

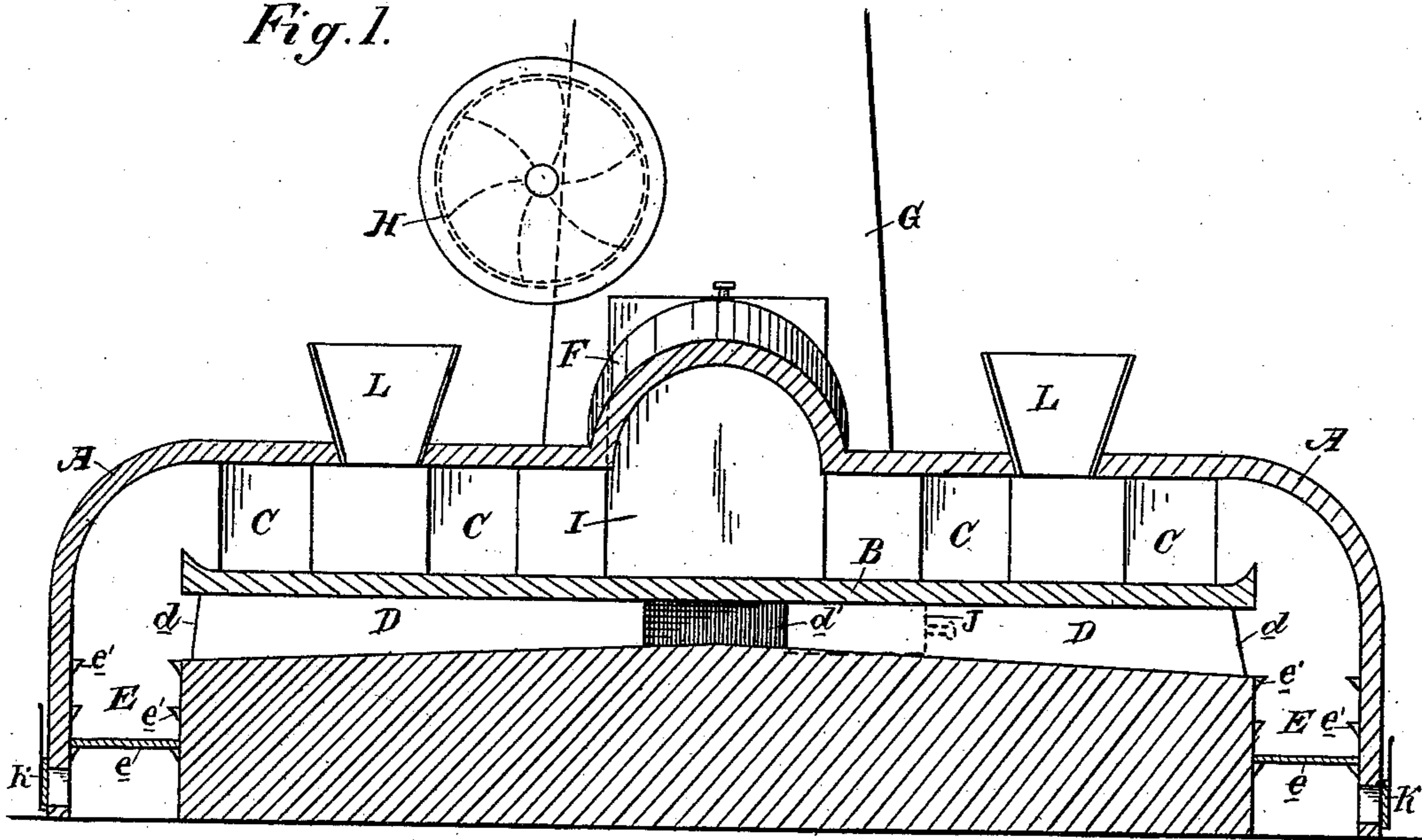
(No Model.)

J. & W. APPLGARTH.  
ORE ROASTING FURNACE.

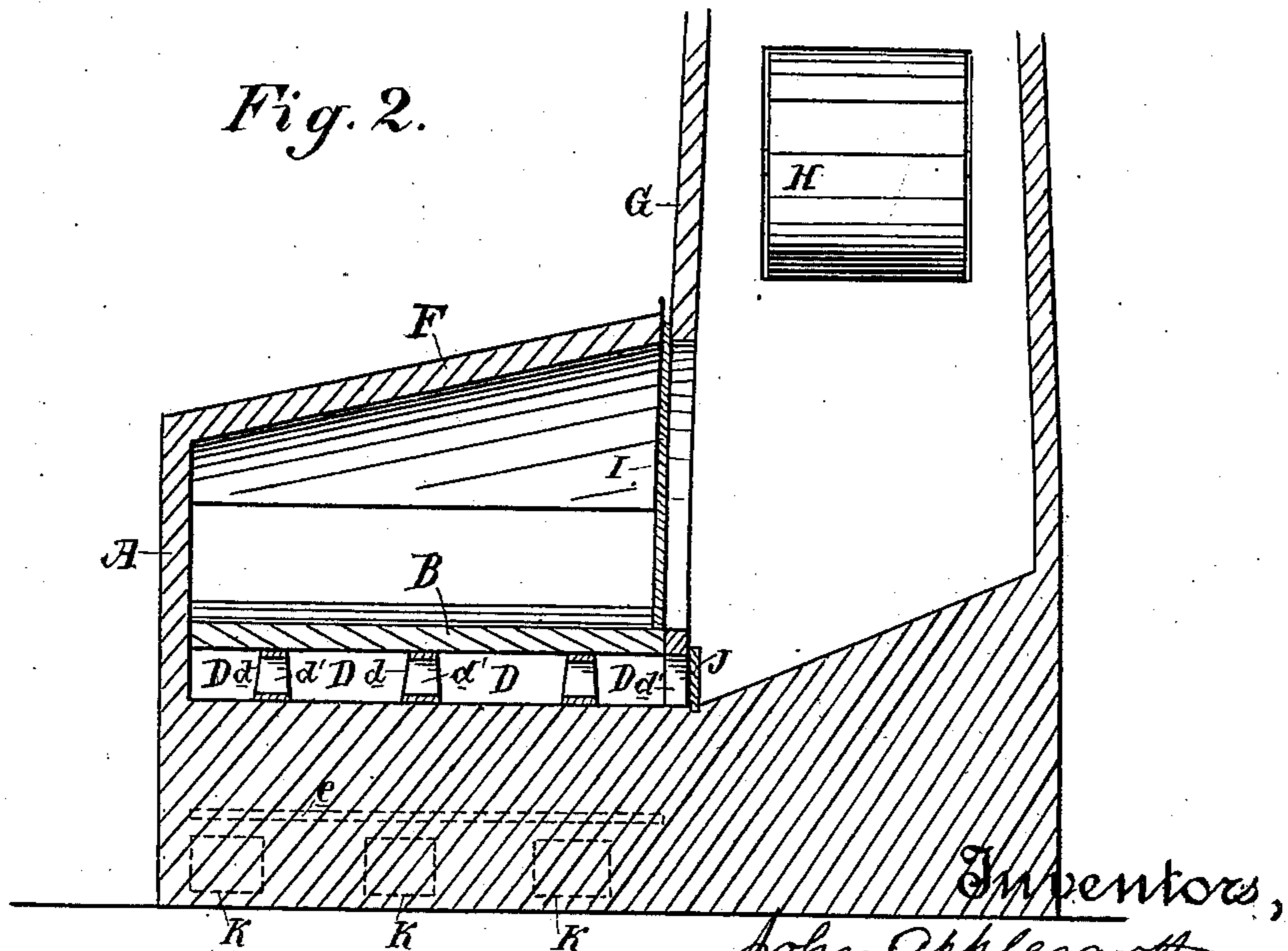
No. 351,563.

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*Fig. 1.*



*Fig. 2.*



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# UNITED STATES PATENT OFFICE.

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## ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 351,563, dated October 26, 1886.

Application filed March 30, 1886. Serial No. 197,220. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN APPLGARTH, of East Oakland, Alameda county, State of California, and WILLIAM APPLGARTH, of Fresno county, State of California, have invented an Improvement in Ore-Roasting Furnaces; and we hereby declare the following to be a full, clear, and exact description of the same.

Our invention consists in the particular arrangement or disposition, in the furnace, of the hearth, the flue, the fire-chambers, the outlets of both said hearth and flue, the exhaust-fan, and the controlling-dampers, the inclined arch, and adjustable grate, all of which we shall hereinafter more fully describe.

The object of our invention is to provide a furnace in which both heat and draft may be equalized, directed, and controlled to the best advantage.

Referring to the accompanying drawings for a more complete explanation of our invention, Figure 1 is a longitudinal section of our furnace. Fig. 2 is a transverse section through its chute.

A is the shell of the furnace, made of suitable material, preferably such as will not expand under the influence of heat to which it is subjected. Within the furnace is arranged, longitudinally, the horizontal hearth B, access to which is had through doors C on the outside, which are adapted to be raised and lowered in suitable guides. Under the hearth is formed a flue, D, which may be divided into several sections by the longitudinal partitions *d*, which serve to sustain the hearth.

E are the fire-chambers, which communicate directly with both the hearth and the flue. These fire-chambers are located at each end of the furnace, and are arranged transversely thereof, and at right angles to the flue and hearth. They are provided with grates *e*, which rest upon ledges *e'*, and may be raised or lowered to rest upon any of the vertical series of said ledges. At and above the center of the hearth, and transversely thereof, is an arch, F, which has an inclination upward from the front side of the hearth to the back, where it communicates with the stack G. The bottom of the flue D inclines upwardly from

each end toward the the center, where it communicates through a central transverse passage, *d'*, with the stack. Let into the stack is a fan, H, mounted in a suitable casing, and having its blades projecting more or less within the stack. This fan is to be rotated by suitable mechanism, unnecessary herein to show.

I is a damper, vertically adjustable, and located in the arch, where it communicates with the stack, and is adapted to regulate and control the communication of the hearth with said stack.

J is a sliding damper which controls the communication between the central transverse passage of the flue and the stack.

K are vertically-adjustable valves or gates located in the ends of the furnace, and communicating with the spaces under the transverse fire-chambers, whereby the draft is controlled.

L are hoppers through the top of the shell, by which the hearth is supplied with ore.

The particular use of our furnace is for treating ores containing base metals, such as lead, sulphur, antimony, &c., and taking them away from the ore during the process of roasting.

The operation of our furnace is as follows: The ore is supplied to the hearth through the hoppers L. The fuel is laid on the transversely-arranged grates, the fires are started up, and the fan is rotated. At the beginning of the operation, when an intense heat is required, the draft-controlling valves or gates K and the dampers I J are opened, while the fan is driven at a high rate of speed. The flames are divided immediately after leaving the fire-chambers, part passing through the flue and part through the hearth over the ore. The object of the central transverse arch, F, inclining from the front to the back, is to avoid the tendency of the draft to draw the flame over toward the stack, whereby the front of the hearth, near the center, is not heated as thoroughly as the back. This arch, by affording room at the center, enables the heat to be equally distributed over the entire width and length of the hearth. When the operation has proceeded to a certain stage and the ore has become thoroughly heated, it is neces-

sary to control the draft in order to prevent the ore, which by this time has been reduced to a sort of dust, from passing off. In order to do this we adjust the dampers and the draft-controlling gates and regulate the speed of the fan, so that we can obtain any amount of draft desired. The ore soon becomes heated to a white heat, and by a previous treatment to which we subject it, and which is unnecessary here to explain, the baser metals are volatilized and are drawn off through the stack, while the precious metals remain. When it becomes necessary to stir the ore on the hearth, we close down completely the damper I, by which the hearth communicates with the stack, so that the draft and the flames are cut off from the hearth and pass only through the flue. This is rendered necessary by the condition of the ore, which, if stirred while the hearth is open to the stack, will pass off in dust and be lost. When the stirring is completed, the damper I is again opened to whatever extent may be desired to control the draft and direct the flames. When necessary, the entire heat may be passed through the hearth and excluded from the flue by closing the damper J, between the flue and the stack. It will thus be seen that by this arrangement of dampers and draft-controlling gates the draft and heat may be perfectly controlled and directed, being passed through both the hearth and the flue, or either, as may be desired.

The object of arranging the fire-chambers E transversely of the flue and hearth is to enable us to make a much smaller fire-box and still use the ordinary length of wood.

In furnaces where the fire-box is made in the end of the shell, and parallel or in line with the hearth, it is obvious that they must be made as wide as the hearth to distribute the flame over its width, and at the same time they must be made as deep as the wood requires; but by arranging them in the manner we show, the length of wood, usually four feet, is enough to provide for the distribution of the flame over the entire width of the flue and the hearth, and we can make the chamber of very much less width, thereby saving fuel and obtaining a direct heat from all portions of the fuel pile, whose flames reach the hearth and flue immediately. The fire is therefore a transverse one, and the gates or valves, being in the ends of the furnace, drive the flames directly to the point desired. The advantage of having the grates vertically adjustable is that when we are directing the flames wholly through the hearth we can raise them so that the flames can reach the hearth directly, and thereby save fuel.

We are aware that an arrangement of hearth and flue by which the flames may be passed simultaneously through both or through either separately is known, and that fire-boxes have been placed at both ends of the hearth and flue. We also know that a suction-fan has been placed in the stack for the purpose of creating a draft, and that the draft has been controlled by gates or dampers; but all these features have been tried in connection with furnaces differing from ours essentially in the arrangement or disposition of the operative parts; and while we do not claim these features, broadly, we do claim the arrangement of the parts of our furnaces by which we accomplish the results we intend in a simple and effective manner.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an ore-roasting furnace, the combination of the horizontal hearth B, the underlying flue D, the bottom of which inclines upward from each end toward the center, the fire-chambers E, communicating directly with the ends of both hearth and flue, the furnace-stack G, an opening between the center of the hearth and the stack, an opening, *d'*, between the center of the flue and the stack, a vertically-adjustable damper, I, controlling the former communication, and a sliding damper, J, controlling the latter communication, and the exhaust-fan H in said stack, substantially as herein described.

2. In an ore-roasting furnace, the combination of the horizontal hearth B, the underlying horizontal flue D, having a bottom inclining upwardly from each end toward the center, the fire-chambers E, communicating directly with the ends of both hearth and flue, the furnace-stack G, the exhaust-fan H in the stack, the damper I, controlling a communication between the center of the hearth and the stack, the damper J, controlling a communication between the center of the flue and the stack, and the vertically-adjustable valves or gates K in the ends of the furnace controlling the draft to the fire-chambers, substantially as herein described.

In witness whereof we have hereunto set our hands.

JOHN APPLGARTH.  
WILLIAM APPLGARTH.

Witnesses:

CH. HILTON,  
S. B. GOODMAN.