C. E. ROBINSON.

Furnace for Roasting Ore.

No. 212,508. Patented Feb. 18, 1879.

Fig. 1.

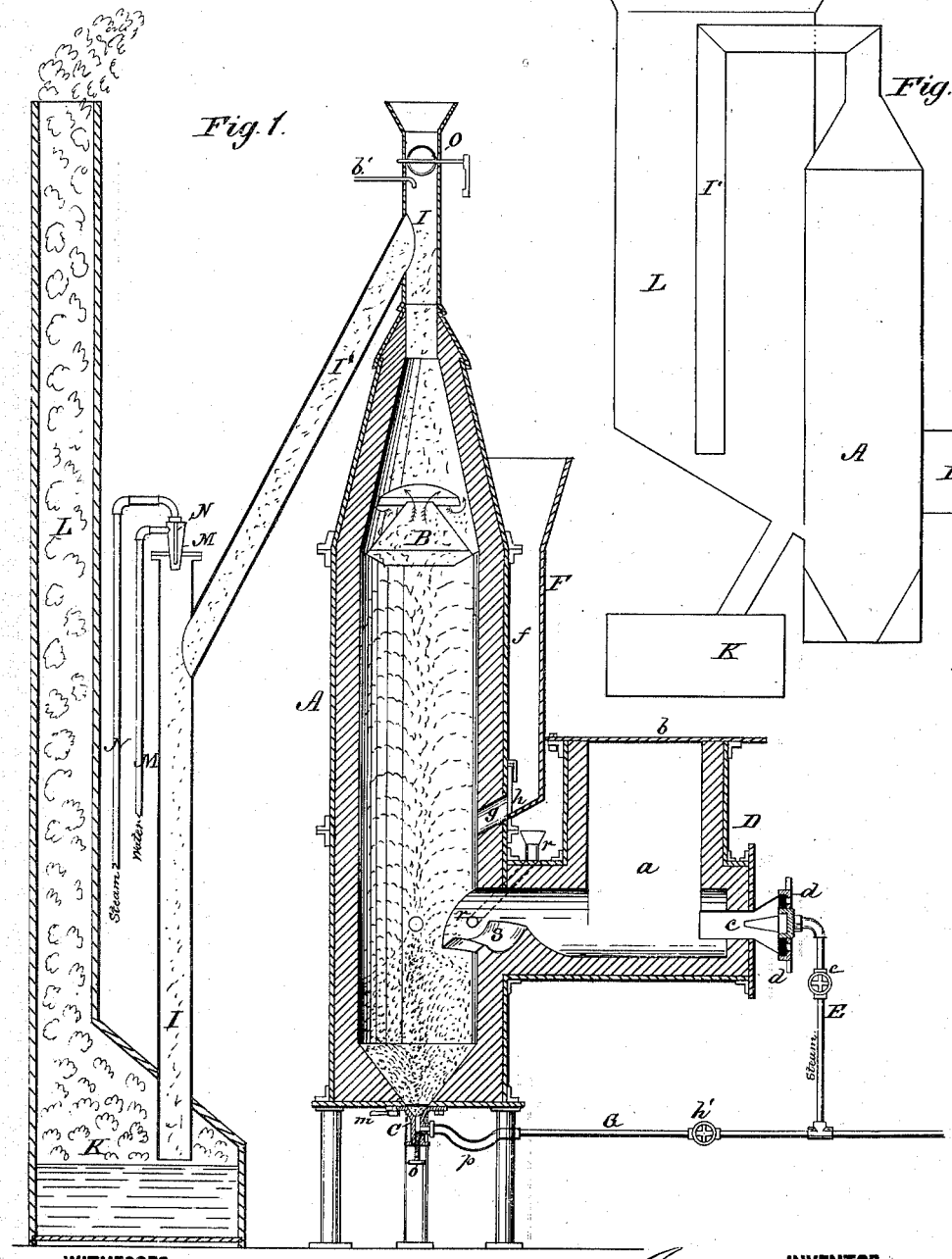
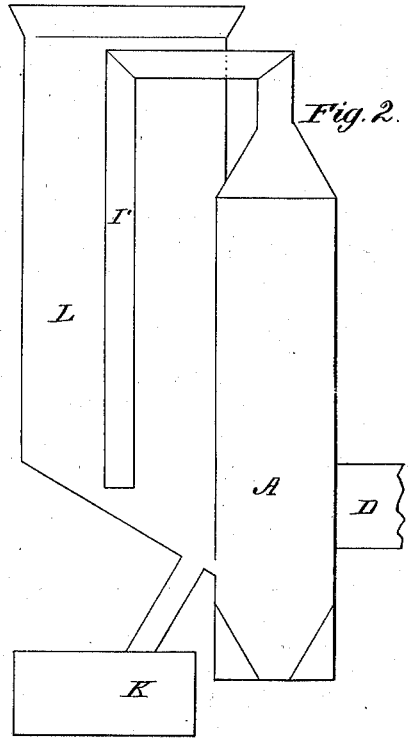


Fig. 2.



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CHARLES E. ROBINSON, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN FURNACES FOR ROASTING ORES.

Specification forming part of Letters Patent No. **212,508**, dated February 18, 1879; application filed January 17, 1878.

To all whom it may concern:

Be it known that I, CHARLES E. ROBINSON, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Process and Apparatus for Treating Ores; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to an improved process and apparatus for treating ores, more particularly for desulphurizing auriferous ores, the object being to secure the desired result in a more perfect manner, in a shorter time, and with less expenditure of fuel and labor than heretofore.

In carrying out the process, a charge of pulverized ore is admitted into the cupola, and a jet or blast of air, gas, or steam is admitted at the bottom of the cupola, and, passing up through the ore, causes it to boil or play like the waters of a fountain. The ore is subjected to the action of a forced furnace or flame blast simultaneously with such ebullition, the blast being admitted through a lateral opening in the cupola. When the ore-charge has been roasted a sufficient time, the steam and air and furnace-blasts are shut off, and the ore is allowed to discharge through a suitable orifice in the bottom of the cupola. A fresh charge is then admitted into the cupola, and the operation is repeated.

The apparatus includes novel features of construction in respect to supplying or feeding ore to the cupola and discharging it therefrom; also in respect to chloridizing the ore, all as hereinafter described.

In the accompanying drawings, forming part of this specification, Figure 1 is a sectional elevation of the furnace. Fig. 2 represents a modified arrangement of certain parts of the furnace.

The retort or combustion-chamber D, which is an exterior portion or attachment of the stack A, has a vertical part, forming a fuel-chamber, *a*, into which coal or wood is introduced by removing the air-tight iron cover *b*. A funnel, *c*, is secured in the outer end of the combustion-chamber D, and provided with an annular slide, *d*, for regulating the admission of atmospheric air. The air jet or current is induced by steam, which is ejected from the nozzle of pipe E, that enters the mouth of funnel *c*. This pipe is provided with a cock, *e*, for regulating the steam-jet or blast.

Surrounding, or partly surrounding, the upper portion of the body of the stack or cupola A is a jacket or casing, F, forming a hopper or receptacle, *f*, for containing the pulverized ore. A tube, *g*, provided with a regulating cut-off, *h*, and extending through the wall of the stack, serves to conduct the ore into the interior of the latter, where it falls in a stream or shower while charging the furnace. An air or steam jet or blast-pipe, G, connects with the base of the stack A, and is provided with a valve, *h'*, for regulating the force of the jet of air or steam. Said pipe G has a flexible portion, *p*, which is attached to pendent tube, forming part of a pivoted gate, C, which is used for discharging ore after treatment. The bottom of stack or cupola A is made cone-shaped, to aid in concentrating and returning the ore to the action of the blast from pipe G.

A deflector, B, is located in the upper portion of the stack A. It is composed of a conical truncated hood, and a convex cap or cover placed immediately above it. The hood concentrates the ore-particles passing upward and diverts them against the cap or cover, by which they are deflected downward and the heavier portion returned into the body of the stack.

From the top I of the cupola A a large pipe, I', leads down to a chamber, K, where the particles of ore which may pass the deflector B and steam-jet *b'*, being driven by sufficient velocity against or into the water in tank *k*, are collected in said tank, thus preventing any possible loss of ore.

The chamber K is constructed with an inclined top, terminating in a shaft or chimney, L, for carrying off the gases or vapors. If it should be desirable to condense the latter, such condensation may be effected by a combined steam and water jet, the same being delivered through water and steam pipes M N at top of the ore-pipe I'. The steam-jet serves to disseminate the water in a spray, so that a less amount of water is required for the purpose, and the condensation is more perfect.

The operation in which the process is embodied is as follows: The chamber D having

been charged with fuel, and the latter ignited, steam is let on, thus causing an induced current of air through the holes in the regulating-slide *d*. The combined steam and air jet thus formed impinges on the fuel, and is driven through it, thus carrying gases of combustion into the cupola A, where they meet with and act on the pulverized ore. The blast from the gas or steam pipe serves to hold the charge of ore in suspension, keeping it in constant play, like the waters of a fountain, the ore being forced or carried up in the center of the cupola, and falling again on the side next the wall of the cupola, and also serves to turn the flames toward the bottom of the stack, thus heating it as hot as the upper portion. The particles of ore which have been carried to the upper part of the stack A are turned from their upward course by the deflector B. If any particles should escape the deflector, the small steam-jet *b'*, at opening of pipe I, serves to drive them back, the gases escaping through the steam into the pipe I', and thence into the tank K. From the chamber K the sulphurous gases pass through pipe L into the outer air.

The height to which the column of ore in the cupola is raised is regulated by the force of the jet from pipe G, and that in turn obviously depends, mainly, upon the position of valve or cock *h'*.

The ore in the exterior chamber, *f*, is heated by radiation from the stack, so that it is fed to the flame in a condition favoring desulphuration, thereby enabling the process to be more quickly and perfectly attained than would be practicable if the ore were supplied at its normal or ordinary temperature.

It is obvious the steam and air jet may be so regulated as to produce a more or less intense combustion and heat, and thereby graduate the effect on the ore up to a perfect roast.

In chloridizing ores, I introduce the salt through the pipe *r* into a pocket, S, formed on the bridge-wall of the fire-chamber D, thus subjecting the salt to the action of the flame. I do not confine myself to this method of introducing the salt, as it may be done in various ways. A stream of chlorine gas may be introduced by means of the jet-pipe G, at bottom of stack A.

When the ore is sufficiently treated it is discharged through the opening at the bottom of stack A, which opening is provided, as before stated, with a gate, C. This gate is constructed in such a manner that it turns on a pivot, and is tightened, when closed, by a handled screw, *m*, as shown in the drawing.

Steam, air, or gas is introduced through the pipe G. In case this pipe should become at any time clogged with ore or any foreign matter it is cleared by means of the rod *o*, which may be screw-threaded or made plain, and operated by a screw or lever.

The top of the stack is provided with a damper, O, or other suitable device, to be used—*i. e.*, opened—when starting the fire.

According to the modification shown in Fig. 2, the cupola-pipe I discharges the gases directly into the pipe L. The latter is enlarged, and provided with an inclined bottom, so that any particles of ore that may be brought over with the gases will slide down the same, and be returned to the cupola A through an opening in the side thereof, or, if that is not desired, will be discharged into tank K, as when the apparatus is constructed as shown in Fig. 1.

I propose to apply my improved process and apparatus in treating various kinds of ores, more especially ores of gold and silver.

I am aware it is not broadly new to subject ore to the action of a furnace-blast when in a pulverulent condition; but heretofore the ore has been forced through the furnace-blast in a continuous stream, so that there was but a momentary action and effect of the flame produced on the ore, and hence no satisfactory result was attained.

Having thus described my invention, what I claim as new is—

1. The process of roasting pulverized ores, consisting in subjecting a charge of the same to the simultaneous action of a jet of flame and of a jet of air, steam, or gas introduced underneath the charge, whereby the particles of ore are kept in continual suspension and agitation during the whole operation, substantially as described.

2. In combination with the cupola, the air, gas, or steam jet pipe or pipes G, the jacket F, and the discharge-aperture *g*, all as shown and described.

3. In combination with the base of the cupola, having a discharge-aperture, the pivoted horizontally-swinging gate C, the rigid jet-pipe G, and flexible connecting-piece *p*, as shown and described.

4. The combination, with the fuel-chamber and cupola, of the salt-pocket S and feed-pipe *r*, for the purpose specified.

CHAS. E. ROBINSON.

Witnesses:
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