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DESULFURIZING FURNACE.

APPLICATION FILED DEC. 18, 1906.

899,403.

Patented Sept. 22, 1908.

2 SHEETS—SHEET 1.

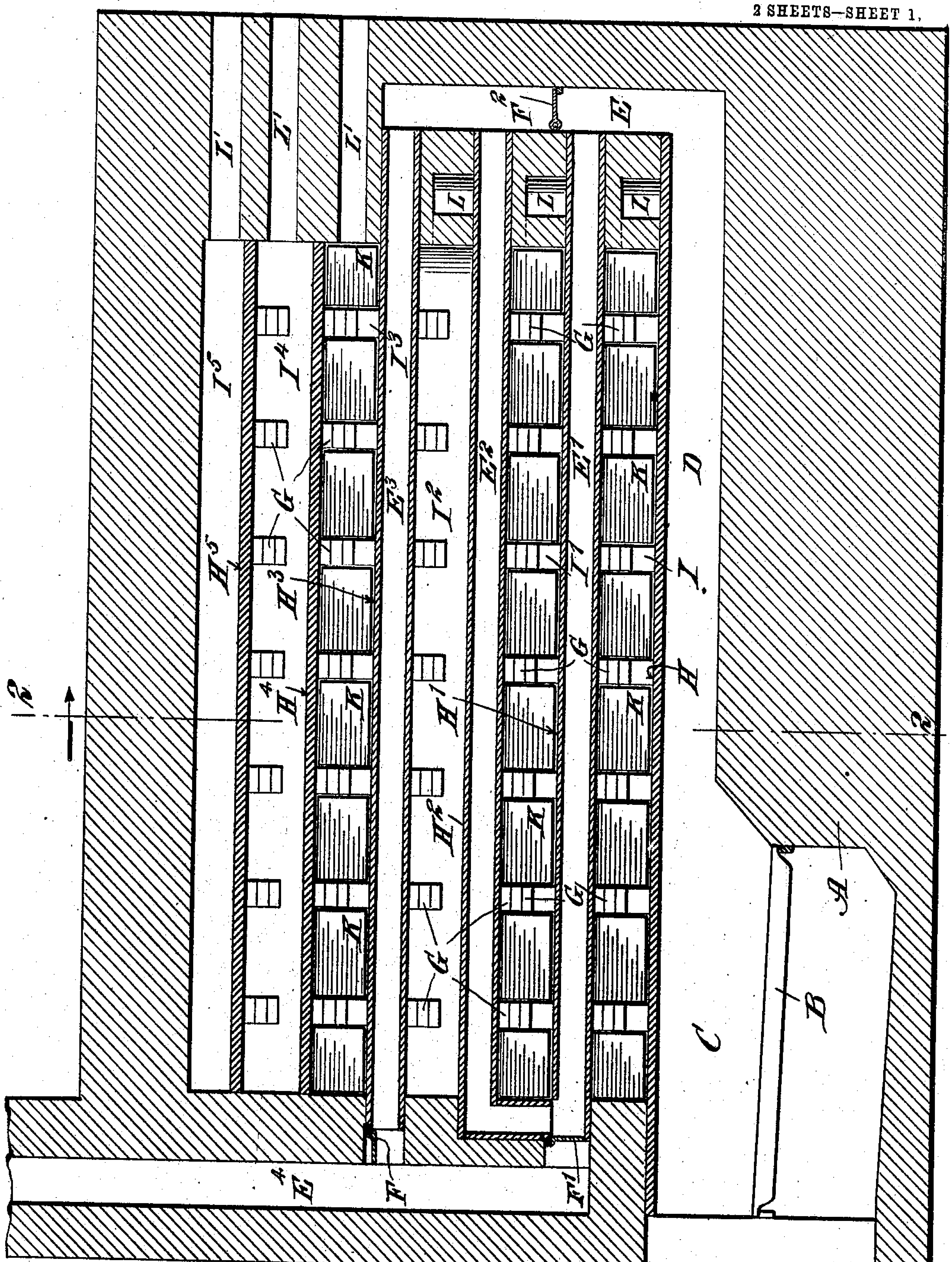

Fig. 1

WITNESSES
Julius M. Lutz.
John Lotka

INVENTOR
Robert Hübner
BY
Friesen & Krauth
ATTORNEYS

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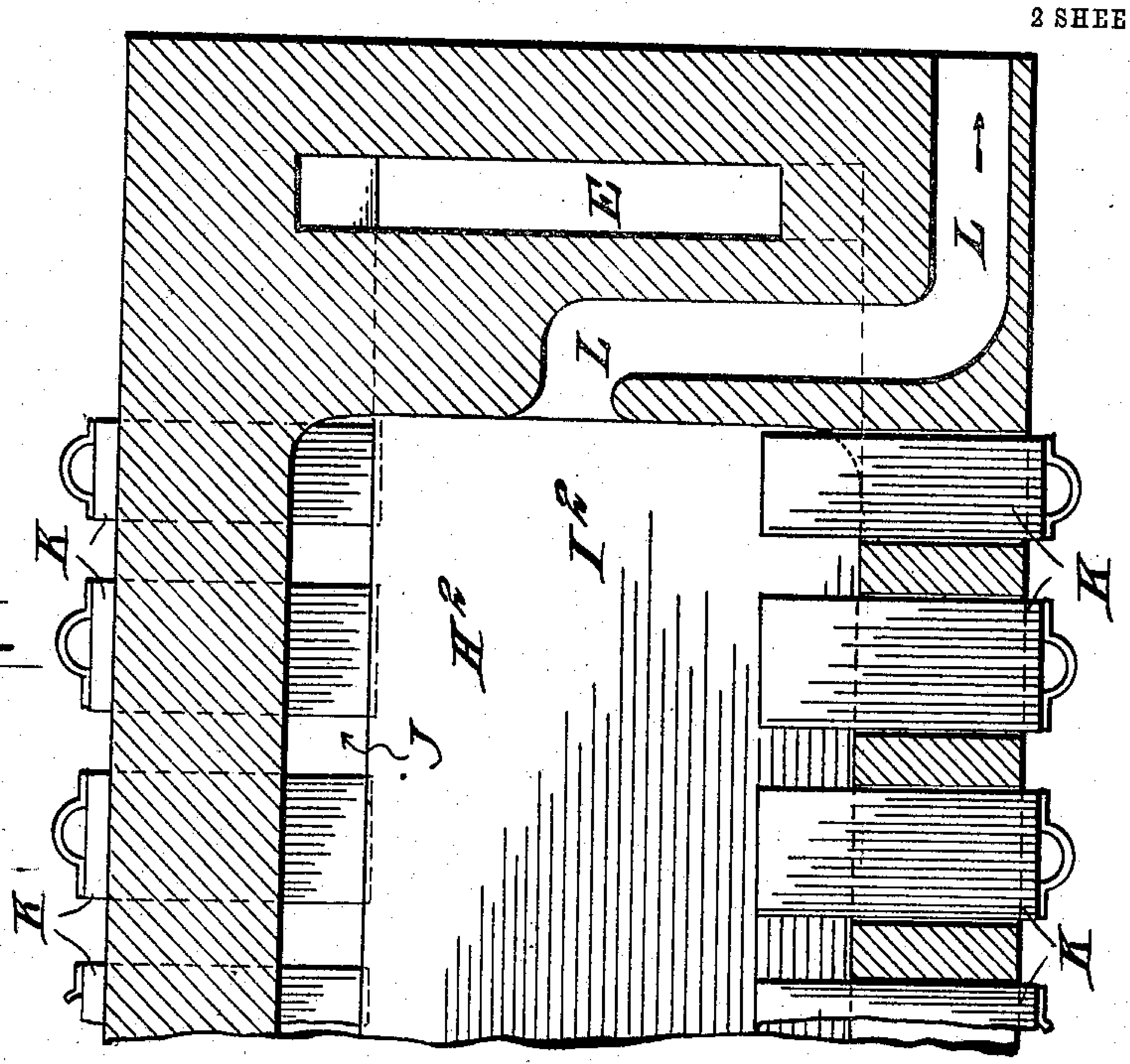
2 SHEETS—SHEET 2.

Fig. 3.



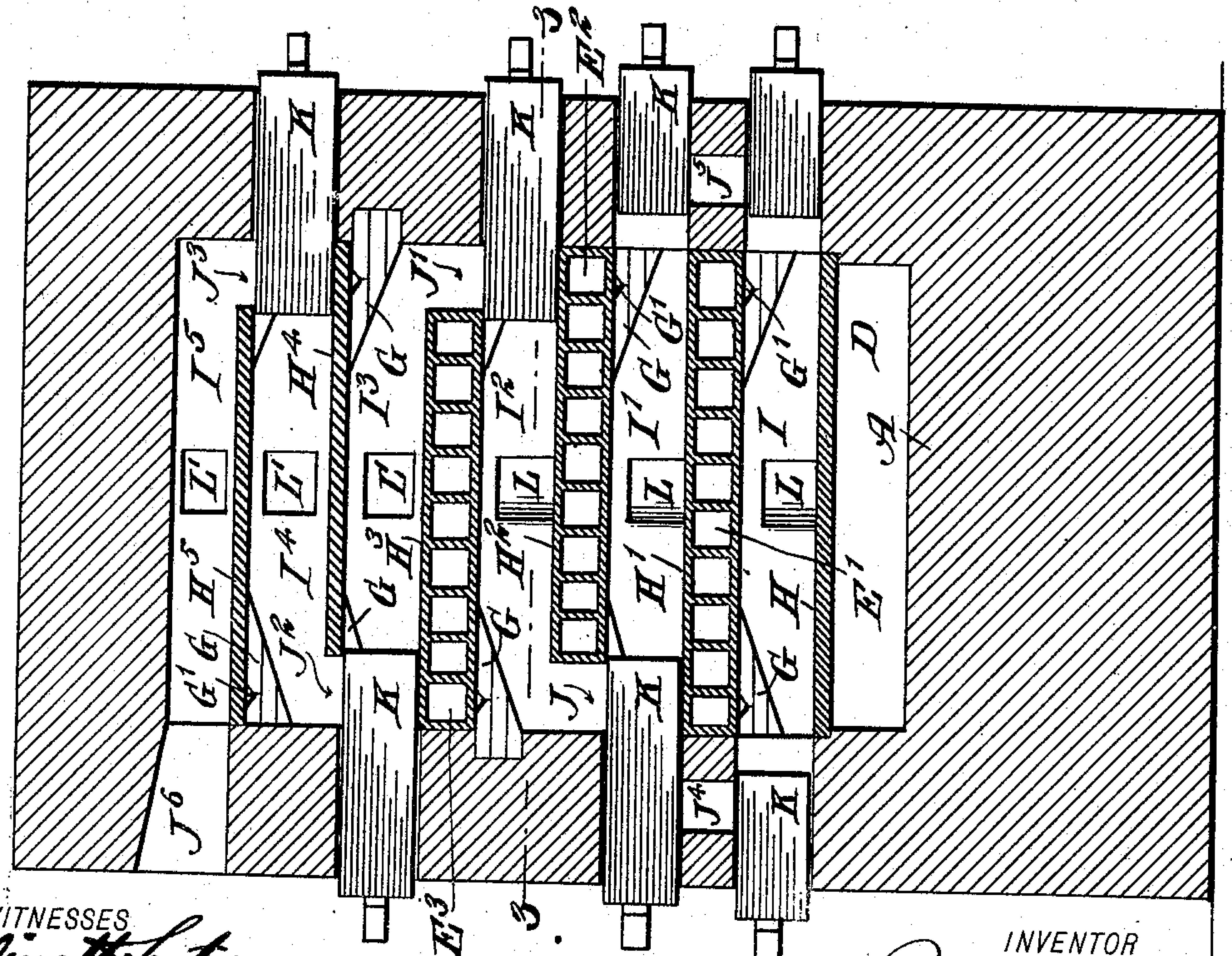


Fig. 2.

WITNESSES

Julius Kuhn

John Lotka

INVENTOR

Robert Hübner

BY

Briesen & Knauth

ATTORNEYS

UNITED STATES PATENT OFFICE.

ROBERT HÜBNER, OF NEW YORK, N. Y.

DESULFURIZING-FURNACE.

No. 899,403. Specification of Letters Patent. Patented Sept. 22, 1908.

Application filed December 18, 1906. Serial No. 348,453.

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 Desulfurizing-Furnaces, of which the following is a specification.

My invention relates to furnaces for desulfurizing ores, and has for its object to provide a compact and efficient construction for enabling a large amount of ore to be desulfurized in successive stages, until the desired degree of perfection has been attained.

The invention will be fully described hereinafter, and the features of novelty pointed out in the appended claims.

Reference is to be had in the accompanying drawings in which

Figure 1 is a longitudinal vertical section of my improved furnace; Fig. 2 is a cross section thereof on line 2—2 of Fig. 1; and Fig. 3 is a horizontal section of part of the furnace on line 3—3 of Fig. 2.

The furnace comprises a setting A of brickwork or other suitable construction, provided with a grate B, above which is located a combustion chamber C. From this combustion chamber a flue D leads rearward, communicating with an upward flue E, from which a number of flues E′, E², E³ lead forward at different levels to connect with the stack or chimney indicated at E⁴. The flues E′, E², E³ are preferably subdivided into a number of channels by partitions, as in Fig. 2. In order that the path of the combustion gases may be varied, I have provided dampers F, F′, F², the first located at the outlet of the flue E³, the second controlling the connection of the flues E′ and E² with the stack E⁴ and the third interposed in the upward flue E between its connections with the horizontal flues E′ and E². In the particular arrangement of the dampers shown in Fig. 1, the combustion gases pass from the chamber C to the flue D, the lower part of the flue E, then forward through the flue E′ upward into the flue E² and rearward in the same, upward in the upper portion of the flue E and forward to the stack E⁴, through the uppermost flue E³.

The top H of the flue D preferably consists of metal and forms a floor on which the ore to be treated is adapted to rest. Similar floors are indicated at H′, H², H³, immediately above the flues E′, E², E³, and two further floors H⁴, H⁵, are located in the upper part of the furnace. The floors may be supported in any suitable manner, as by means of brackets G, which I prefer to provide with openings G′, so that the gases may circulate and stagnation may be avoided. Between each of the floors above mentioned and the ceiling above is formed an ore chamber I, I′, I², I³, I⁴, I⁵ respectively. The ceiling for the chambers I, I′, I², is formed by the bottom wall of the flues E′, E², E³ respectively; the ceiling for the chamber I³ is formed by the bottom H⁴; the ceiling for the chamber I⁴ is formed by the bottom H⁵; and the ceiling for the chamber I⁵ by the top wall of the setting A.

A filling opening through which ore may be introduced into the uppermost chamber I⁵ is indicated at J⁶ in Fig. 2. At the opposite end, said chamber has a passage J³, leading to the chamber I⁴ below. This passage may be closed by means of sliding plugs K. By means of further openings J², J′ and J, and other plugs K, similar to those above mentioned, a connection is established from each chamber to the next chamber below, until the chamber I′ is reached. This chamber can be made to communicate with the lowermost chamber I by means of passages J⁴, J⁵, located in the walls of the setting A and not within the chambers themselves. The plugs K not only close the openings through which communication is provided from one chamber to the next, but also close openings leading to the outside of the furnace, so that by removing one or more of the plugs access may be had to each of the chambers from the outside, for the purpose of introducing or removing ore, or of stirring the ore by means of suitable tools. As will be seen in Figs. 2 and 3, the plugs K fit between the brackets G, so that said brackets and plugs together close the openings such as J.

The chambers I, I′, I², I³, have been shown provided with exhaust passages L, adapted to be connected with a centrifugal pump or other machine by means of which gases may be withdrawn from the ore chambers and the pressure within such chambers reduced to a point below atmospheric pressure. I have found that the reactions are facilitated considerably by the use of a pressure below atmospheric pressure. Similar exhaust connections L′ are provided for the two uppermost chambers I^4 and I^5, but these connections may be straight, whereas the connections L are bent to clear the flue E.

In operation, the ore is first introduced into the chamber I^5, and after having been treated there for a suitable length of time, is transferred to the chamber I^4 by simply taking out the plugs K which register with the openings J^3, causing the ore to fall through said opening and spreading it on the floor H^4. The process is continued in stages, the material being transferred from one chamber to the next chamber below after a suitable interval of time, and the reaction is made more energetic by the use of an exhaust, as above referred to.

In some cases it may not be necessary to have the ore treated in all of the chambers, since some ores might be sufficiently desulfurized by the time they reach the chamber I′. For this reason, there are openings at both sides of the chamber I′, as shown in Fig. 2, so that the ore can be pushed out at one side by means of a tool inserted at the other side.

It will be observed that the path of the combustion gases from the chamber C is entirely separate from the ore chambers; that is, the ore is nowhere exposed directly to the combustion gases, but only to the heat of such gases transmitted through the walls of the furnace and of the chambers. By means of the dampers F, F′, F^2 I may regulate the heating effect. For instance, by opening the damper F^2 while leaving the other two in the position shown, the heat would be caused to travel direct through the upper flue E^3, so as to insure a more energetic heating of the chambers I^3, I^4, I^5. This might be done at the beginning of the operation. Then, as the ore reaches the chamber I^2, the dampers might be so manipulated as to cause the combustion gases to pass through the flues E′ and E^2. By swinging the damper F′ against the downtake at the forward end of the flue E^2 (while leaving the other dampers, or at least the damper F^2, in the position shown in Fig. 1), the hot gases would be made to pass from the flue E direct to the chimney or stack E^4 through the lower flue E′ exclusively.

The process herein referred to is described more fully, and claimed in a companion application filed of even date herewith.

I claim as my invention:

1. A desulfurizing furnace provided with a series of heat-conducting bottoms located at different levels, upper walls above said bottoms to form ore chambers, means for heating said chambers, and brackets, contained within said chambers, for supporting the upper walls.

2. A desulfurizing furnace provided with a series of heat-conducting bottoms located at different levels, upper walls above said bottoms to form ore chambers, means for heating said chambers, and brackets, contained within said chambers, for supporting the upper walls, said brackets having openings to prevent the trapping of gases.

3. A desulfurizing furnace provided with a series of superposed ore chambers with openings or channels through which the material may pass from one chamber to the next chamber below, and additional openings leading from each chamber to the outside of the furnace, movable means each of which is arranged to close both kinds of openings, and means for heating the ore chambers.

4. A desulfurizing furnace provided with a series of superposed ore chambers with openings or channels through which the material may pass from one chamber to the next chamber below, and additional openings leading from each chamber to the outside of the furnace, the lowermost chamber having such additional openings in opposite walls, movable means each of which is arranged to close both kinds of openings, and means for heating the ore chambers.

5. A desulfurizing furnace provided with a series of ore chambers, movable devices for isolating any one of said chambers from its neighbors, and a separate exhaust channel leading from each chamber to the outside of the furnace.

6. A desulfurizing furnace provided with a series of ore chambers, and a separate exhaust channel leading directly from each chamber.

7. A desulfurizing furnace provided with a series of superposed ore chambers with channels through which the material may pass from one chamber to the next chamber below, and openings located adjacent to said channels and leading from each chamber to the outside of the furnace, and movable devices each of which is arranged to control one of said channels as well as one of said openings.

8. A desulfurizing furnace provided with an ore chamber having a channel for the discharge of the material, and an opening located adjacent to said channel and leading to the outside of the furnace, and a movable plug arranged to control both said channel and said opening.

9. A desulfurizing furnace provided with an ore chamber having a channel for the discharge of the material and brackets or guides projecting across said channel, and devices movable between said guides and adapted to close said channel.

10. A desulfurizing furnace provided with an ore chamber having a channel for the discharge of the material, brackets or guides projecting across said channel, openings leading to the outside of the furnace and located in line with the spaces between the

guides, in combination with plugs arranged to slide between said guides and controlling both said channel and the openings.

11. A desulfurizing furnace provided with a combustion chamber, a series of substantially horizontal flues located at different levels and connected with the combustion chamber, a stack or chimney with which a plurality of said flues may be connected directly, an upward connection from one flue to the next flue above, said connection being located adjacent to said stack, a damper which according to its position connects the lower one of the two flues either directly with the stack or with the said upward connection, and ore chambers arranged to be heated by the gases passing through said flues.

12. A desulfurizing furnace provided with a combustion chamber, a flue extending rearward therefrom, an uptake at the rear end of said flue, superposed flues extending forward from said uptake, a stack or chimney located adjacent to the front ends of said flues and connected with a plurality of them, a damper located in the uptake between its connections with two of said flues, a second uptake connecting said two flues adjacent to the chimney, another damper for connecting the lower one of said two flues either with said second uptake or directly with the chimney, and a third damper controlling the connection of the uppermost flue with the chimney.

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

ROBERT HÜBNER.

Witnesses:
JOHN LOTKA,
JOHN A. KEHLENBECK.