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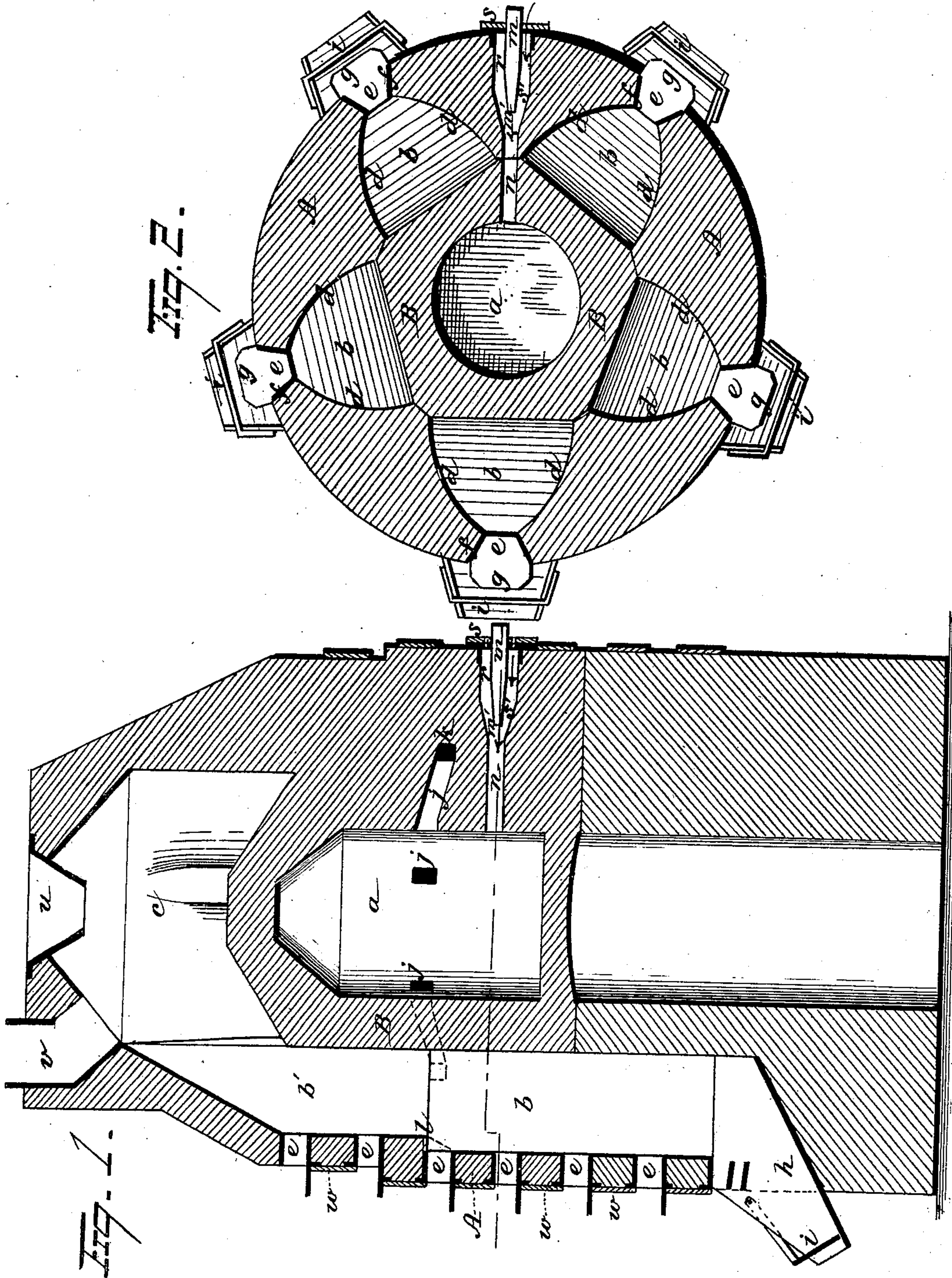
N. M. LANGDON.

2 Sheets—Sheet 1.

Furnace for Roasting Ores.

No. 241,227.

Patented May 10, 1881.



WITNESSES

Floyd Norris
Howell Barltt.

INVENTOR

N. M. Langdon
by Johnson & Johnson

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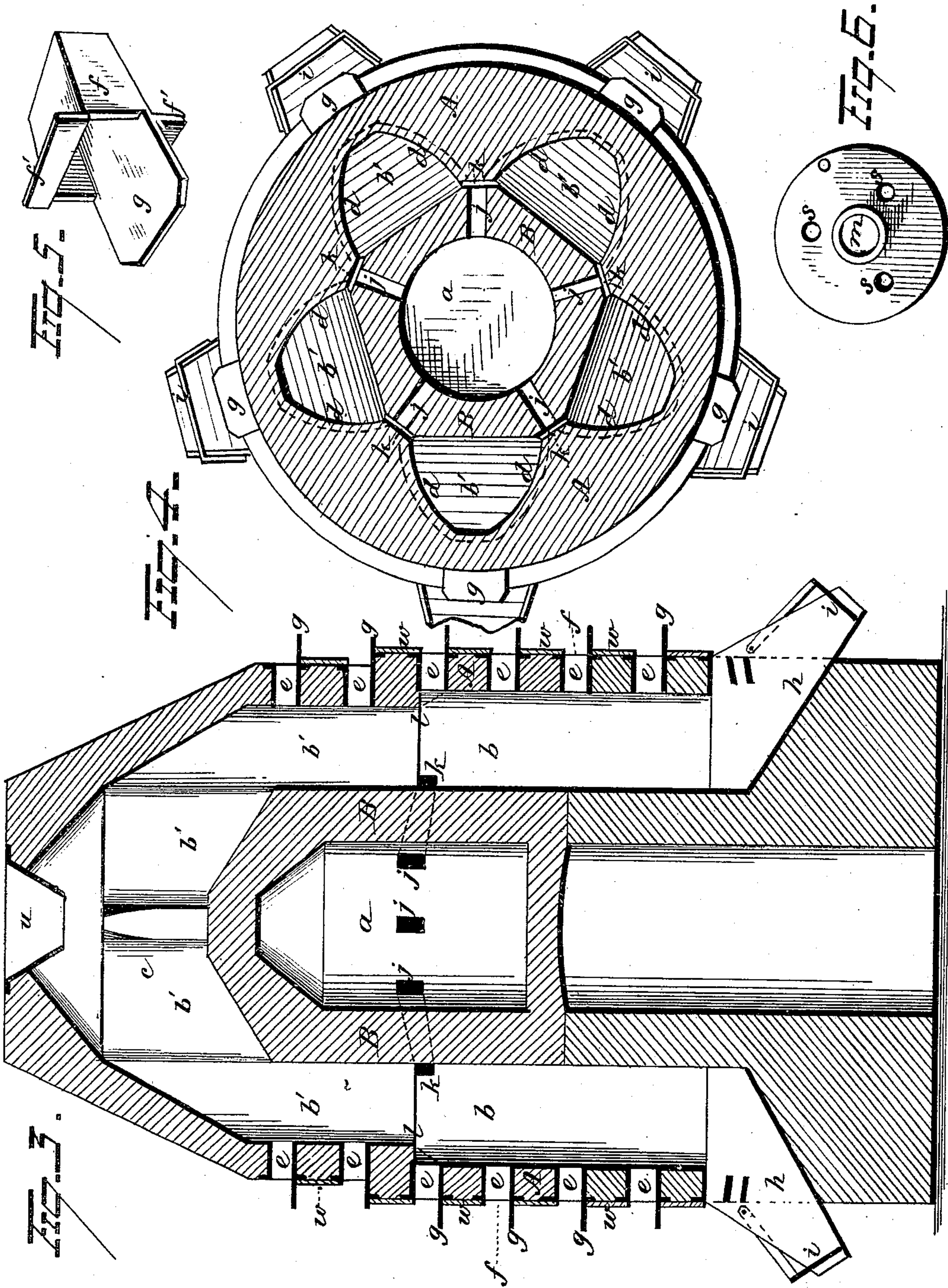
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Furnace for Roasting Ores.

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INVENTOR

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UNITED STATES PATENT OFFICE.

NELSON M. LANGDON, OF CHESTER, NEW JERSEY, ASSIGNOR OF THREE-
FOURTHS TO WM. J. TAYLOR, OF SAME PLACE.

FURNACE FOR ROASTING ORES.

SPECIFICATION forming part of Letters Patent No. 241,227, dated May 10, 1881.

Application filed January 17, 1881. (Model.)

To all whom it may concern:

Be it known that I, NELSON MILTON LANGDON, a citizen of the United States, residing at Chester, in the county of Morris and State of New Jersey, have invented new and useful Improvements in Furnaces for Roasting Ores, of which the following is a specification.

The style and kind of furnace or kiln which I have improved is that patented to W. J. Taylor, October 9, 1877; for roasting or calcining iron or other ores for the elimination of sulphur and the oxidation of the ore, the operation being continuous, with gas as the fuel, and in which an elevated central combustion-chamber communicates with separate surrounding ore-oxidizing chambers.

My improvements are the result of experience in working this kiln, and by them the cost of construction and the cost for repairs is greatly reduced and the capacity of the kiln is greatly increased; the working and drawing of the ore under treatment are rendered more uniform and much less difficult; a more thorough and even roasting of the ore is effected; the combustion is made more perfect by a more thorough mixture of the gas and air before entering the combustion-chamber, and thereby a more thorough and rapid oxidation of the ore; and, finally, by my improvements the kiln is adapted in a more satisfactory manner not only for the elimination of sulphur and the rapid oxidation of the ore, but for the elimination of any volatile substance from any ores or minerals which can be effected by heat, as in the burning of limestone, &c. In fact, a kiln constructed with the ore-oxidizing chambers and the working-openings, as I have devised them, increased the product from thirty to fifty tons in the same time over a Taylor kiln of the same size and number of chambers, by reason of the increased facilities of my kiln for working and dropping of the ore under a more evenly roasting heat.

Referring to the accompanying drawings, Figure 1 represents a vertical section of a furnace or kiln embracing my invention; Fig. 2, a horizontal section of the same, taken on a line with the gas and air injecting pipe; Fig. 3, a vertical section of the kiln, taken through two of the ore-chambers; Fig. 4, a horizontal sec-

tion taken on a line with the flues in the walls of the combustion-chamber; Fig. 5, a detail of one of the metallic rest-boxes for the working-openings, and Fig. 6 a detail of the air-register.

The combustion-chamber *a* is centrally located within and near the top of the kiln; and the ore-oxidizing chambers *b* are formed by the wall *A* proper of the kiln and the wall *B* of the combustion-chamber. These chambers *b* extend from the bottom chutes and merge into the top feeding-chamber, *c*, of which the top of the combustion-chamber forms the bottom. These ore-oxidizing chambers approximate in cross-section a semicircle or the letter *V*, and are formed by corrugations or scallops on the inner side of the outer wall, *A*, which has a thickness sufficient to bring the inner joining sides or angles of said chambers against the outside of the wall of the central combustion-chamber, which, between said joining angles, is preferably made flat. These chambers are thus constructed for two important purposes: the formation of flaring sides *d d* and the placing of the working-openings *e* in the outer meeting angles of these flaring sides. A peculiarity of these working-openings is that their sides flare outward, and are therefore reversed in their relation to the inward-flaring sides of the ore-oxidizing chambers, so that the flaring sides of these chambers are, for working purposes, practically in line with the flaring sides of the working-openings, while giving a comparatively narrow throat to said openings. This construction is productive of highly important results in permitting, from comparatively small working-openings, arranged at the outer joining angles of the flaring sides of the chambers, easy access, horizontally and vertically, with a bar or iron to every part of the chambers for properly working the ore and breaking down clinkers, and necessarily produces more even roasting, for it will be seen that the outward-flaring sides of the openings allow the iron to be introduced and worked along the inward-flaring sides of the chambers. The forming of these small openings just at the meeting angles of the chambers give unbroken walls to their sides, as wall arches are not necessary, and no irregularities are presented upon which the ore can lodge or hang in its descent; but

its dropping is rendered even, the wear of the walls from the working-irons is reduced to a minimum, and the durability of the furnace greatly increased. In this way a single line of working-openings is more effective than two rows, lessens the number of wall-openings, and to such extent diminishes the catching of the ore within said openings. The smallest area of these openings is at the meeting angles of the flaring sides, their largest area being at the outside of the furnace-wall. The sides of these openings are thus brought alternately in line, or nearly so, with the flaring sides of the ore-oxidizing chambers, giving the good results in working before stated.

The working-openings *e* are formed a suitable distance apart, and are provided with protecting metal boxes *f*, having rests *g* projecting from the wall for supporting the bar or iron introduced through said openings for working the ore and breaking down clinkers. They may be provided with doors or closed by a brick.

The ore-oxidizing chambers are provided with chutes *h*, suitably arranged with gates *i* and grate-bars for properly drawing the ore. The products of combustion pass from the combustion-chamber through the flues *j* into the ore-oxidizing chambers at the junction of the inner angles of the flaring sides *d d* with the wall of said combustion-chamber, such inner angles being cut away at *k* to give a free exit for the hot gases directly into two ore-chambers and outward beneath the overhanging offset along their flaring sides. The issuing of the hot gases at points around the outer side of the combustion-chamber gives a better and more rapid distribution of the heat within the ore-oxidizing chambers than if the gases issued at points farther away from the combustion-chamber. From a horizontal line above these flue-openings *k*, which are arranged about midway between the top and bottom of the combustion-chamber, the ore-oxidizing chambers are of less area in cross-section, and the walls of this part form an overhanging wall part or offset, *l*, which, in effect, forms a cover for the flue-openings *k*, and, extending over the sides of the chambers, from one flue-opening to the other, forms a circulating-flue beneath said offset, as indicated by dotted lines in Fig. 4, so as to direct the hot gases outward into the chambers and up through the ore. As the overhanging wall part or offset *l* joins the outer side of the combustion-chamber just above the flue-openings *k*, the latter are thereby covered and protected from being choked with ore.

Gas for combustion is admitted under pressure to the combustion-chamber by the injector-pipe *m*, which leads from the producer or generator. The wall-opening into which this injector enters passes through the solid joining of the outer wall with the combustion-chamber, and is of peculiar form, having a long narrow throat, *n*, and an expanded entrance, *r*, which is provided with a register or valve, *s*, which

surrounds said pipe, and is supported by a cover for said entrance, through which the supply-pipe enters centrally. The end *m'* of the injector-pipe *m* is nozzled or contracted, and extends a distance into the expanded entrance *r*, to form, in connection with the surrounding space *s'* and the entrance to the throat *n*, the injector, the action of which gives the proper supply of gas and air to the combustion-chamber. The forcible injection of gas through the nozzled pipe *m* sucks or draws with it through the register and space *s'* a supply of air which is regulated by said register for the proper combustion of the gas. In the passage of the gas and air into and through the long narrow throat *n* they are thoroughly mixed and intermingled before entering the combustion-chamber, thus producing a perfect combustion within the combustion-chamber, and hence requiring less gas to produce the heat required. As this combustion takes place within the combustion-chamber the deleterious effect of introducing partially-combusted gases into the ore-oxidizing chambers is obviated, for partially-combusted gases have a reducing instead of an oxidizing effect upon the ore.

The ore is introduced through a hopper, *u*, into the top feeding-chamber, *e*, from which the roasting-chambers *b* are supplied, as the roasted ore is worked down and drawn at the chutes. The sulphurous gases pass out the chimney *v* at one side of the top chamber. The protecting-boxes *f* for the working-openings are secured therein by the binding-bands *w*, placed around the kiln, and lying over top and bottom lips, *f'*, Fig. 5, of said boxes, so that these boxes may be easily removed when worn out. The rest for the working-bar is an extension of the bottom plate of said box, and is important in affording facilities for the more convenient manipulation of the working-iron.

I have stated that the ore-oxidizing chambers merge into the top feeding-chamber, and I mean by this that the corrugations or scallops in the outer wall extend above the combustion-chamber and open into and around the top feeding-chamber, thereby giving smooth-walled inlets *b'* to the oxidizing-chambers, and an unobstructed passage of the ore from said feeding-chamber into the oxidizing-chambers, and renders the descent of the ore more certain, because there are no wall-arches in these chambers above the point at which the ore is brought to an intense heat from the hot gases issuing from the distributing-flue formed by the wall-offset. The gas and air supplying inlet passes through the solid joining of the outer wall and enters the side of the combustion-chamber below the flame-discharging flues, thus being less liable to choke with dust or ashes carried in by the gas, and affording better facilities for cleaning than when entering at the bottom of said chamber, as in said Taylor patent. A kiln thirty-three feet high and sixteen feet in diameter will give seven oxidizing-chambers, with an average product of fifty tons in twenty-four

hours—a result due to the facilities afforded for working the ore, the introduction of the hot gases into the ore at the wall of the combustion-chamber, and the construction which gives a free and uniform feed of the ore into the oxidizing-chambers.

The chemical process by which the elimination of the sulphur from the ore is effected is explained in the patent referred to, and the operation therein described is the same as practiced in my improved furnace.

The gas in the combustion-chamber may be ignited by inserting a lighted taper or piece of waste through the register-openings.

I claim—

1. An ore-roasting kiln having the wall thereof corrugated or scalloped on the inner side to form ore-chambers, with sides flaring to their junction with the wall of the combustion-chamber and from the working-openings of said chambers, substantially as described, for the purpose specified.

2. An ore-roasting kiln or furnace provided with chambers formed by corrugations or scallops within the kiln-wall, which have their sides flaring to their junction with the wall of the combustion-chamber, and provided with the working-openings at the outer meeting angles or junction of said flaring sides, having their sides flaring outward in the relation to the chamber sides, substantially as described, for the purpose specified.

3. An ore-roasting kiln or furnace having the ore-chambers formed by corrugations provided at their junction with the outer side of the combustion-chamber, with openings *k* in the described relation to the outlets of the flues *j* in the combustion-chamber, and the overhanging wall part or offset *l* in said ore-chamber, substantially as described, for the purpose specified.

4. In an ore-roasting kiln, the combination, with an elevated central combustion-chamber and the top ore-feeding chamber, of the ore-oxidizing chambers formed by corrugations or scallops in the kiln-wall, extended above said combustion-chamber and opening into the top ore-feeding chamber, with smooth and unobstructed walls, substantially as described, for the purpose specified.

5. A calcining-kiln having a central elevated combustion-chamber and a series of surrounding ore-oxidizing chambers, constructed substantially as herein described, and provided with the wall-inlet *n r*, formed in the walls *A B* at their junction, and in the described relation with the radial flues *k*, and the gas-injecting pipe entering said wall-inlet, as described, for the purpose specified.

6. The ore-roasting furnace or kiln herein described, consisting of the series of ore-chambers *b b'*, formed by corrugations or scallops within the outer wall having inward-flaring sides, *d d*, and the openings *k* at the junction with the wall of a central combustion-chamber, and with the flue-outlets *j* thereof, the working-openings *e* at the outer meeting angles of said flaring sides having their sides flaring outward and their least area opening into said chambers, the wall-offset *l*, covering said flue-openings *k*, and the gas and air injector having the relation to the wall-inlet *n r* and the air-register substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

N. M. LANGDON.

Witnesses:

A. E. H. JOHNSON,
J. W. HAMILTON JOHNSON.