

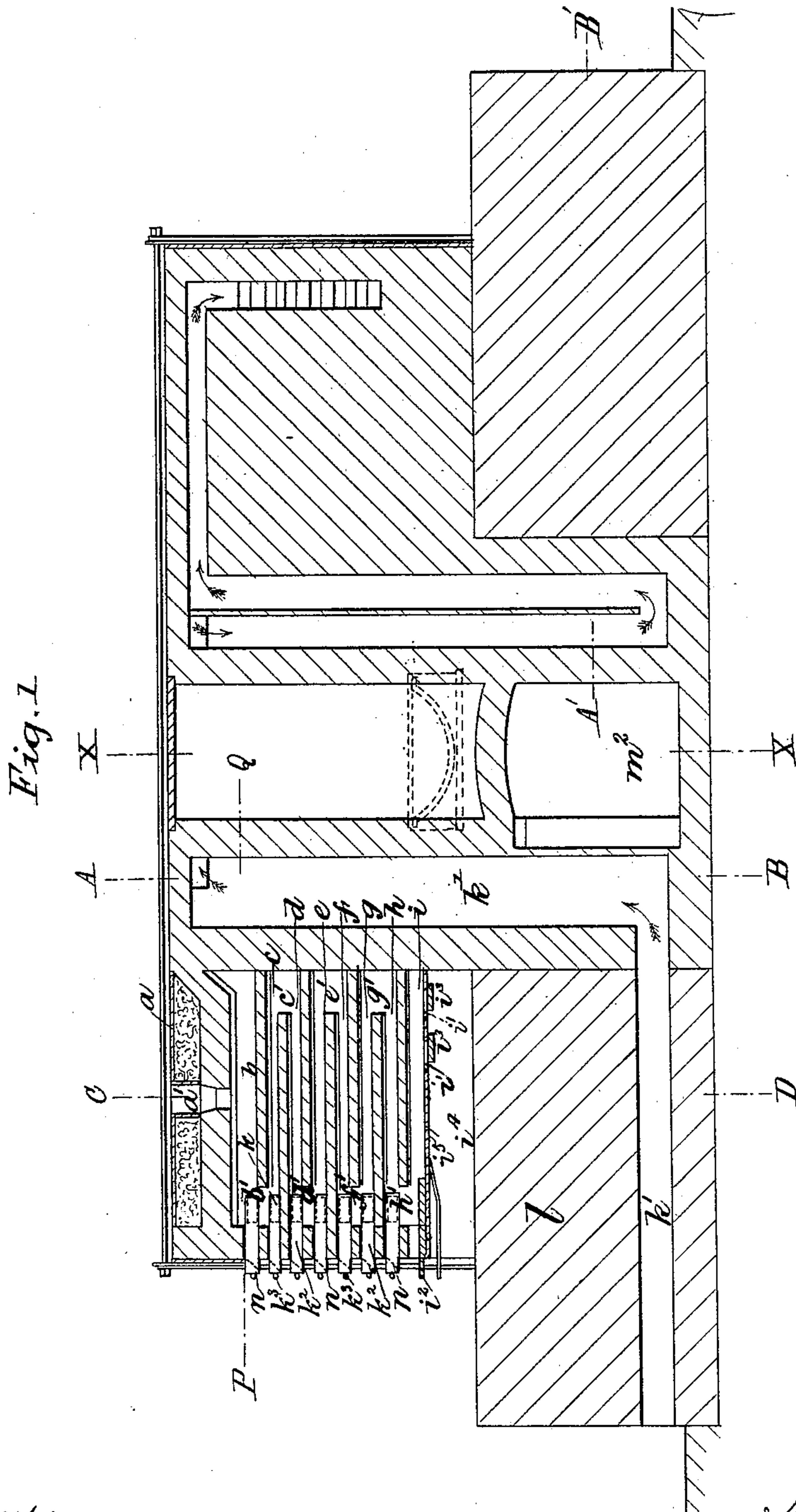
(No Model.)

4 Sheets—Sheet 1.

S. TRIVICK.  
FURNACE FOR ROASTING ORES.

No. 434,744.

Patented Aug. 19, 1890.



Witnesses  
Wm T Norton  
Harry D. Palmer.

Inventor  
Sidney Trivick  
by John J. Hausted for  
his Atty.

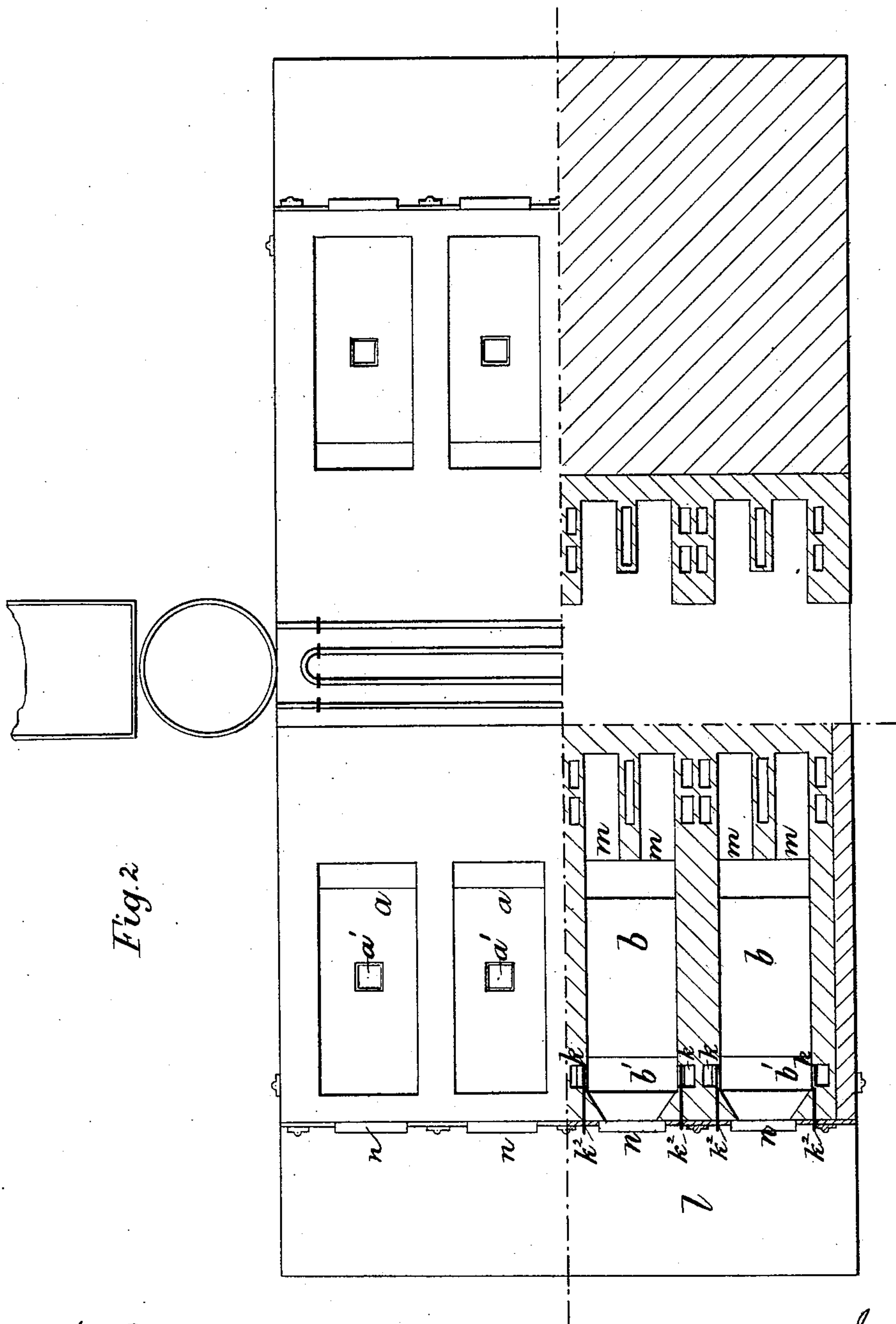
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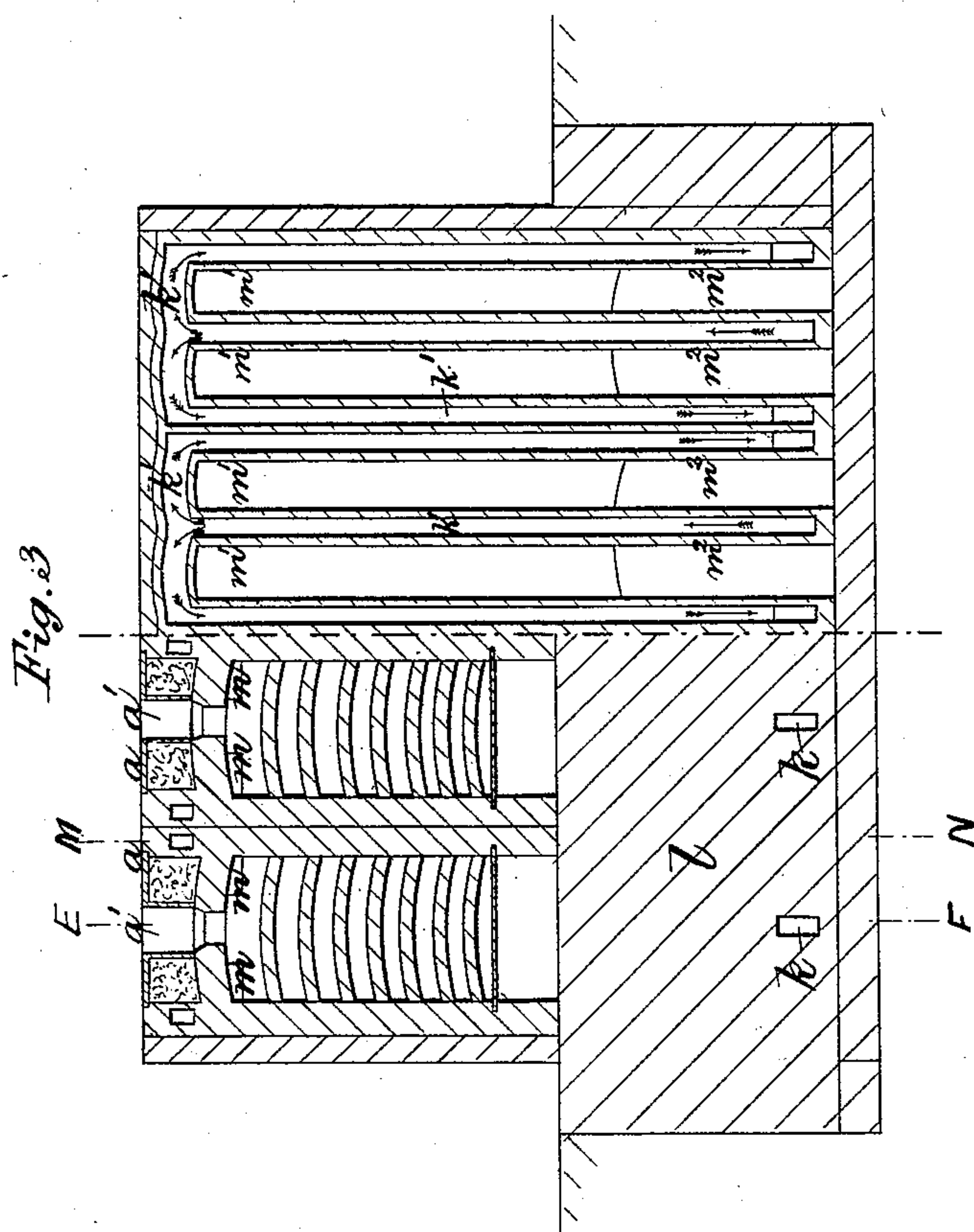
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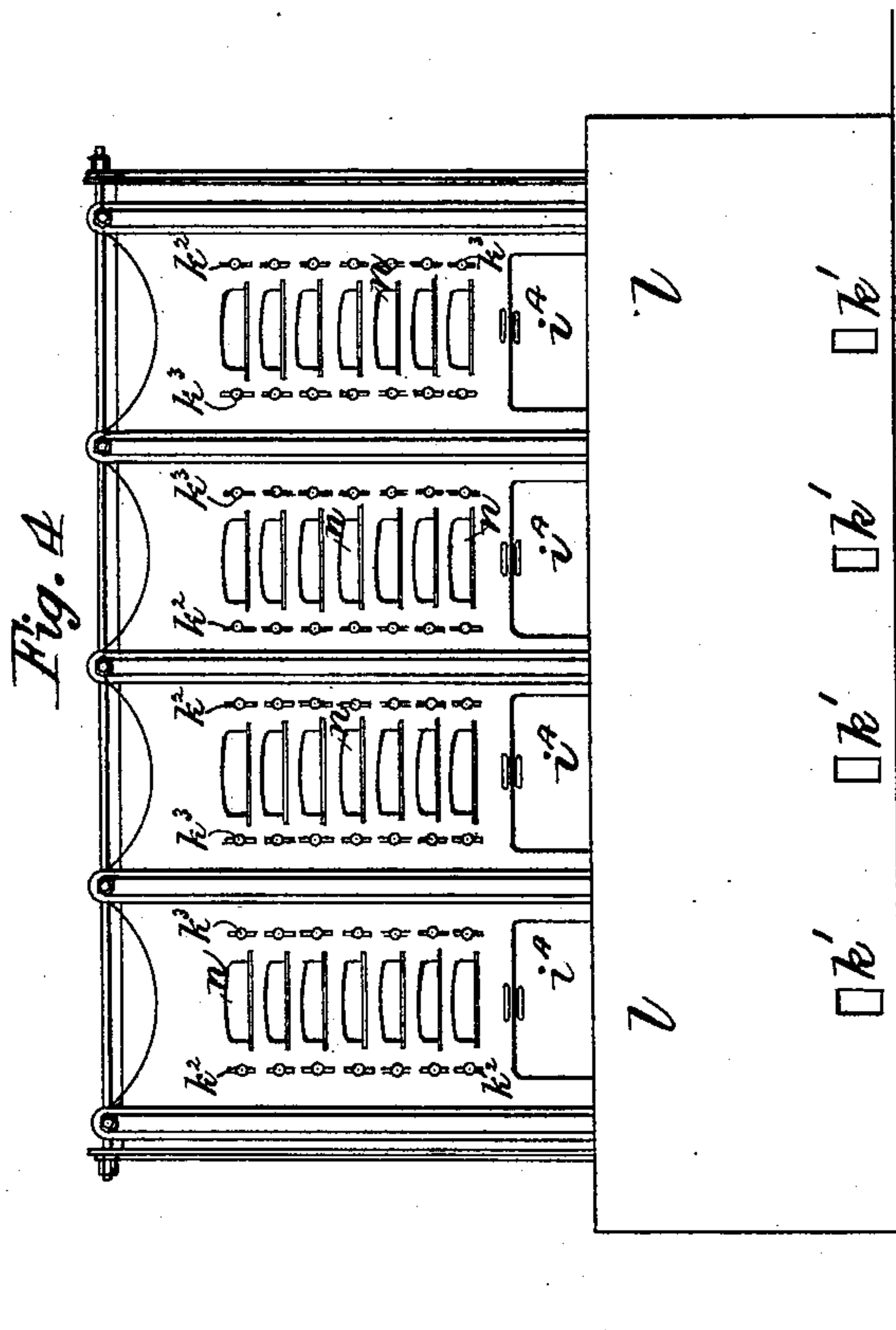
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# UNITED STATES PATENT OFFICE.

SIDNEY TRIVICK, OF CLAPHAM, ENGLAND.

## FURNACE FOR ROASTING ORES.

SPECIFICATION forming part of Letters Patent No. 434,744, dated August 19, 1890.

Application filed September 17, 1889. Serial No. 324,199. (No model.)

### *To all whom it may concern:*

Be it known that I, SIDNEY TRIVICK, analytical chemist and metallurgist, a subject of the Queen of Great Britain, residing at 29 Gauden Road, Clapham, in the county of Surrey, England, have invented a certain new and useful Improvement in Furnaces for Roasting Ores, of which the following is a specification.

This invention relates to the construction or arrangement of the parts of a furnace or set of furnaces or ovens in which to effect the roasting of ores rich in sulphur, in order to obtain the metals contained. These ores for which the said improved ovens are suitable and designed to treat are those not containing a larger proportion of lead than three per cent. of the whole mass, as a greater relative quantity if sufficient to induce fusion would interfere with the operation. These ores, in a finely-divided state, are introduced into the furnace in a suitably dry condition, and, if required, with previously intimately admixed salts or matters designed to facilitate subsequent treatment for eliminating precious or other metals. The ores rich in sulphur and not containing an inconvenient proportion of lead are by the aid of my improved furnace or oven enabled to be roasted either alone, sufficiently finely ground, or intimately admixed with other added matters, without the employment of fuel extra of that provided by the contained sulphur, except that fuel which is necessary to give a sufficient preliminary heating to the furnace to induce combustion of the sulphur at starting the operation, subsequent combustion being maintained by the partially roasted ore igniting the successive fresh charges. The furnace or oven according to my invention contains a series of hearths or floors superposed one above another, upon a bed or foundation. These floors are formed of fire-brick or like fire-resistant material, and constituting a series of shallow ovens, each communicating with the next above and the next below it by means of openings—one or more in each floor—arranged not to come one above or below the next, and preferably one toward the front, and the next floor having the next toward the back thereof, and so on, except that the top floor is roofed over, with the exception of an

opening conveniently but not necessarily centrally located, by which ore dried above the said roof on the floor formed by its upper surface may be raked in when a fresh charge to the first chamber is needed and the cover to said opening is off, and the bottom floor is preferably made of iron, partly fixed and partly removable, so that adjustable spaces for air to enter may be left, and the movable part drawn apart to permit dropping of the roasted ore onto the hearth below ready for removal. At front of each chamber is a door or closing-piece adjustable in its position so as to admit more or less cold air and for the introduction of the rakes for moving the ore from floor to floor, and the bottom floor admits a stream of like air, which permeates the chambers successively in turns. At each of the sides of each chamber is an opening, preferably toward the front, through which heated air enters and aids combustion of the sulphur contained in the ores from which the metals are to be obtained, and this air is conducted and heated in its conduction by means of passages carried along the side and up over the fire-chambers joining other passages leading down rearward of and then frontward under the bed or through it to the front of the furnace. The adjustments by the opening or closing (more or less) of the dampers provided at the opening of each hot-air flue in the oven connected with the separate hearths and the adjustment of the front cold-air doors and of the movable bottom floor enable the combustion of the ores to be controlled with great delicacy and efficiency.

In the drawings, Figure 1 shows a longitudinal vertical section of a furnace or oven constructed, grouped four aside, with four like furnaces back to back, the line X X showing the line of junction, the flue-passage  $m^2$  and chamber  $o$  over being in common to the two rows. The right-hand furnace is shown as taken on the line M N of Fig. 3, while the left-hand furnace is shown as taken on the line E F of that same figure through the center lengthwise of each chamber of the pair in line. Fig. 2 shows on plan an arrangement of eight furnaces constructed as described, the upper half of the said figure showing the exterior of two pairs of furnaces, the left-hand bottom quarter of said figure showing



two furnaces in longitudinal transverse section taken on the line P Q of Fig. 1, and the opposite bottom quarter of the figure showing the air-passages for heated air and the position of the regulator sliding doors  $k' k'$ , provided to each opening therefrom into the chambers  $b$ . Fig. 3 shows a vertical section taken transversely of Fig. 1, the left-hand half of this figure being taken on the line C D of Fig. 1 and the right-hand half on the line A B thereof. Fig. 4 shows a front view of the roasting-ovens.

$a$  is the roof or drying-floor opened to the air.

$a'$  is the closable supply-hole to the chamber  $b$ , the floor of which is omitted at  $b'$  to the front of the oven. The next floor  $c$  has a like opening at  $c'$ , but located rearwardly, and so alternately with the floors  $d e f g h i$  and their respective openings  $d' e' f' g' h' i'$ .

$k$  indicates a series of openings leading one to each of the front sides of the chambers from passages  $k'$  leading from the front of the bed-block  $l$ , each opening  $k$  being closed or partially closed by means of a sliding tile  $k^2$ , one of which is shown separately adjoining Fig. 4, so to adjust the quantity of hot air supplied through flues to each hearth. These tiles slide in grooves formed in the furnace, and they are moved to and fro by handles or knobs thereto provided.

$m$  are exits for products of combustion at the rear of the top chamber  $b$ , leading by passages  $m'$  to the common flue  $m^2$  to four furnaces, and thence away to a stack or chimney.

$n$  are a series of adjustable doors, one to the front of each oven-chamber, by which adjustment of quantity of cold air admitted to that chamber is obtained, and through the openings covered by such doors the rakes for moving the ore from floor to floor are admitted. The iron or other metal floor  $i^5$  is provided with openings or passages  $i'$ , and is capable of being moved by means of the handle  $i^2$  relatively to the fixed plates  $i^3 i^3$ , so as to vary the extent of opening and draft of air, while on pulling said plate completely forward the ore supported is thrown off onto the hearth  $i^4$  below, from whence it may be carried away to be ground finely, leached for precious metals, or otherwise treated according to its nature and intended treatment. The furnace having been heated thoroughly in the first instance throughout by means of wood

charcoal or suitable fuel, this primary heating medium is withdrawn from the uppermost chamber, as  $b$ , and its place supplied by ore which becomes ignited, and then in succession each primary charge of fuel is withdrawn from chambers  $c, d, e, f, g, h$ , and  $i$ , the first charge of ore being progressively raked down onto the floor next below and its place supplied by a fresh charge from the hole  $a'$ .

Although I have shown four furnaces side by side, placed back to back relatively to the other four, yet any other number may be assembled; but four is a convenient and most suitable number, because one flue-chamber, one heating-chamber over it, and its contained piping, if employed, can be used most readily in common with great economy, and waste of heat usually incident to the exposure of the rear walls of the ovens is avoided.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is—

1. In a furnace or oven for roasting ores, a series of chambers, as  $b, c, d, e, f, g, h$ , and  $i$ , superposed and communicating at alternate ends by openings, as  $b' c' d' e' f' g' h'$ , doors  $n$  for closing the fronts of such chamber, a supply-opening  $a'$ , adjustable floor  $i^5$ , having passages  $i'$  therein, and the fixed plates  $i^3$ , in combination with hot-air passages heated by the furnace itself and exits  $m$  and passages  $m'$ , leading to a flue  $m^2$  and thence to the stack or chimney, and adjustable dampers to the flues leading into each separate hearth or floor, substantially as shown and described.

2. In a furnace for roasting ores, a series of roasting-chambers communicating at alternate ends and arranged one above another, in combination with tortuous passages for heating air, and adjustable openings connecting from said passages, openings having doors at the front of each chamber for admitting cold air, and a movable bottom floor for further regulating the air.

In testimony whereof I, the said SIDNEY TRIVICK, have hereunto set my hand this 22d day of July, 1889.

SIDNEY TRIVICK.

Witnesses:

ALFRED GEORGE BROOKES,  
KENNETH ROMANES.