H. G. LIVERMORE.

ORE ROASTING FURNACE.

No. 169,713. Patented Nov. 9, 1875.

Fig. 1.

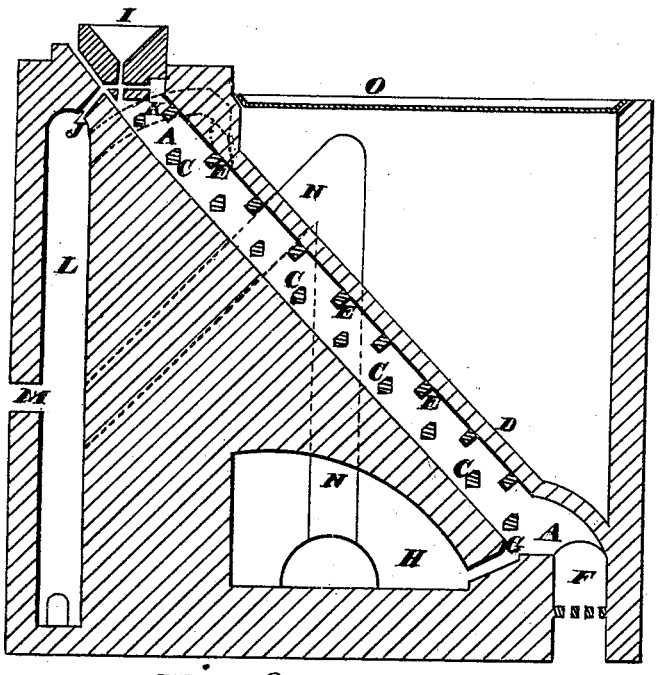


Fig. 2.

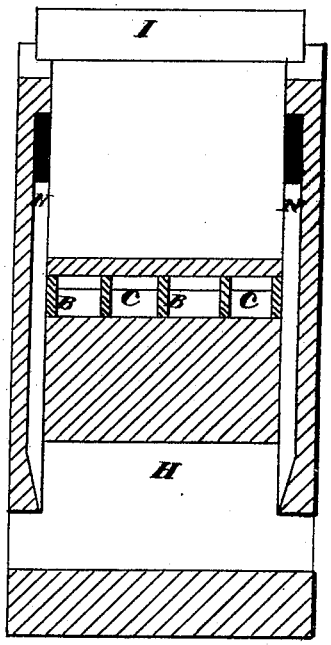


Fig. 3.

Fig. 4.

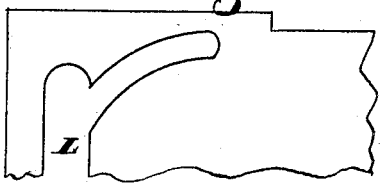
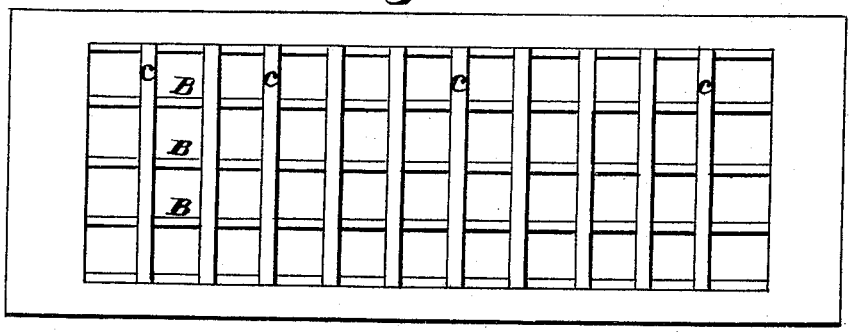


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

HORATIO G. LIVERMORE, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN ORE-ROASTING FURNACES.

Specification forming part of Letters Patent No. **169,713**, dated November 9, 1875; application filed August 11, 1875.

To all whom it may concern:

Be it known that I, HORATIO G. LIVERMORE, of San Francisco city and county, State of California, have invented a Furnace for Roasting Fine Ores; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention without further invention or experiment.

My invention relates to certain improvements in furnaces for roasting or desulphurizing fine ores; and it consists in a novel construction of a furnace having a floor placed at such an angle that the ore, if left to itself, would slide to the bottom or foot. The space between this floor and the top or cover is comparatively limited, and is crossed by numerous dams or abutments, so that the ore will be detained, and will only move when a portion is withdrawn from below, when the whole body of ore will move downward, the dams serving to stir and turn the ore and loosen it, so that the vapors can escape and a new surface will be exposed to the heat. The furnace is situated at the foot of the incline, and the heat passes up over the body of ore, and is deflected upon it.

Suitable feeding and stirring devices and passages for the escape of the fumes to the condensers are made.

Referring to the accompanying drawing for a more complete explanation of my invention, Figure 1 is a longitudinal vertical section of my furnace. Fig. 2 is a transverse vertical section. Figs. 3 and 4 are detached views of parts of the furnace. Fig. 5 is a plan view of the channeled floor and the abutments.

A is a furnace, which is built so that its floor stands at an incline of about fifty degrees from the base. This floor may be made of any desired width—as ten or twelve feet—and is divided in the direction of its length into about as many longitudinal channels by partitions B. I then build transverse dams or abutments C, which extend across these channels about two inches from the inclined floor.

I have shown these dams as being in transverse section in the shape of a vertical parallelogram, having the upper corner cut off at such an angle that it will present a face nearly at right angles with the floor; but I do not desire to confine myself to this particular form, as it will be manifest that any form of abutment which will retain the body of ore at this angle, and allow it to move downward and be turned as it is removed from below, will accomplish the desired result.

The top or cover D of my furnace is placed at a short distance (twelve or fifteen inches) above the floor, extending at the same angle and parallel with it, and this top has abutments E projecting downward at intervals, alternating with the dams C in such a manner that they will deflect the heat and flame upon the body of ore which is passing below. The fire-place F is situated at the lower end of the incline, and may have a hot-blast or other suitable draft. At the foot of the incline, and just above the fire-place, is a transverse passage, G, across the ore-chamber, through which the ashes and burned débris from the ore will pass to the waste-chamber H. This chamber is provided with a draw-hole and door, and as fast as the refuse is drawn out it will be seen that the whole body of ore, resting upon the inclined floor, will move downward a short distance, and will be stirred up to allow the vapor to escape and present a new surface to the action of the heat.

As this body of pulverized ore is but a few inches in thickness, it will be thoroughly and rapidly roasted.

The feeding device consists of a hopper, I, which stands on the upper end of the incline, fitting closely, and it is perforated with openings opposite to or above the upper end of each of the longitudinal channels, through which the ore passes as fast as the ore in the chamber moves downward. Openings J are made through the bottom, just behind and above the point where the ore enters the chamber, and channels *k* are also made in the sides near the same point, all leading to the chamber L beneath, and this chamber receives all the vapors of the roasted ore, and also the products of combustion. A flue, M, leads to the condenser, and the vapor is drawn into the chamber and thence to the condenser by any suitable draft. The waste-chamber H has passages N formed on its walls, and these lead

either directly to the chamber L, or they may be carried up above the roasting-chamber, and thence to their destination, their object being to save any heat and mercurial vapors which may have passed into the waste-chamber H with the refuse ore, and to assist in drying the ore in the pan *o*.

Openings may be made from the top of the furnace in a line with the inclined chamber, for the introduction of rods to stir up the ore, should it ever become clogged.

The operation will then be as follows: The ore is first sifted with a coarse sieve, and the finer part is fed into the hopper after having been dried (if wet) upon a pan, *o*, which is set upon the top of the furnace, above the fire-place and ore-chamber, from which it will receive a gentle heat sufficient to dry out any moisture which may be contained within the ore. From the hopper the ore will pass into the inclined chamber, sliding down its floor, until it rests at the bottom, and the dams C will then retain it in its place, as before described.

The body of ore, being so thin and so thoroughly exposed to the heat, will be roasted almost as fast as it can be fed and withdrawn at the bottom, the operation being continuous.

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

1. The improvement in furnaces for roasting ores, consisting of inclined chamber A, having a longitudinally-channeled floor and a roof with abutments E, wherein the ore may move downward by gravitation, and the heat and flame pass upward and be deflected on the ore, substantially as and for the purpose set forth.

2. The shallow furnace-chamber A, with its floor standing at such an angle that the ore will move down by gravitation alone, in combination with the transverse dams or abutments *c*, by which the ore is retained upon the floor-surface in a thin sheet, and is at the same time stirred as it moves downward, substantially as herein described.

3. The angular channels N, leading from the waste-chamber H, above the inclined ore-chamber, and thence to the condenser, for the purpose of utilizing any heat and fumes which may have passed into the waste-chamber, substantially as described.

4. The receiving-chamber L, for the fumes, having the openings J and K from the ore-chamber, and the channels N from the waste-chamber, substantially as herein described.

In witness whereof I hereunto set my hand and seal.

HORATIO G. LIVERMORE. [L. S.]

Witnesses:

GEO. H. STRONG,

JNO. L. BOONE.