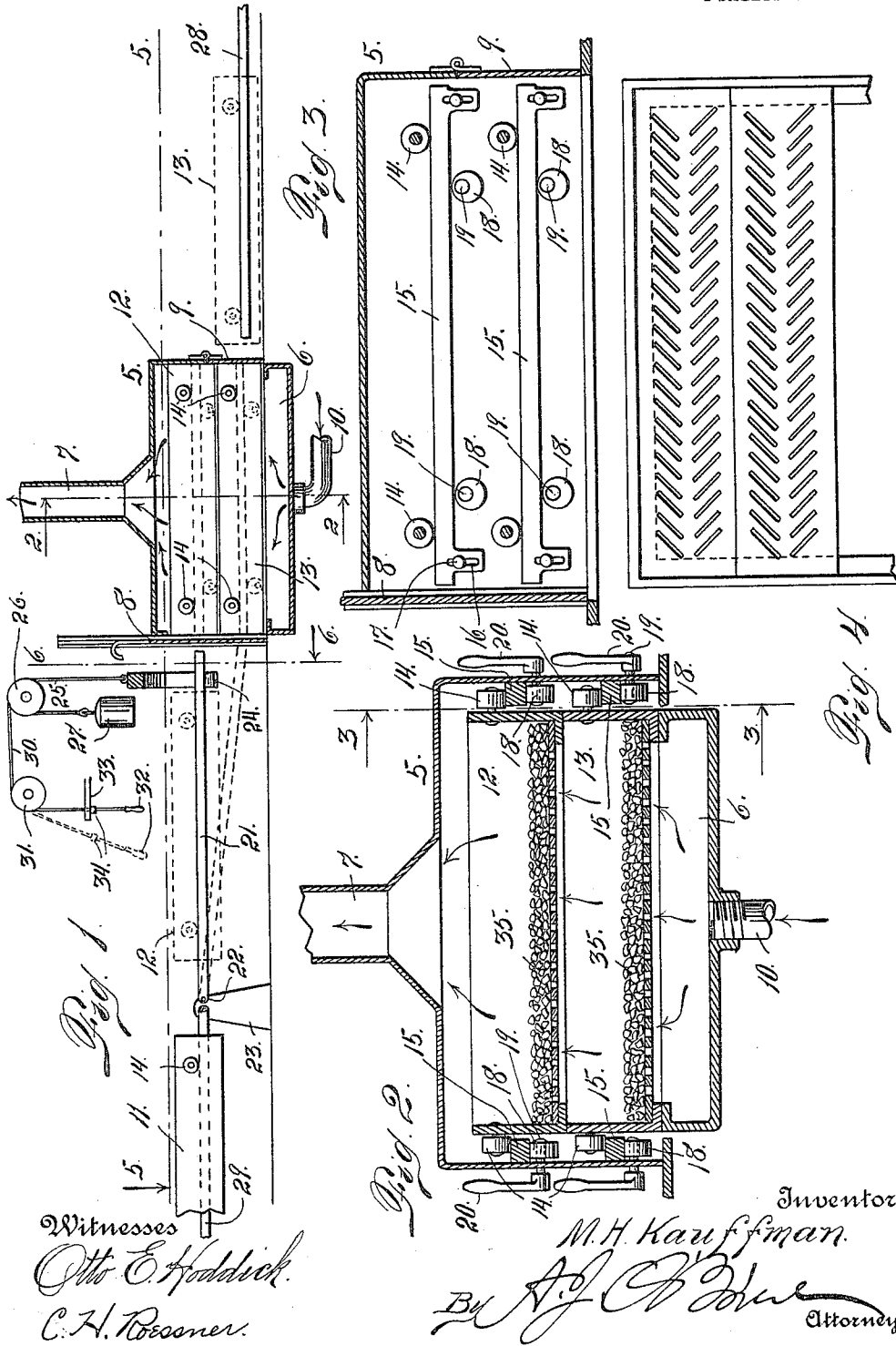


1,045,853.



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Patented Dec. 3, 1912.
2 SHEETS—SHEET 2.

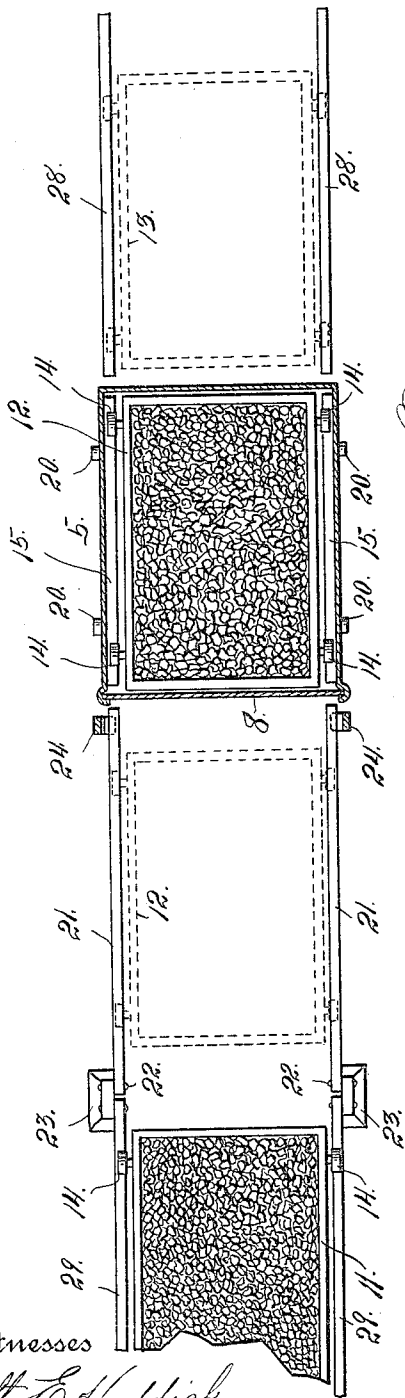


Fig. 5.

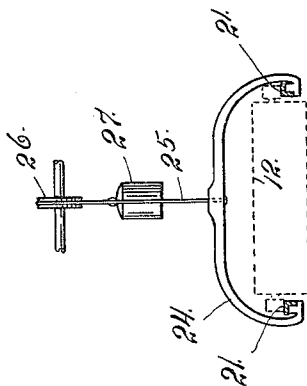


Fig. 6.

Witnesses

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SINTERING-FURNACE.

1,045,853.

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To all whom it may concern:

Be it known that I, MILTON H. KAUFFMAN, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Sintering-Furnaces; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in sintering furnaces or furnaces adapted for roasting ores whereby the elements which retard the separation of the metallic values from the gangue, such as sulfur, arsenic and other so-called refractory elements, are removed. In this form of roasting, the ore lies in a mass undisturbed, and when roasted or sintered, constitutes a readily breakable porous mass.

In my improved construction, I arrange pans having porous bottoms one above another in a closed hood or casing, the lower part of the structure being equipped with a box or receptacle into which air is introduced for sintering purposes, the said air or wind-box being in communication with a suitable source of air under pressure.

I prefer to employ two pans simultaneously for sintering purposes, each pan containing a charge of ore, the two pans being so arranged that the air-blast passes first through one and subsequently through the other. In this way, while the ore in what may be termed the primary pan, is being sintered, the ore in the other, or the secondary pan, is partially sintered or roasted. After the sintering process in the primary pan is completed, the two pans are removed from the hood, and the secondary pan returned to the hood in the lowermost position originally occupied by the other pan. A third pan is then placed in the hood and made to occupy a position above the pan which was originally secondary, after which the sintering process is continued in the same manner as before.

The pans and the hood are so arranged and equipped by means of rollers and tracks that the pans may be readily removed from and introduced to the hood. The hood is provided with a stack or outlet for the waste

gases or products of combustion, and with this exception it is practically air-tight.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a side view partly in section illustrating my improved apparatus. In this view the hood is sectionized, while the pans are shown in side elevation. Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1, the parts being shown on a larger scale. Fig. 3 is a sectional view of the hood taken at right angles to Fig. 2. In this view the pans are omitted in order to disclose the construction whereby the tracks within the hood are adjusted, and also the means for raising and lowering the tracks together with the pans thereon when the latter are in place. This is a section taken on the line 3—3 Fig. 2 looking toward the right. Fig. 4 is a fragmentary top-plan view of one of the pans on a scale approximately the same as Fig. 3. Fig. 5 is a top plan view of Fig. 1 partly in section, the section being taken on the line 5—5 Fig. 1. Fig. 6 is a section taken on the line 6—6 Fig. 1, looking toward the left.

The same reference characters represent the same parts in all the views.

Let the numeral 5 designate a hood which is provided at the bottom with an air-receptacle 6 and at the top with an outlet pipe 7 for the waste gases or products of combustion. This hood is provided in front with a vertically-slidable door 8 and at the rear with a hinged door 9. The bottom of the hood, or the air-box or receptacle 6 is connected with the pipe 10 for supplying air under suitable pressure to the hood. This hood is of such size as to receive two pans 12 and 13, the pan 13 being lowermost while the pan 12 occupies a position directly above and in contact therewith, the outer edges of the pans during the roasting operation fitting closely together, whereby the air, after leaving one pan passes to the next and is compelled to travel through both charges of ore before reaching the stack. The bottom of each pan is perforated to permit the passage of the air. This perforation may be arranged in any suitable manner. It is preferred to provide the bottom of each pan with what are termed herring-bone slots (see

Fig. 4). This feature, however, may be varied at will since it is evident that the form of the openings in the bottom of the pans is not of material significance so long as these openings are of sufficient capacity to allow the air to pass freely therethrough into the charge of ore.

As illustrated in the drawing, each pan is open at the top. The sides of each pan are equipped exteriorly with rollers 14 which engage tracks 15, formed on the inner surfaces of the sides of the hood. These tracks 15 are mounted upon the hood in such a manner that they are vertically adjustable. As illustrated in the drawing, in order to produce this adjustability the opposite extremities of each track are provided with vertically-arranged slots 16 through which pass pins or bolts 17 which are secured in the side walls of the hood. The shanks of these pins are of such size as to allow the tracks to move freely vertically. Mounted upon the inner surfaces of the side-walls of the hood, are eccentric cams 18, the said cams having wrist-pins 19 which extend through the side-walls of the hood and are journaled therein, their outer extremities being provided with hand-cranks or lever-arms 20. When the tracks are at their lowest limit of movement, their under-surfaces are engaged by the faces of the cams which are nearest the center. It is evident that by manipulating these cams by the use of hand-cranks 20 in such a manner as to bring the portions of their faces which are farthest from the pivotal center, into engagement with the tracks, the latter may be raised a limited distance. This is an important feature since it is necessary, or at least advisable to first remove the top pan from the hood before removing the bottom pan. In order to do this, the top pan is first lifted to disengage it from the lower pan, and this is accomplished by raising the tracks 15 through the medium of the cams 18 and their operating crank-arms 20 arranged on opposite sides of the hood, as best illustrated in Fig. 2.

In order to facilitate the introduction to and the removal of the pans from the hood, a track 21 is arranged in front of the hood and in close proximity to the slidable door 8. This track is pivoted at one end, as shown at 22, to a pedestal 23, while its opposite end is supported by a hook 24 connected with a cable or other flexible device 25 which passes over a pulley 26, the opposite end of the cable being equipped with a counterbalance weight 27. This weight is of sufficient mass to normally support the track 21 in a horizontal position and at such a level that when the pan 12 is raised by adjusting the eccentric cams 18, the rollers of the pan will be in position to engage the exterior track 21 approximately as soon as they leave the interior track 15 of the hood.

As soon as the pan, for instance, is drawn out of the hood, upon the track 21, the latter, by virtue of the weight of the pan, will move downwardly from the full-line position in Fig. 1 to the dotted-line position in the same figure. In the meantime the pan 13 has been moved out of the hood at the opposite end by opening the door 9. In this event the pan 13 assumes a position upon a track 28 in the rear of the hood, as indicated by dotted lines in Fig. 1. The pan 12 will then move down the inclined track 21 and may be readily pushed into the hood where it is caused to occupy the lowermost position, it being assumed that the charge of ore contained in the pan 13 has been completely sintered. A third pan 11 is then moved from a track 29 to the track 21. Before the pan 11 is moved to the track 21, the latter is locked in the horizontal position by means of a cable 30 passing over a guide-pulley 31, its free extremity being provided with a hand-piece 32. This cable below the guide-pulley may be thrown into engagement with a slotted device 33, the cable being provided above the hand-piece with a stop-button 34 which, when the track 21 is to be locked in a horizontal position, will occupy a position just below the slotted device 30. This construction maintains the track 21 in a horizontal position whereby the pan 11 may be introduced into the hood and caused to occupy a position directly above and in contact with the lowermost pan. The sintering operation then proceeds until the roasting or sintering process in the charge of ore in the lowermost pan is completed, after which the top pan with its charge is removed at the front end of the furnace while the lowermost pan is removed at the rear end, after which the operation heretofore described is repeated.

In beginning the operation, the lowermost pan is furnished with a layer of live coals and a pan charged with ore placed above the same within the hood. The air-blast through the pipe 10 is then turned on and this condition exists until the ore-charge in the uppermost pan is thoroughly ignited. The uppermost pan is then removed in the manner heretofore explained, at the front end of the furnace, while the pan containing the coals or igniting material, is removed at the rear end of the furnace. The pan containing the charge of ore is then introduced to the hood and caused to occupy the lowermost position, and a third pan placed in the hood directly above the pan containing the ignited charge. The blast from the pipe 10 is then continued, the charge of ore in the lowermost pan being rapidly sintered, while that in the uppermost pan is also subjected to the sintering process, but not, however, to the same degree as that of the charge in the lowermost pan.

In Fig. 2 of the drawing the two pans 12 and 13 are each equipped with a charge of ore designated 35. The depth of this charge, as compared with that of the pans, may be regulated as may be desired.

Having thus described my invention, what I claim is:

1. In a roasting or sintering apparatus, the combination of a closed hood, a plurality of pans removably mounted in the hood, the pans having bottoms open to the passage of air and adapted to sustain charges of ore, and means for introducing air under pressure to the hood, the pans being so arranged that the air-blast passes successively through the ore charges of the ore pans, substantially as described.

2. In a roasting or sintering apparatus, the combination of a closed hood open for the entrance of air and for the escape of the products of combustion, a plurality of pans removably mounted in the hood, one above another, the several pans having their bottoms open to the passage of air and adapted to sustain charges of ore to be sintered, and means for introducing air under pressure to the hood whereby it is caused to pass successively through the ore charges of the several pans, substantially as described.

3. The combination of a closed hood open at one extremity for the entrance of air under pressure and at its opposite extremity for the escape of the products of combustion, pans arranged in the hood one above another, the said pans being removably mounted, and means for causing the air under pressure to pass through the hood, the pans being arranged in the path of the air current whereby the air passes successively through the ore charges of the pans, substantially as described.

4. The combination of a hood having tracks arranged on its opposite sides and vertically adjustable, a plurality of pans arranged one above another, the top pan resting upon the pan next below and engaging the vertically-moving tracks, and means connected with the tracks for raising them to free the top pan from that next below, substantially as described.

5. The combination of a hood, two pans arranged therein, one resting upon the other, the pans being provided with rollers and the hood equipped with tracks upon which the rollers of the pans rest, the track of the upper pan being vertically movable to disengage it from the pan below, substantially as described.

6. The combination of a hood, tracks arranged on opposite sides of the hood, a pan located in the hood and having rollers on opposite sides to engage the track of the hood, means for introducing air under pressure to the hood, the bottom of the pan being open for the passage of air and adapted

to sustain a charge of ore, the hood having an escape for the products of combustion, the pan being equipped with rollers engaging the tracks of the hood, the hood having a door adapted to be opened for the introduction and removal of the pan, substantially as described.

7. In a roasting or sintering apparatus the combination of a plurality of pans having bottoms open to the passage of air and adapted to sustain charges of ore, means for causing a blast of air to pass through the ore charges in the several pans, the pans being so arranged that the air-blast passes successively through the several charges of ore, substantially as described.

8. In a roasting or sintering apparatus the combination of a plurality of pans arranged one above another the several pans having their bottoms open to the passage of air and adapted to sustain charges of ore to be sintered, an air-box upon which the lowermost pan rests forming an air-tight joint, the said box being open at the top, the adjacent pans above the box engaging each other, and means for introducing air under pressure to the said box whereby it is caused to pass successively through the ore charges of several pans, the charge of ore in each pan after the first receiving the heat from the adjacent pan on the side in the direction from which the air-blast comes, substantially as described.

9. In a roasting or sintering apparatus the combination of two pans having perforated bottoms, the bottom of one pan closely fitting the top of the other pan, the pans being adapted to sustain charges of ore, and means for passing an air-blast through the charges of ore in the two pans, the heat resulting from the sintering of the ore in the pan on the side from which the air-blast proceeds, serving to ignite and partially sinter the ore in the adjacent pan, substantially as described.

10. The herein described ore-sintering process, consisting in arranging a number of pans one in advance of or above another, igniting the ore in one of the pans and passing an air-blast successively through the charges of ore in the several pans whereby the heat developed by the sintering process in the pan on the side from which the air-blast proceeds, aids in sintering the ore charge in the adjacent pan, substantially as described.

11. The combination of a hood having an end-door, a pan of a size to enter the hood and adapted to contain a charge of ore to be sintered, and a pivoted track arranged at one end of the hood and movably mounted, the said track being counterbalanced to normally assume a horizontal position at a level to permit the introduction to or removal of a pan from the upper part of the hood, the

pivoted end of the track being remote from the hood and the track being adapted under the weight of a pan to assume an inclined position to allow a pan to run downwardly
5 thereon to the lower part of the hood.

12. The combination of a hood having an end-door, a pan of a size to enter the hood and adapted to contain a charge of ore to be sintered, a pivoted track arranged at one end
10 of the hood the track being movably mounted and weighted to normally assume a horizontal position at a level to permit the introduction of a pan or its removal from the upper part of the hood, the pivoted end of the
15 track being remote from the hood, the track being adapted under the weight of the pan to assume an inclined position in the direction of the hood and means for securing the

track in the horizontal position, substantially as described.

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13. In a roasting or sintering apparatus, the combination of a plurality of pans arranged one in advance of the other and adapted to contain charges of ore, and means for causing a blast of air to pass successively
25 through the ore charges of the pans whereby the heat resulting from the combustion in one pan is utilized for igniting and partially sintering the charge in the adjacent
30 pan.

In testimony whereof I affix my signature in presence of two witnesses.

MILTON HENRY KAUFFMAN.

Witnesses:

A. J. O'BRIEN,
F. E. BOWEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."