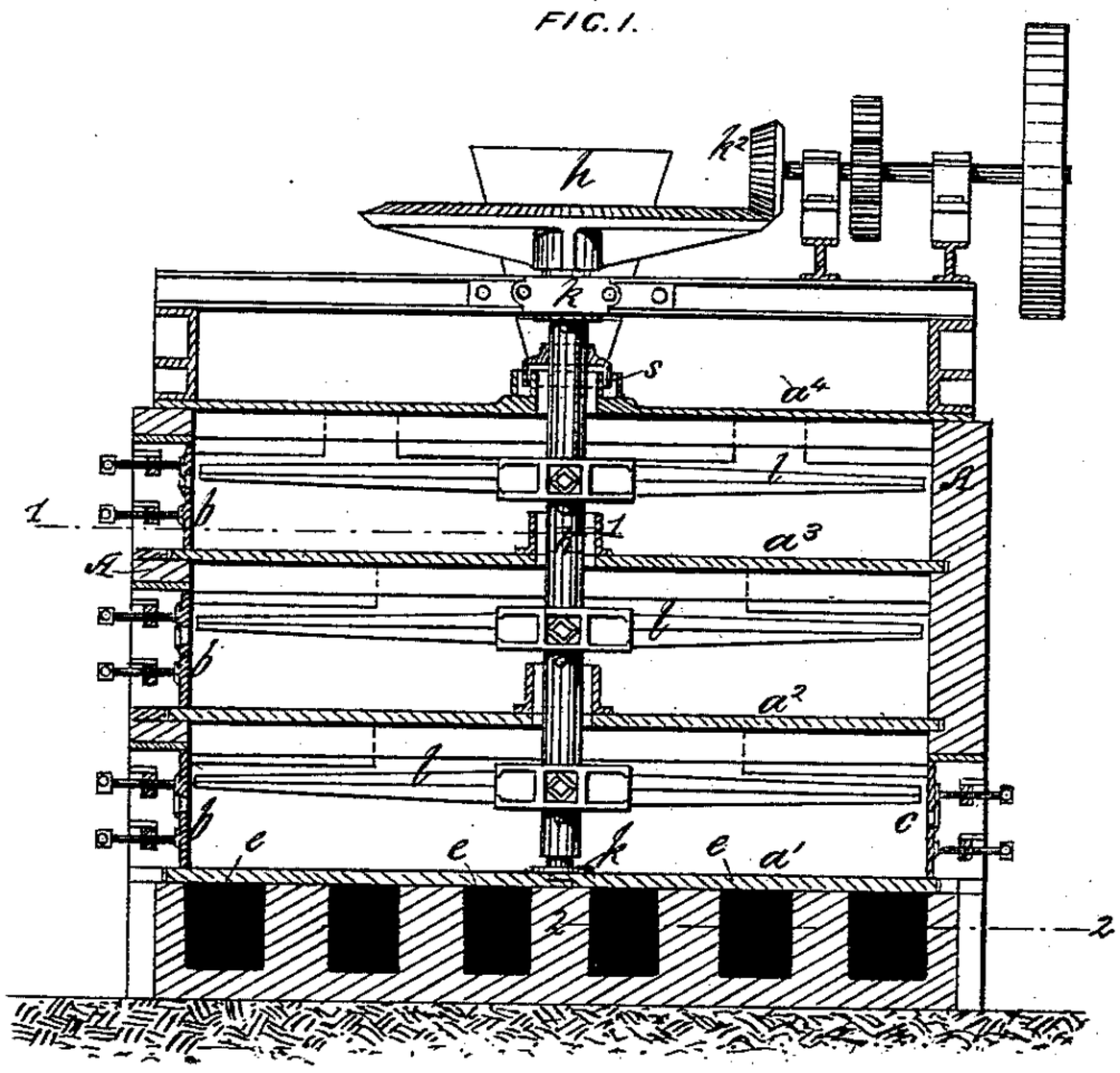
(No Model.) 2 Sheets—Sheet 1.

W. BLACK & T. LARKIN.

ORE ROASTING FURNACE.

No. 278,859. Patented June 5, 1883.

FIG. 1.



Witnesses
James J Tobin.
Harry Drury

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 2.

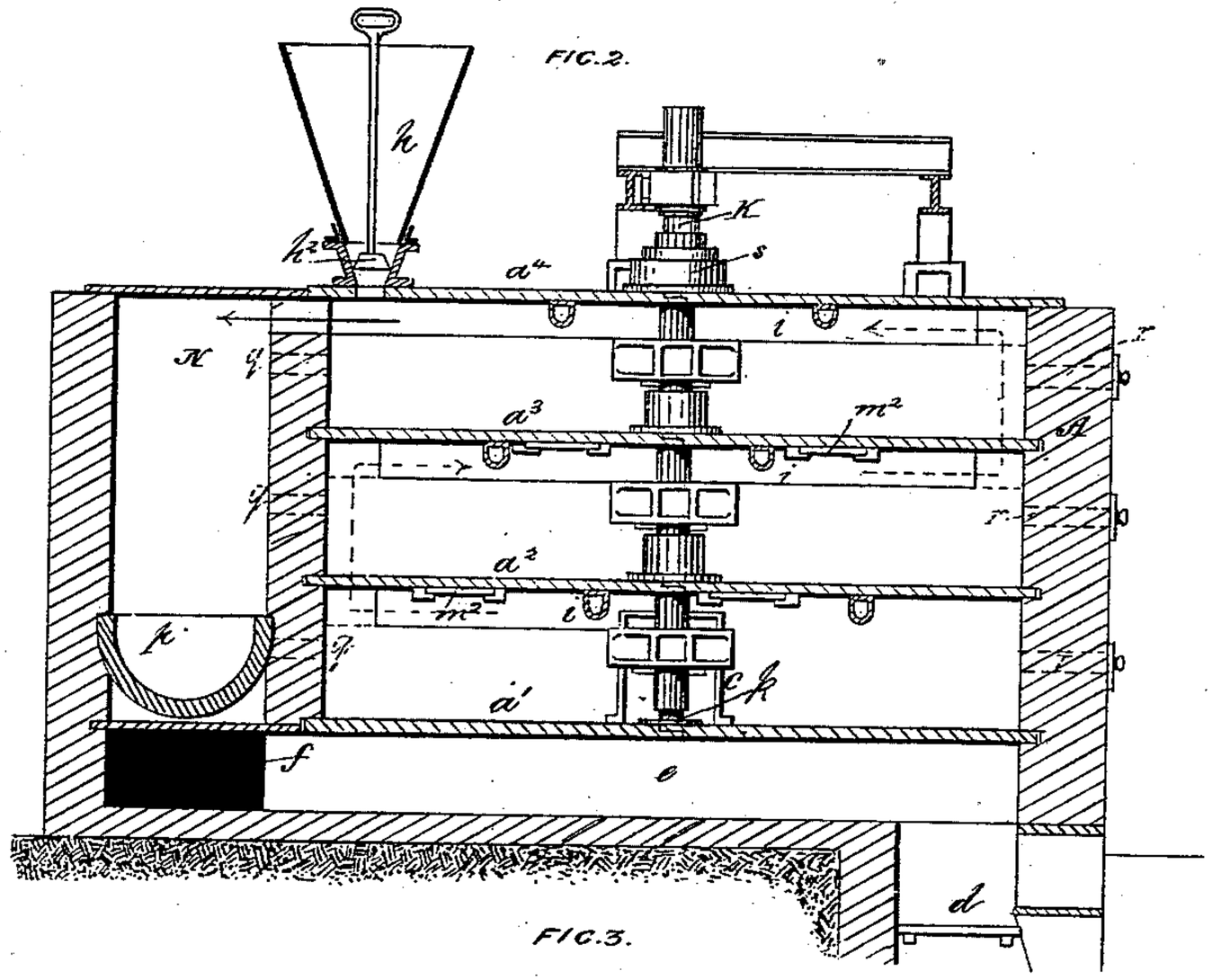
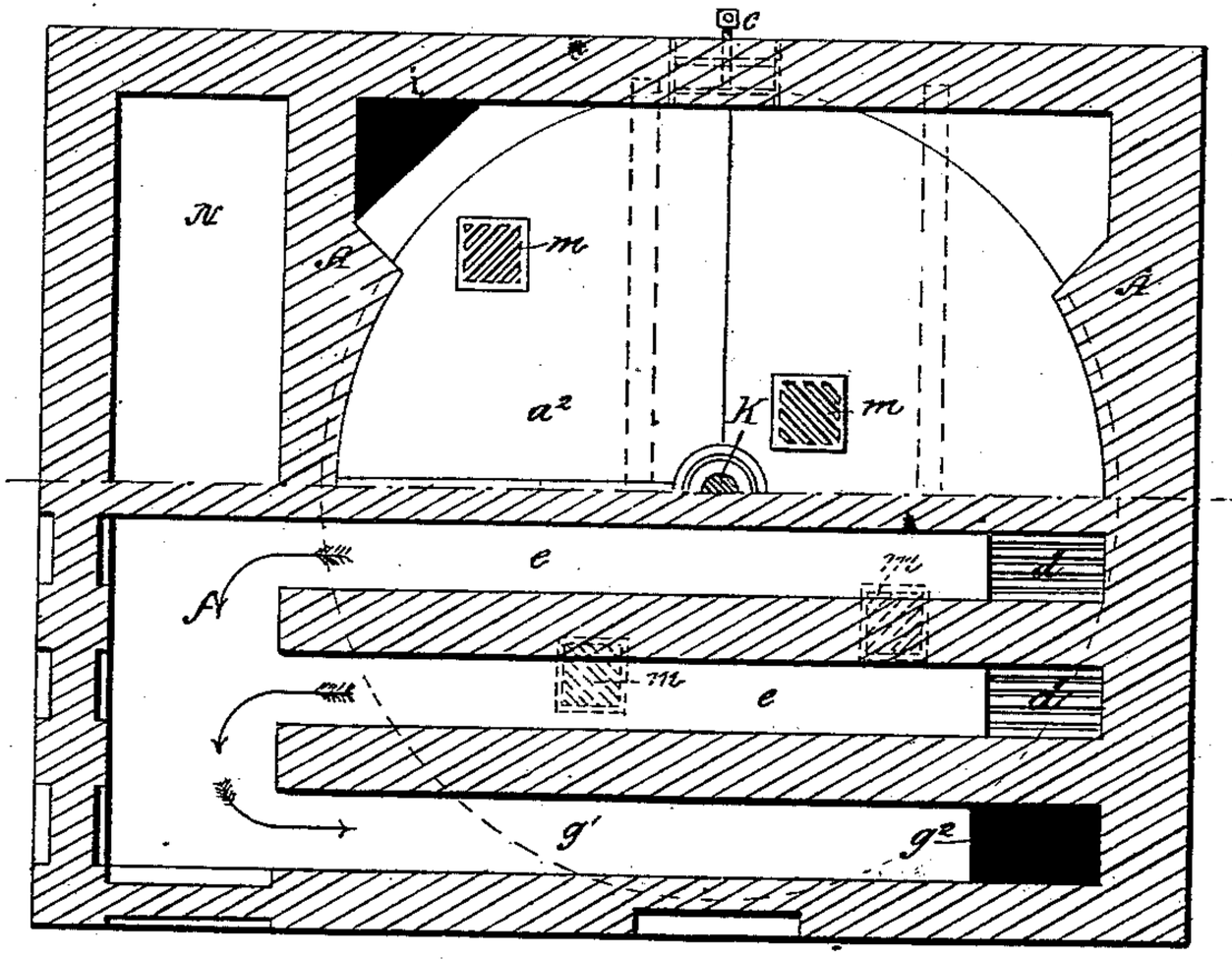


FIG. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM BLACK, OF SOUTH SHIELDS, AND THOMAS LARKIN, OF EAST JARROW, COUNTY OF DURHAM, ENGLAND.

ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 278,859, dated June 5, 1883.

Application filed May 19, 1882. (No model.) Patented in Belgium April 1, 1881, No. 57,771; in France April 14, 1881, No. 148,435; in England October 13, 1881, No. 4,456, and in Italy May 22, 1882, No. 14,204.

To all whom it may concern:

Be it known that we, WILLIAM BLACK and THOMAS LARKIN, subjects of the Queen of Great Britain and Ireland, and residing, respectively, at South Shields and East Jarrow, county of Durham, England, have invented certain Improvements in Ore-Roasting Furnaces, (for which we have obtained a Belgian Patent No. 57,771, April 1, 1881; French Patent No. 148,435, April 14, 1881; British Patent No. 4,456, October 13 1881, and Italian Patent No. 14,204, May 22, 1882,) of which the following is a specification.

Our invention consists of certain improvements in the construction of furnaces for treating ores to extract the sulphur therefrom, and for the calcining and decomposition of copper ores, the object being to obtain economy in time and labor, and to increase the yield as well as facilitate the manipulation of the ore, as more fully described hereinafter.

In the accompanying drawings, Figure 1 is a vertical section of our improved furnace; Fig. 2, a vertical section in a plane at right angles to that shown in Fig 1; and Fig 3, a sectional plan on the line 1 2, Fig. 1.

In the outer walls, A, of the furnace are supported the horizontal bed-plates a' a^2 a^3 (three in the present instance) and a roof-plate, a^4, forming three chambers for the treatment of the ore. Each chamber is provided with a door, *b*, and the bottom chamber is provided with an additional door, *c*, Fig. 1.

Below the bottom plate, a', are situated fire-places *d*, Figs. 2 and 3, four in the present instance, and from each fire-place leads a flue, *e*, opening into a transverse flue, *f*, which is common to each pair of flues *e*, and communicates with a chimney through flues g' g^2. These flues have no communication with the interior of the ore-chambers; but the lower chamber is heated by the products of combustion passing through the flues, while the upper chambers are heated by the gases evolved from the roasting of the ores in the chamber immediately beneath.

The upper part of each chamber is provided with an outlet-opening, *i*, which, as shown by the arrows, Fig. 2, communicates with the chamber above, and the top chamber has an outlet into the sulphuric-acid chamber N. The interior of each roasting-chamber is cylindrical in plan view, as shown in Fig. 3, and the communicating passages *i* are formed in the walls of the furnace at the corners thus left in the rectangular structure beyond the edge of the ore-beds, and as these passages open into each chamber only at the top the ore cannot get into them from the ore-beds.

On the roof-plate a^4 is a hopper, *h*, provided with a stopper, h^2, to admit the ore into the top chamber.

A vertical shaft, K, is mounted in a bearing, *k*, carried by a transverse beam above the roof of the furnace, so as to be practically suspended therefrom. The step-bearing in the bottom plate, a', is only in the nature of a guide, as it is desirable to have all frictional parts as far as may be from the heated interior of the furnace. This shaft is provided with a sand or similar joint at *s*, but passes freely through central openings in the plates a^2 and a^3.

The shaft K carries arms *l* in each chamber, each arm being provided with suitable scrapers or stirrers, preferably of the character described in British Letters Patent No. 4,468, granted to us November 2, 1880. These arms are omitted from Figs. 2 and 3. A rotary motion may be imparted to the shaft by suitable gearing, k^2, as shown in Fig. 1.

As shown in Figs. 2 and 3, each of the upper bed-plates a^2 a^3 is provided with slots or grates m', which may be closed or opened by means of sliding shutters m^2, provided with operating-rods extending to the exterior of the furnace. These grates are preferably arranged at varying distances from the centers of the beds, and although, when open, they form communications between the chambers for the passage of the ore, they are distinct from the gas-passages *i*, which are beyond the edges of the ore-beds.

In using the apparatus the ore to be treated is placed upon the upper plate a^4, and when the moisture is driven off therefrom the said ore is put into the hopper *h*, and is therefrom charged (by opening the valve h^2) into the first

or top chamber and onto the bed a^3. The shaft K being rotated, the ore is agitated thereby, and is discharged by the slots *m* onto the bed a^2 below, where it is subjected to further treatment at a higher temperature. From this bed a^2 the ore passes, by the slots *m* therein, onto the lowest bed, a', where it is submitted to the final heat, and is eventually removed from the said bed through the door *c*. The gas, gases, or products pass off or are conducted by the passages *i i* from the furnace for treatment in the ordinary or other way. If it be wished to subject the ore only to treatment upon, say, the two lower beds, the ore is charged to the bed a^2 through its door *b*, from which bed it passes, by the slots *m* therein, to the lower bed, a'. If, on the other hand, the ore is not required to be subjected to the final heat of the bed a', the slots *m* in the bed a^2 may be covered by their closing-shutters m^2, and the ore be removed from the bed a^2 through the door *b* in connection with the said bed. It will thus be understood that the ore may be subjected to heat on any one or more of the beds.

Air-holes covered by regulators or dampers may be provided, as indicated in dotted lines at *r*, to allow of air being admitted as required to each chamber.

The bearers or supports under the plate a^4 and beds a' a^2 may be simply bars or rails; but they are preferably hollow, as shown, with their ends open to the air, so as to allow the passage of the outer and colder air therethrough. One end of each hollow bar may have a passage to the flue, so as to draw the cold air through.

The furnace constructed or arranged according to our invention is more particularly suited for the treatment of ore of a small size or in a fine state of division; but it is also applicable for the treatment of ore of other sizes, the principal advantages obtained being economy of time, fuel, and labor, and increased efficiency and facility in manipulation of the ore.

The floors of the beds are preferably of iron, fire-clay, or quartz; but they may be of any other suitable material.

In place of or in addition to rotating the shaft, the bed-plates may themselves be rototed by any convenient means.

We do not desire to claim, broadly, an ore-roaster having a series of superposed roasting-chambers arranged over a fire-place not in communication with the roasting-chambers; but

We claim as our invention—

The combination of the fire-place and flues of an ore-roasting furnace with two or more superposed roasting-chambers directly over but not in communication with said fire-place and flues, the said roasting-chambers having communicating gas-passages *i* beyond the edges of the ore-beds, all substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WILLIAM BLACK.
THOMAS LARKIN.

Witnesses to the signature of the said William Black:

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