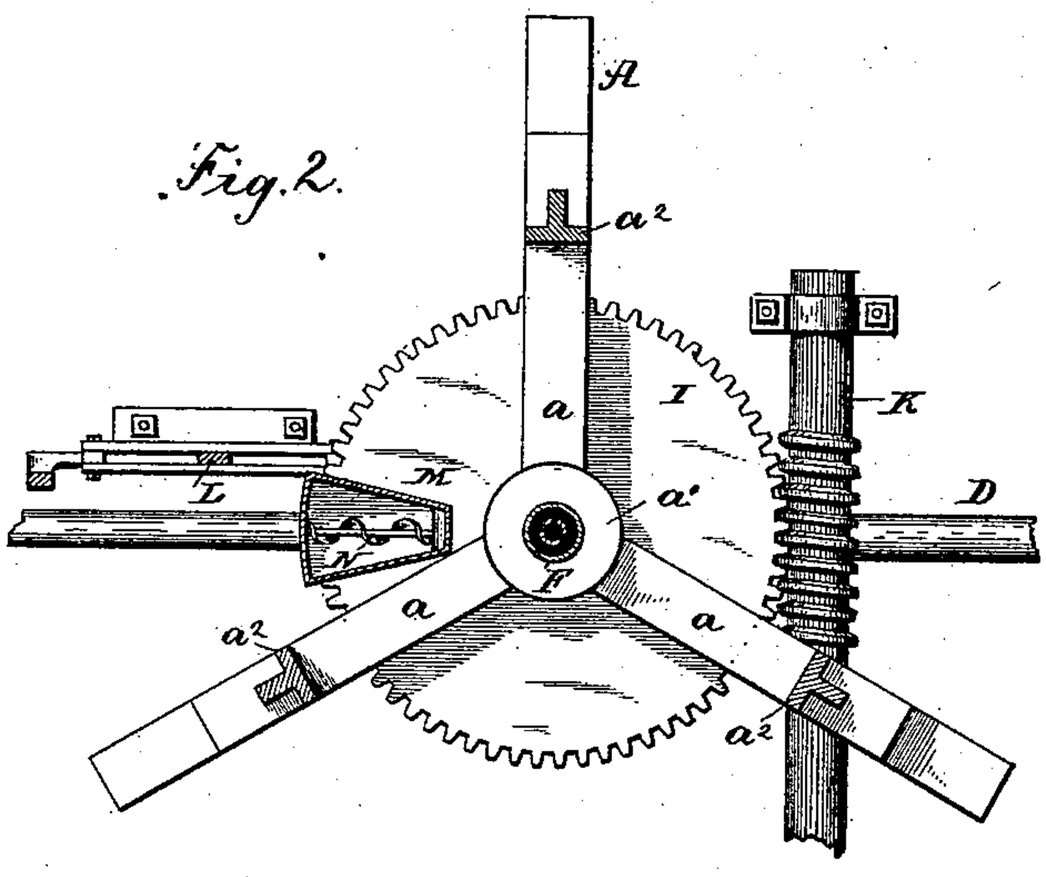


Fig. 3.

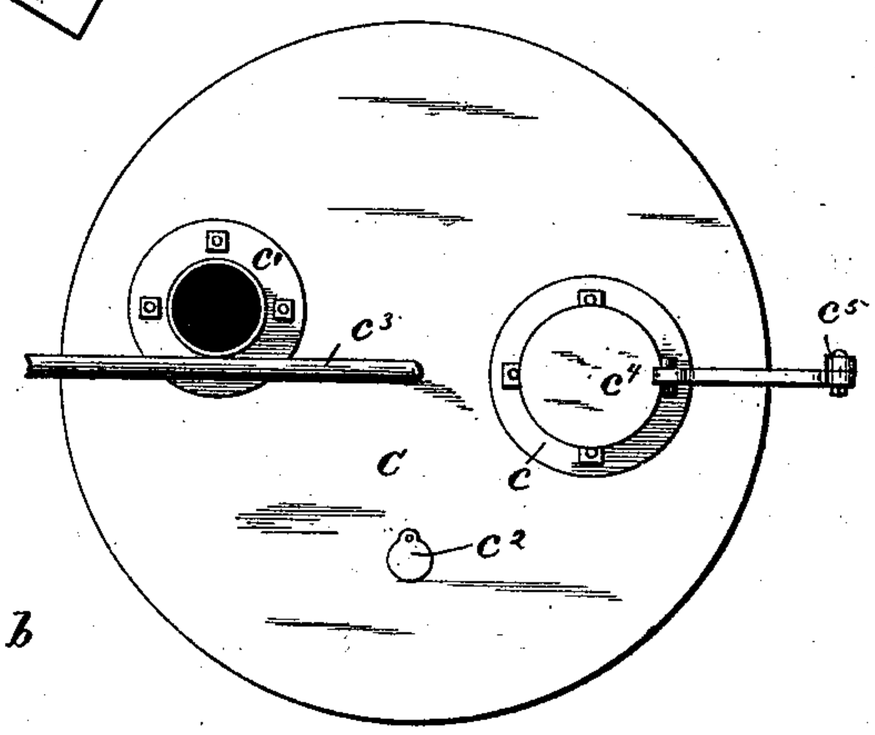


Fig. 4.

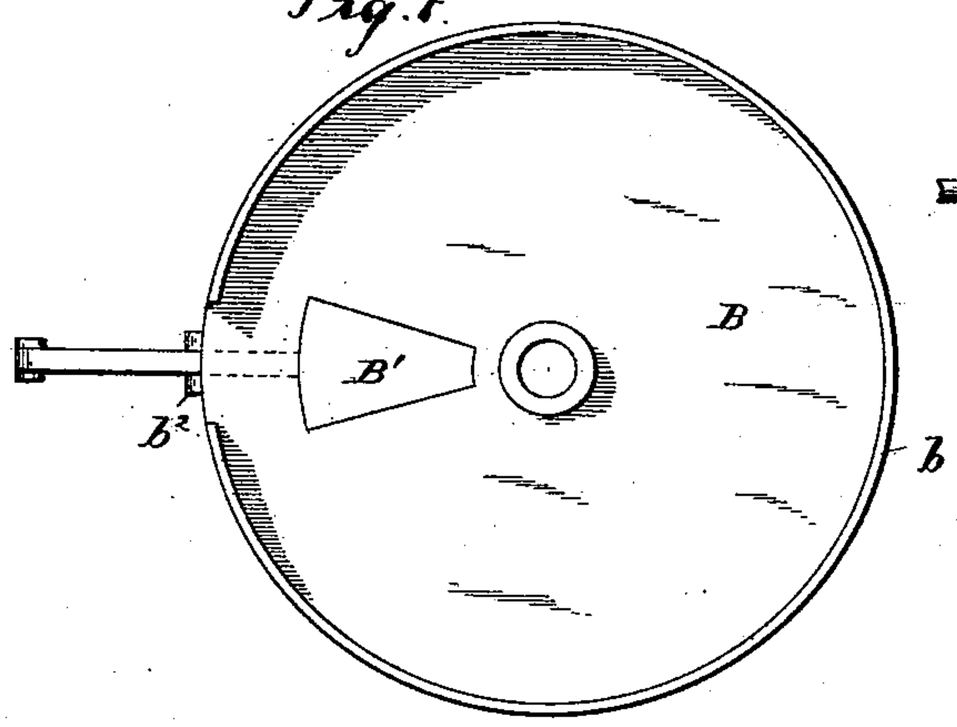
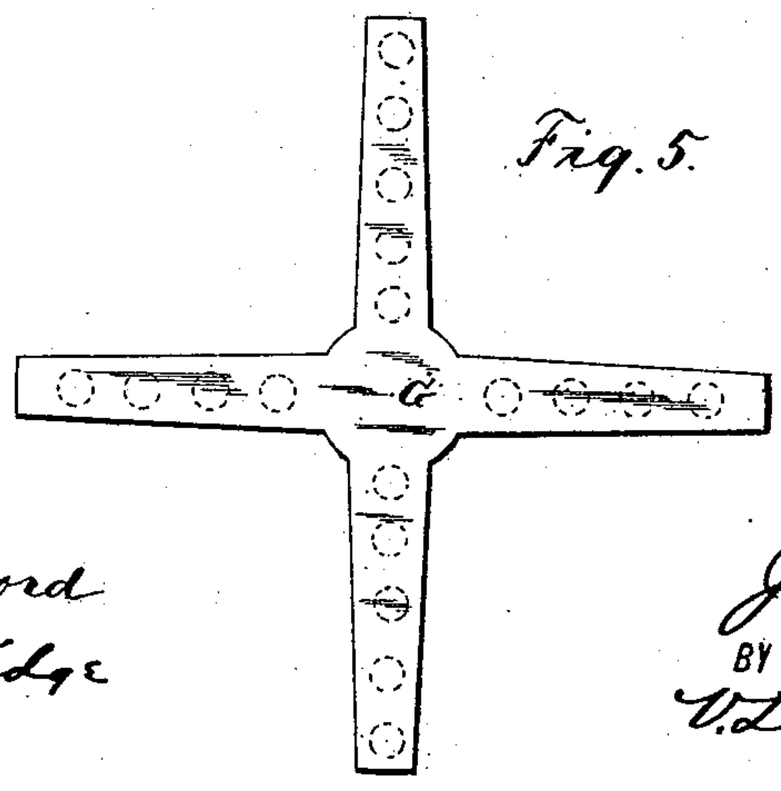


Fig. 5.



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UNITED STATES PATENT OFFICE.

JULIUS LEEDE, OF MINNEAPOLIS, MINNESOTA.

APPARATUS FOR TREATING REFRACTORY ORES.

SPECIFICATION forming part of Letters Patent No. 471,617, dated March 29, 1892.

Application filed October 19, 1889. Renewed September 5, 1891. Serial No. 404,822. (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.

In roasting for desulphurizing very fine ores it is essential that the ore be stirred or agitated continuously or intermittently in order that the flame and heat may reach all parts thereof. This has generally been done by hand with rakes or bars projecting through the side of the furnace.

The object of my invention is to provide means whereby this may be done automatically and continuously, to the end that the best results may be obtained in the most economical manner.

The invention consists generally in the combination of rotary stirrers or mixers with the burner-jets, whereby the jets are continually moving and being brought into intimate contact with the pulverulent material.

The invention also consists in constructions and combinations hereinafter described, and particularly pointed out in the claims.

In the drawings forming a part of this specification, Figure 1 is a central vertical section of an apparatus constructed according to my invention. Fig. 2 is a section on the line *x x* of Fig. 1, showing in plan a tripod or support for the furnace-chamber and other parts below said furnace-chamber. Fig. 3 is a plan of the top of the machine. Fig. 4 is a plan of the bottom of the furnace, and Fig. 5 is a plan of the burner-arms.

A is the tripod or support, having arms *a a* radiating from a boss *a'*, formed with or secured thereto. The parts *a a* also have cast integral or secured to them risers a^2 a^2, upon which is supported a flanged base-piece B. The part B is flanged at *b* and has a base *b'* and a lug b^2, to which is pivoted a triangular door or trap B'. The parts B and B' form the bottom of a fire-chamber, the part B serving to support fire-brick B^2, which serve as the walls of the fire-chamber or furnace.

C is a flanged top for the fire-chamber, having attached thereto a hopper *c* and the flue *c'*. A peep-hole c^2 and a water or steam pipe c^3 are also connected with the top. The hopper is normally closed by a damper or door c^4, operated by a handle or pull c^5.

The fire-chamber is provided with a door C^2, as shown, for convenience in lighting the furnace-flame and other obvious purposes.

D is a blast-pipe leading from any suitable means of forcing air, and E is a gas-pipe, also leading from a proper source of supply.

F is a tube or pipe fitted closely and loosely supported in the bosses *a'* and *b'*. To the upper extremity of this tube is fixed the cross-head G. The cross-arms are hollow, plugged or stopped at their ends, and provided with depending nipples or burners *g g*. One cross-arm is provided with an even number of nipples on each side of the tube and the other with an odd number, arranged so as to move in paths intermediate to each other. The nipples are perforated or slitted on the side behind the path of movement.

H is a stuffing-box fitted around the tube F and blast-tube D. To the tube F is keyed or clamped a gear-wheel I, which is slowly driven by a revolving worm-shaft K to rotate the cross-head G, with its nipples, which serve as stirrers as well as burners. The part B' is tilted through the medium of lever L and connections, and the ore is discharged to hopper M and conducted thence by conveyer N.

In operation the gas is turned on and ignited and the blast and worm-shaft started. The fine ore is then introduced through the hopper, and the operation of roasting begins.

In this apparatus a liquid or steam jet is used either alone or charged or saturated with chemical agents for bringing the mass to the desired condition in a manner similar to that described in another application for a patent of even date herewith, Serial No. 327,890, filed October 29, 1889. When the treatment is concluded, the part B' is tilted and the ore is swept by the nipples to the hopper below and is thence conveyed to an amalgamator or other proper place of deposit.

Having described my invention, what I claim is—

1. In an ore-treating apparatus, the combination of an ore-chamber, a series of movable nipples or burners arranged to pass through the ore in said chamber, and air-blast and gas-supply pipes leading to said burners,

whereby a blow-pipe flame is brought into direct contact with the ore while the same is being agitated, substantially as described.

2. In an ore-treating apparatus, the combination of an ore-chamber, a series of rotatable nipples or burners arranged to move through the ore, air-blast and gas-supply pipes leading to the burners, and a movable gate in the bottom of the combustion-chamber, substantially as described.

3. In an ore-treating apparatus, the combination of an ore-chamber, a series of rotatable nipples or burners arranged to pass through the ore in the chamber, and air-blast and gas-supply pipes leading to said burners, substantially as described.

4. The combination of a fire-chamber, a rotating pipe or tube, a cross-head arranged within the ore-chamber, having nipples or burners and mounted on said pipe, and air-blast and gas-supply pipes communicating with said rotating pipe, substantially as described.

5. In an apparatus for treating fine ores, the combination of a fire-chamber, a series of rotatable nipples or burners arranged within the chamber, air-blast and gas-supply pipes connected to the burners, a pipe communicating with the upper part of the chamber, and means, substantially as described, for supplying chemicals through the wall into the fire-chamber, 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.