

(No Model.)

2 Sheets—Sheet 1.

J. L. WELLS.  
ROASTING FURNACE.

No. 569,901.

Patented Oct. 20, 1896.

Fig. 2

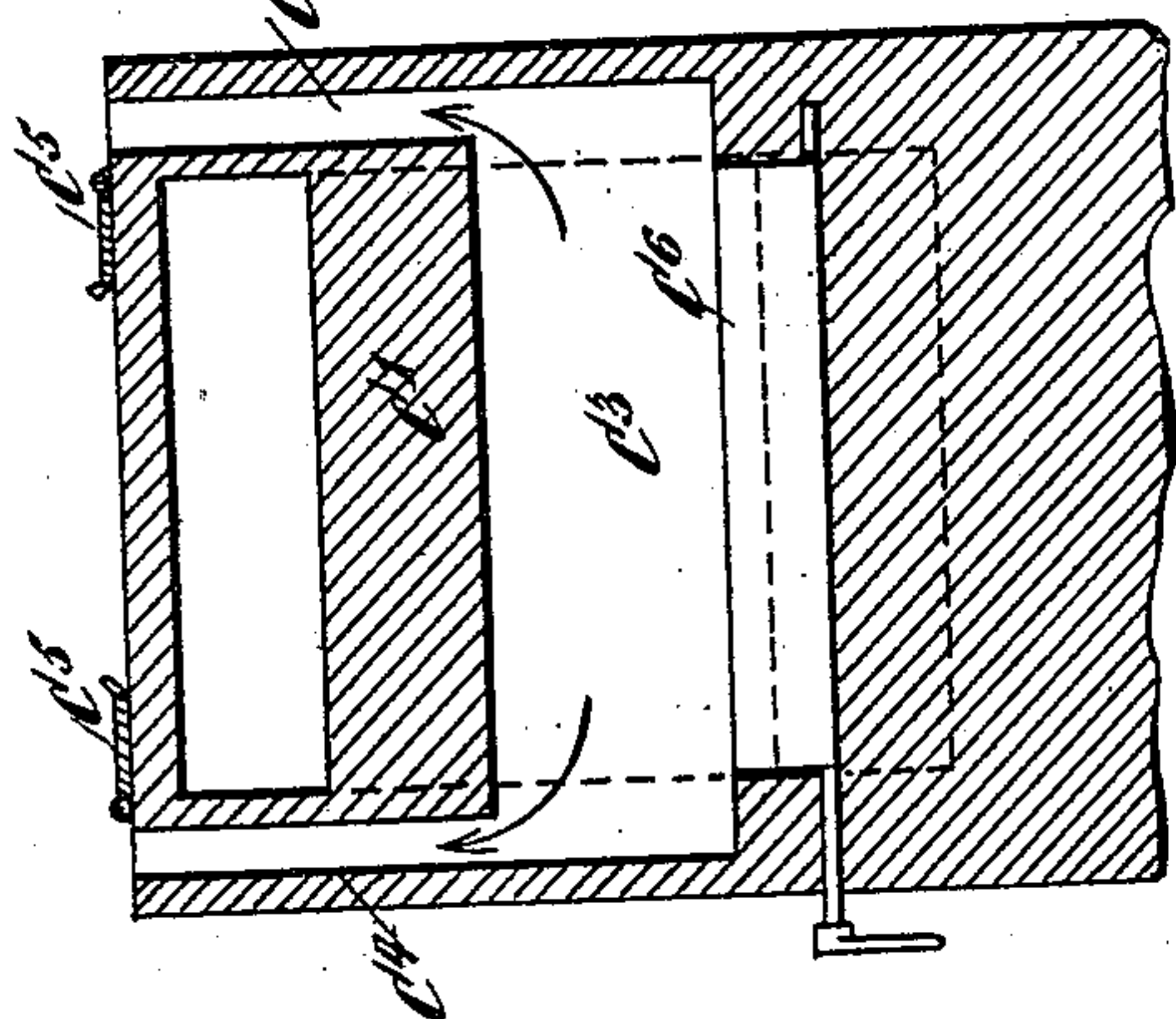
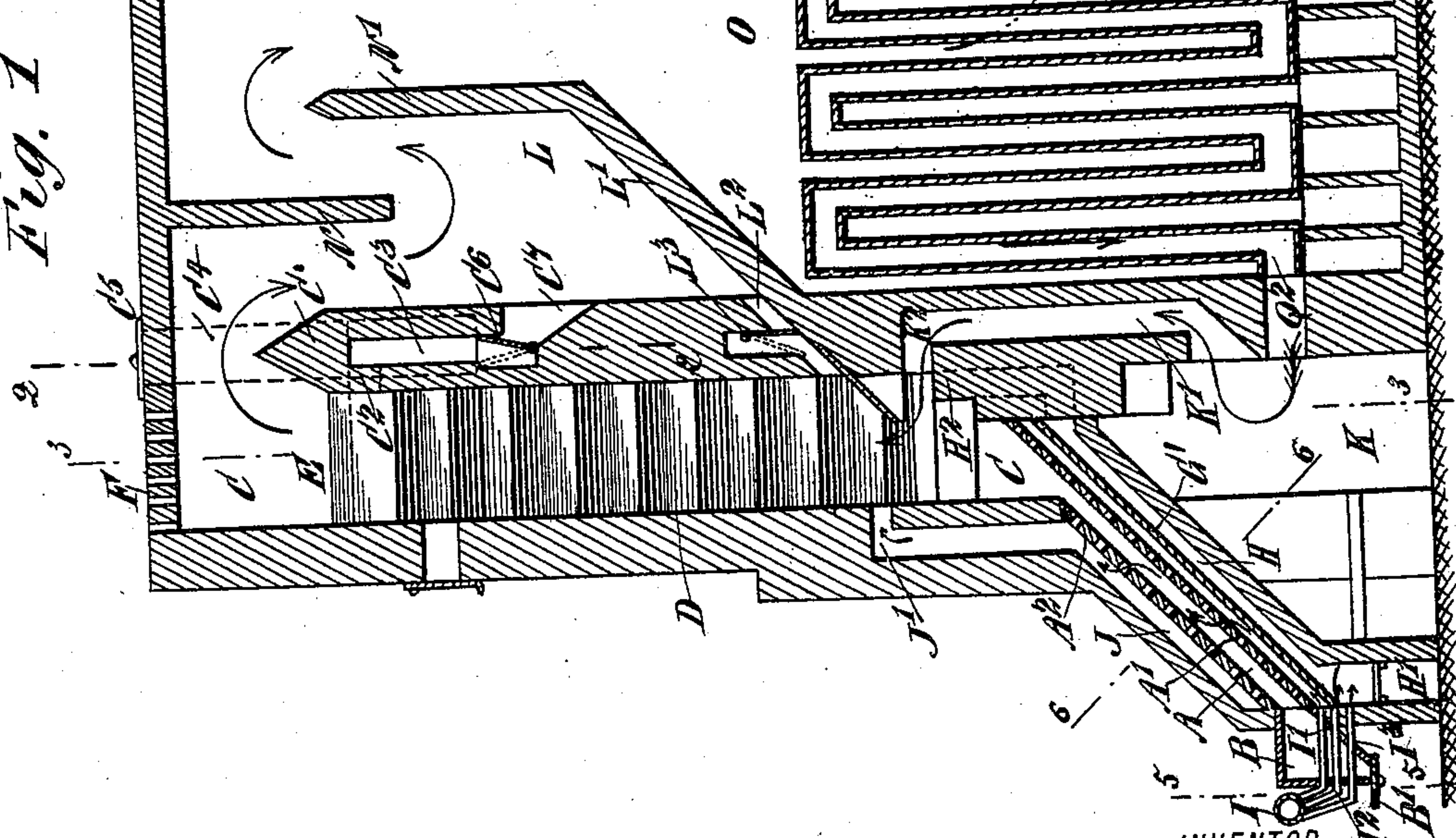


Fig. 1



WITNESSES:

C. Nereux

Rev. G. Foster

INVENTOR  
J. L. Wells  
BY  
Munn & Co  
ATTORNEYS.







# UNITED STATES PATENT OFFICE.

JAMES L. WELLS, OF LEADVILLE, COLORADO.

## ROASTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 569,901, dated October 20, 1896.

Application filed November 29, 1895. Serial No. 570,428. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES L. WELLS, of Leadville, in the county of Lake and State of Colorado, have invented a new and Improved  
5 Roasting-Furnace, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved roasting-furnace arranged to utilize the available heat from the  
10 burning ore and to insure a complete roasting at a comparatively low expense.

The invention consists principally of a shaft provided with zigzag flues through which falls the ore to be roasted, and a hot-  
15 air chamber connected with the lower ends of the flues to cause hot air to pass upward through the downwardly-moving ore.

The invention further consists of a hearth adapted to receive the ore, an air-chamber divided from said hearth by a perforated bed-  
20 plate, and a fume-chamber separated from said hearth by a perforated top plate.

The invention also consists of certain parts and details and combinations of the same, as  
25 will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indi-  
30 cate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement on the line 1 1 of Fig. 3. Fig. 2 is a transverse section of part of the same on the line 2 2 of Fig. 1. Fig. 3 is a trans-  
35 verse section of the improvement on the line 3 3 of Fig. 1. Fig. 4 is a longitudinal section of part of the improvement on the line 4 4 of Fig. 3. Fig. 5 is a cross-section of the air supply on the line 5 5 of Fig. 1. Fig. 6  
40 is a transverse section of the hearth and adjacent parts on the line 6 6 in Figs. 1 and 4, and Fig. 7 is a transverse section of the fume or dust chamber on the line 7 7 of Fig. 1.

45 The improved ore-roasting furnace is provided with an inclined hearth A, provided at its lower end with a discharge-hopper B, having a valve B' for opening said hopper at its bottom from time to time to discharge the  
50 roasted ore. The upper end of the inclined hearth A opens into a shaft C, provided with a series of longitudinally-extending hollow

partition-walls D, arranged to form a series of zigzag flues E, terminating a suitable distance below the top of the shaft C, as is  
55 plainly illustrated in Figs. 1 and 3.

The top of the shaft C is provided with inlet-openings F, through which the ore in a finely-divided state is discharged into the  
60 upper end of the shaft to cause the said ore to fall downward into the zigzag flues E to the lower end of the shaft and upon the inclined hearth A, so that the latter as well as the hopper B are completely filled with the  
65 ore, which latter extends into the lower end of the shaft C, but below the partition-walls D. The latter are formed at their exterior surfaces with V-shaped projections to produce the zigzag flues and cause the falling  
70 ore to turn over in its descent, and permit the hot air moving upward in the shaft, as hereinafter more fully described, to come in contact with all the particles of the downwardly-moving ore. The upper ends of the partition-  
75 walls are peak-shaped, to insure a ready passage of the ore into the flues.

The bed-plate A' of the hearth A is perforated, as plainly shown in the drawings, and this bed-plate separates the hearth at its under side from an air-chamber G, separated by  
80 a solid plate G' from a combustion-chamber H, parallel to the inclined hearth and the air-chamber G. The lower end of the combustion-chamber H is provided with a suitable fire-box H'. Air for the air-chamber G, the  
85 combustion-chamber H, and the fire-box H' is supplied through an air-supply pipe I, connected with a suitable fan or blower, and having branch pipes I', I<sup>2</sup>, and I<sup>3</sup> leading through the hopper B into the said air-chamber G,  
90 combustion-chamber H, and fire-box H', respectively, at the lower ends thereof, as shown in Fig. 1.

The top of the hearth A is separated from the fume-chamber J by a perforated top plate  
95 A<sup>2</sup>, so that the air from the air-chamber G and heated from the combustion-chamber H passes through the ore filling the hearth A, and passes through said perforated plate A<sup>2</sup> into the fume-chamber J to remove the last  
100 trace of sulfur or like matter contained in the ore in the hearth A. The upper end of this fume-chamber J opens at J' into the zigzag flues E a short distance above the lower



ends of the partition-walls D, so that the fumes ascend in said flues, together with hot air passing from a hot-air chamber K, through flues K' into the lower ends of said flues E, the entrance K<sup>2</sup> of the flues K' being on the opposite side from that of the flues J'. (See Fig. 1.) Part of the air in the air-chamber G, rising and passing through the ore in the upper part of the hearth and the lower part of the shaft C, passes into the flues to rise therein, so that the fumes as well as the hot air passing up in the shaft are mixed and heat the downwardly-moving ore, so that a preliminary roasting of the latter takes place before the ore reaches the hearth, in which it receives a final roasting in the manner above described.

The mixture of fumes, air, and gases passes at the upper end of the shaft C over the bridge-wall C' into a suitable chamber L, having an inclined bottom L', leading to inclined passages L<sup>2</sup>, passing through the bridge-wall C' back into the shaft C, near the lower end thereof, so that the particles carried up by the fumes and air and settling on the bottom L<sup>2</sup> slide down the same and through the passages L<sup>2</sup> pass back into the shaft C and to the hearth A. The several passages L<sup>2</sup> are controlled by a gate L<sup>3</sup>, pivoted at its upper end and arranged to permit the particles to slide down through the passages, but to prevent the upwardly-moving air and gases to pass into the settling-chamber L by way of said passages.

Into the settling-chamber L extends from the top a partition N, which terminates at its lower end below the back wall N' of the settling-chamber L, said back wall terminating a suitable distance below the top of the furnace, as plainly indicated in Fig. 1, so that the rear end of the settling-chamber L is connected with a chamber O, leading to the smokestack P. In this chamber O are arranged a series of coils of pipe Q, connected with a suitable air supply Q' and discharging at their forward ends Q<sup>2</sup> into the hot-air chamber K, it being understood that the air in passing through the coils of pipe Q is heated by the gases passing through the chamber O to the smokestack P.

The upper end of the combustion-chamber H leads to a series of flues H<sup>2</sup>, discharging into the lower open ends of the hollow partition-walls D, so that the smoke and gases from the burning fuel in the fire-box H', after passing through the said combustion-chamber, pass through the flues H<sup>2</sup> into the hollow partition-walls D, which connect at their upper closed ends by openings C<sup>2</sup> with a transversely-extending chamber C<sup>3</sup>, formed in the upper portion of the partition-walls D. The sides of this chamber C<sup>3</sup> are provided with outlets C<sup>4</sup>, leading to the outer air at the top of the furnace, (see Fig. 2,) and the upper ends of the outlets are adapted to be closed by suitable valves C<sup>5</sup>.

The lower end of the chamber C<sup>3</sup> is adapted

to be opened by a gate C<sup>6</sup> to an opening C<sup>7</sup>, leading to the settling-chamber L. When the gate C<sup>6</sup> is closed and the valves C<sup>5</sup> are open, as shown in Figs. 1 and 2, then the smoke and gases rising in the hollow partition-walls D and passing into the chamber C<sup>3</sup> can pass from the latter to the outer air by way of the outlets C<sup>4</sup>. When the valves C<sup>5</sup> are closed and the gate C<sup>6</sup> is open, then the smoke and gases instead of passing to the outer air pass through the chamber C<sup>3</sup> and openings C<sup>7</sup> into the settling-chamber L.

Now it will be seen that by the arrangement described the outgoing gases heat the incoming air previous to the latter passing upwardly in the zigzag flues to heat and roast the downwardly-falling ore. A final roasting is given to the ore filling the hearth by the hot air passing through said ore from the hot-air chamber G. By passing the smoke and gases from the combustion-chamber through the hollow partitions D, the latter are heated to insure heating of the ore coming in contact with the partitions while passing through the zigzag flues.

The bottom of the chamber O is inclined, as shown in Fig. 7, and extends through a side wall to the outside to permit the dust that settles in the chamber to be conveniently scraped into a conveyer, cars, or other means on the outside of the furnace at the lower end of the said bottom.

The material composing the plates A and A' may be iron or fire-clay, either separately or jointly used.

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

1. A roasting-furnace comprising a shaft, an inclined hearth into which discharges said shaft, a settling-chamber connected with the upper end of said shaft and having an inclined bottom, and valved passages leading from said settling-chamber into said shaft, substantially as shown and described.

2. A roasting-furnace comprising a shaft having hollow partition-walls forming vertical flues for the passage of the ore, a hearth connected with the lower end of the said shaft below said partition-walls, a chamber in the upper end of the bridge-wall of the shaft and connected with the upper ends of the hollow walls, valved outlets leading from said chamber to the outer air, a settling-chamber connected with the upper end of said shaft, and a valved opening leading from said chamber into said settling-chamber, substantially as shown and described.

3. In a roasting-furnace, a housing, a shaft in the housing, a hearth, a settling-chamber in communication with the shaft, a series of flues arranged in the shaft, and a chamber within the housing, the said chamber being in communication with the atmosphere and with the flues and having a valved opening into the settling-chamber, substantially as described.



4. A roasting-furnace, comprising a casing having a shaft and a settling-chamber therein, the settling-chamber having a valved passage into the shaft, a series of vertically-extending flues having spaces between them and located within the shaft, a chamber with which the flues have common communication, the chamber having a valved passage into the settling-chamber and being in communication with the atmosphere, a hearth, and a fire-box, the fire-box being in communication with the flues and the hearth with the shaft, substantially as described.

5. A roasting-furnace, comprising a housing having a shaft, a hearth at the lower end of the shaft, a fire-box, a series of flues extending vertically within the shaft and having vertical passages between them, the flues be-

ing in communication with the fire-box, and a chamber within the housing, the chamber being in communication with the flues and with the atmosphere, substantially as described.

6. A roasting-furnace, comprising a housing, a shaft within the housing, a fire-box, a series of vertically-extending flues communicating with the fire-box and having vertical spaces between them, the flues having corrugated sides, and a chamber within the housing, the chamber having communication with the flues and with the atmosphere, substantially as described.

JAMES L. WELLS.

Witnesses:

A. J. PLUME,

E. G. H. ARNOUX.