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PROCESS OF DESULFURIZING ORES.

APPLICATION FILED DEC. 18, 1906.

906,883. Patented Dec. 15, 1908.

2 SHEETS—SHEET 1.

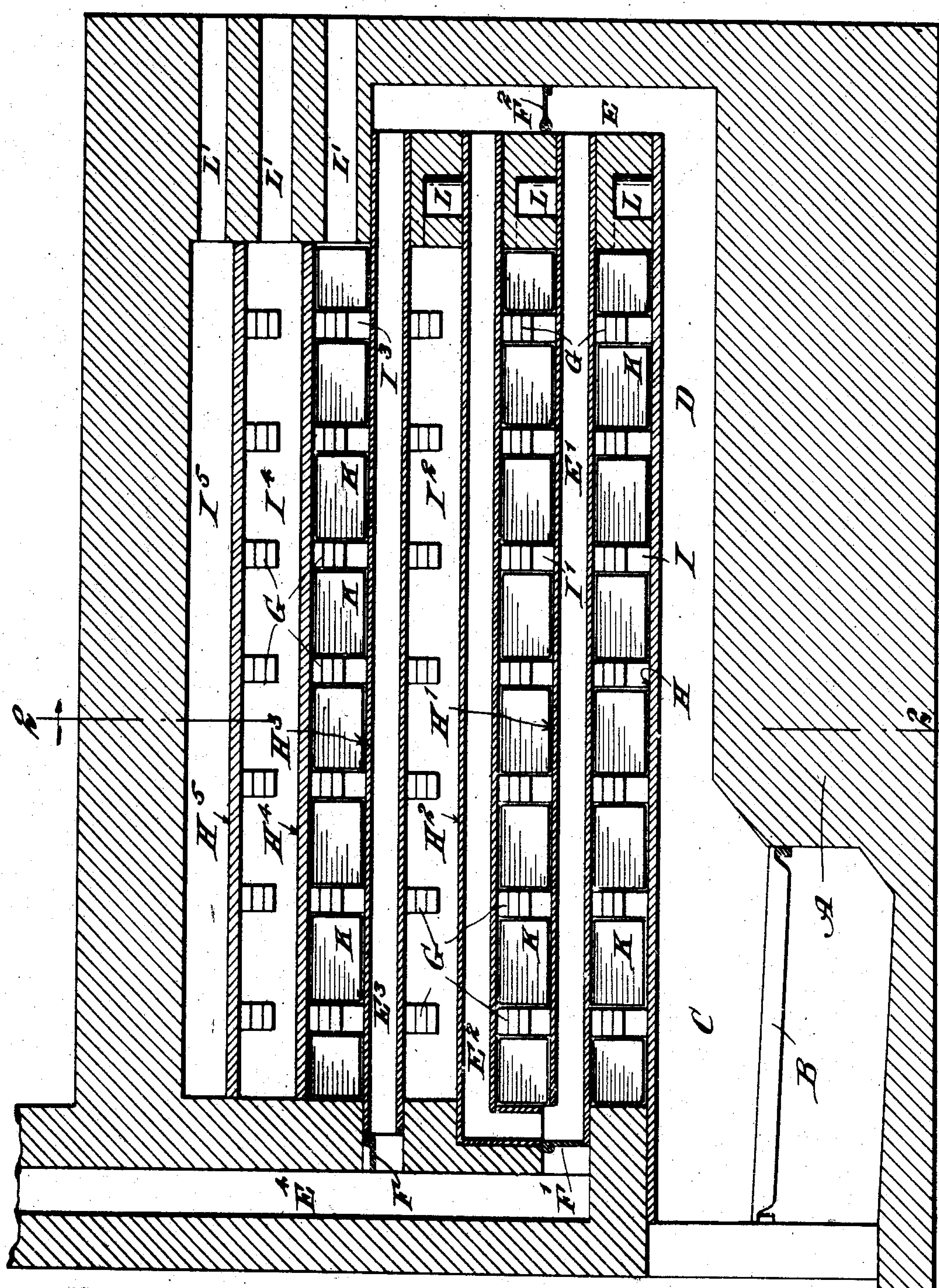

Fig. 1

WITNESSES
Julius A. Katz
John Lotka

INVENTOR
Robert Hübner
BY
Briesen & Knauth
ATTORNEYS

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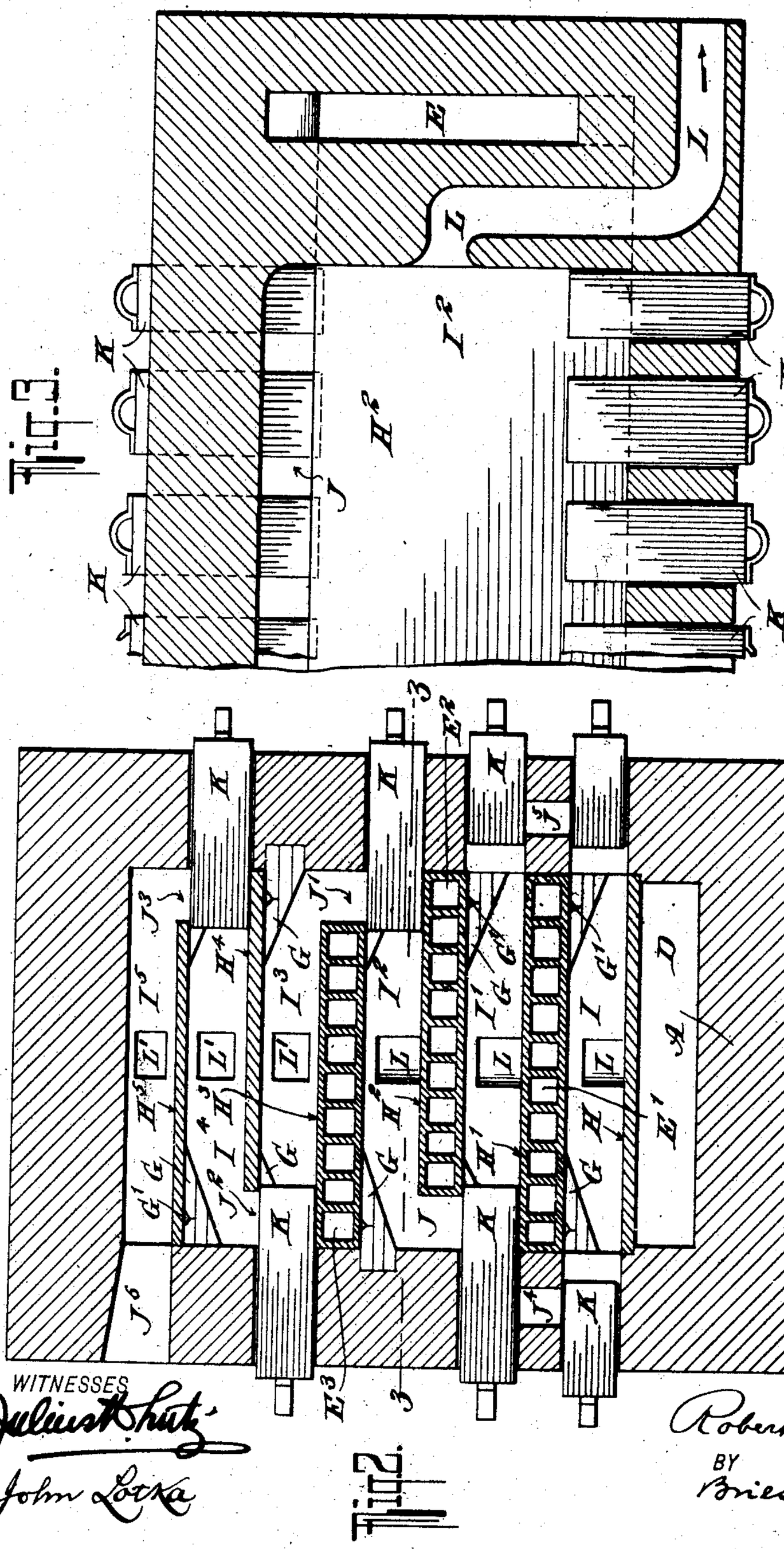
Fig. 2.



WITNESSES

Julius Schultz

John Lotka

INVENTOR

Robert Hübner

BY

Briesen & Knauth

ATTORNEYS

UNITED STATES PATENT OFFICE.

ROBERT HÜBNER, OF NEW YORK, N. Y.

PROCESS OF DESULFURIZING ORES.

No. 906,883. Specification of Letters Patent. Patented Dec. 15, 1908.

Application filed December 18, 1906. Serial No. 348,452.

To all whom it may concern:

Be it known that I, ROBERT HÜBNER, a subject of the Emperor of Germany, and resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Processes of Desulfurizing Ores, of which the following is a specification.

My invention relates to a process of desulfurizing ores, and has for its object to accomplish this result in an efficient and complete fashion within a relatively short time and with an economical expenditure of fuel.

The invention involves the treatment of the ores under a pressure lower than atmospheric pressure, and also embodies certain other novel features, all of which will be fully described hereinafter and particularly pointed out in the appended claims.

An apparatus suitable for carrying out the present invention is shown in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of a desulfurizing furnace; Fig. 2 is a vertical cross-section thereof on line 2—2 of Fig. 1, and Fig. 3 is a partial horizontal section on line 3—3 of Fig. 2.

The furnace shown in the drawings also contains certain features of novelty which, however, are not claimed in the present application but in a companion case filed concurrently herewith.

The furnace shown in the drawings comprises a setting A made of brick work, or other suitable material, and provided with a grate B, above which is the combustion chamber C connected with the rearwardly leading horizontal flue D; at the rear end of said flue is an uptake E, from which three tiers of horizontal flues E′, E², E³ lead forward at different levels to the stack or chimney E⁴; preferably each of the flues E′, E², E³ is subdivided by partitions, as shown in Fig. 2. The top H of the flue D is preferably made of metal, or other material, which is a good conductor of heat, and this top forms the bottom of an ore chamber I, the ceiling of which is formed by the bottom of the next flue E′. In a similar manner an ore chamber I′ is formed between the top H′ of the flue E′ and the bottom of the next flue E², and again a third ore chamber I² between the top H² of the flue E² and the bottom of the flue E³. The plates forming the top walls of the ore chambers may be supported in any suitable manner, as, by means of brackets or arches G, which I prefer to provide with openings G′ so as to avoid the formation of pockets in which gases might be trapped. Above the flue E³ are located three additional ore chambers I³, I⁴ and I⁵ respectively, having bottoms H³, H⁴, H⁵. By means of dampers F, F′, F², the path of the combustion gases may be varied. With the damper arrangement shown in Fig. 1, the combustion gases pass through the lower portion of the uptake E, then forward through the flues E′, rearward through the flues E², upward in the upper portion of the uptake E, and forward through the flues E³. If damper F′ is swung upward so as to close the forward end of the flues E², the combustion gases will pass only through the lower-most flues E′ and not through the flues E², E³; by closing the damper F and opening the dampers F′ and F², the combustion gases would be made to pass through the flues E′ and E², but not through flues E³; finally, by leaving the dampers F, F′ in the position shown, and opening the damper F², the combustion gases will be caused to pass entirely through the uppermost flues E³ and not through the flues E′, E².

J⁶ in Fig. 2 indicates an opening through which the ore may be charged into the uppermost chamber I⁵. At the opposite end of said chamber is provided an opening J³ leading to the chamber I⁴ below. From this chamber, at the opposite end, an opening J⁴ leads to the next chamber below, and then again there are openings J′ and J through which the material may reach the chambers I² and I′, respectively. These openings are within the chambers themselves. The connection from the chamber I′ to the lowermost chamber I is preferably effected by means of two channels J⁴, J⁵ located in the walls of the furnace (see Fig. 2). The openings J′, J², J³, J⁴, J⁵ may be closed by means of sliding plugs K projecting from the walls of the furnace, and adapted to be operated in any suitable manner. So far as the openings J, J′, J², J³ are concerned, these plugs K are located between arches G so that when the plugs are shoved in, as shown in

Fig. 2, they, together with the intervening arches G, will entirely close the openings by which one chamber communicates with the next. The plugs can be withdrawn entirely, in which case the opening from which they are removed will afford a clearance for the introduction of tools to either stir the ore or push it toward the opening so as to cause it to drop into the next chamber below. The chamber I′ is preferably provided with such openings and plugs, not only at the side adjacent to the opening J, but at the other side also. Thus, if it should be found that the ore is completely desulfurized by the time it reaches the chamber I′, the plugs K can be withdrawn on both sides and the ore will be removed at one side by means of tools inserted at the opposite side.

It will be seen that the path of the combustion gases is entirely separate from the ore chambers, so that the combustion gases do not come in contact with the ore, but heat it simply by transmission through the walls of the furnace and flues.

As indicated at the beginning of this specification, I employ a pressure below atmospheric pressure during the treatment; for this purpose each of the chambers has an exhaust or suction flue which may be connected with a fan, or other device for withdrawing air and gases from the ore chambers, and for creating a low pressure there-in.

L indicates the three exhaust channels leading from the chambers I, I′, I², respectively, said channels being bent, as indicated in Fig. 3, in order to clear the uptake E. Since the chambers I³, I⁴, I⁵ are above the uptake E, the exhaust channels L′ of these chambers may be straight, as indicated in Figs. 1 and 2.

In operation the ore is first brought into the chamber I⁵ and is heated, it being advisable in some cases to open the damper F² for this purpose, so that the combustion gases will pass directly through the flues E³, thus securing a more energetic heating operation at the start. It will be understood that while the gases evolved from the ore are being withdrawn from the ore chamber by suction, said chamber is otherwise closed, so that the supply of air is limited to what can find its way through cracks and joints. When the treatment has progressed sufficiently in the upper chamber I⁵, the plugs K at the right hand side of the chamber I⁴ (Fig. 2) are moved sufficiently to the right to uncover the opening J³, and by means of a suitable tool inserted through the opening J³ the ore is caused to fall on the next floor H⁴; by then removing the said plugs K entirely access may be had to the ore on the floor H⁴ to spread it thereon. The plugs are then reinserted, and the treatment goes on in the chamber I⁴. Thus the ore may be passed successively from one chamber to the next, remaining in each of them the suitable length of time, this depending on the character of the ore and on the amount of heat available. While the ore is in one of the chambers, that particular chamber is connected with the fan, or other exhausting device, so that the operation proceeds at a pressure under atmospheric pressure, air as well as the gases evolved during the desulfurizing process escaping through the channel L or L′ connected with that particular chamber. Of course, after the material has passed into the chamber I⁴, and while it is being treated therein, a new charge may be brought into the chamber I⁵ and the apparatus may be worked continuously, the various chambers containing ore in different stages of desulfurization.

I have found that when working at a pressure under atmospheric pressure, as above described, the results obtained are very satisfactory, being secured in a very short time and with a relatively low consumption of fuel.

According to the quality of the ore, the process is completed for practical purposes after a varying number of stages. Thus, in some cases, the desired degrees of desulfurization may not be obtained until the last chamber I is reached, but in other cases this condition may already exist in the chamber I′. Accordingly, the desulfurized material will be removed from the chamber I, or the chamber I′, as the case may be.

Speaking in a general way, it will be seen that the amount of heat to which the material is subjected increases progressively from one chamber to the next, since the ore gets nearer and nearer to the combustion chamber C.

When operating continuously the various dampers will generally be in the position shown in Fig. 1, but this depends entirely on the character of the ore. Some ores might require less heat, in which case the combustion gases could be excluded from the upper flues E³ after the beginning of the operation, or even from the flues E³ and E².

I claim as my invention:—

1. The process of desulfurizing ores, which consists in subjecting the ore to heat while keeping it out of direct contact with the heating agent and exerting suction to withdraw gases from the chamber containing the ore while keeping said chamber otherwise closed to prevent the entrance of any material amount of air, then transferring the partly desulfurized ore to another chamber and there treating it in the same manner as during the first stage, but at a higher temperature.

2. The process of desulfurizing ores, which consists in subjecting the ore to heat while

keeping it out of direct contact with the heating agent and exerting suction to withdraw gases from the chamber containing the ore while keeping said chamber otherwise closed to prevent the entrance of any material amount of air.

In testimony whereof I have signed my name in the presence of two subscribing witnesses.

ROBT. HÜBNER.

Witnesses:
JOHN LOTKA,
JOHN A. KEHLENBECK.