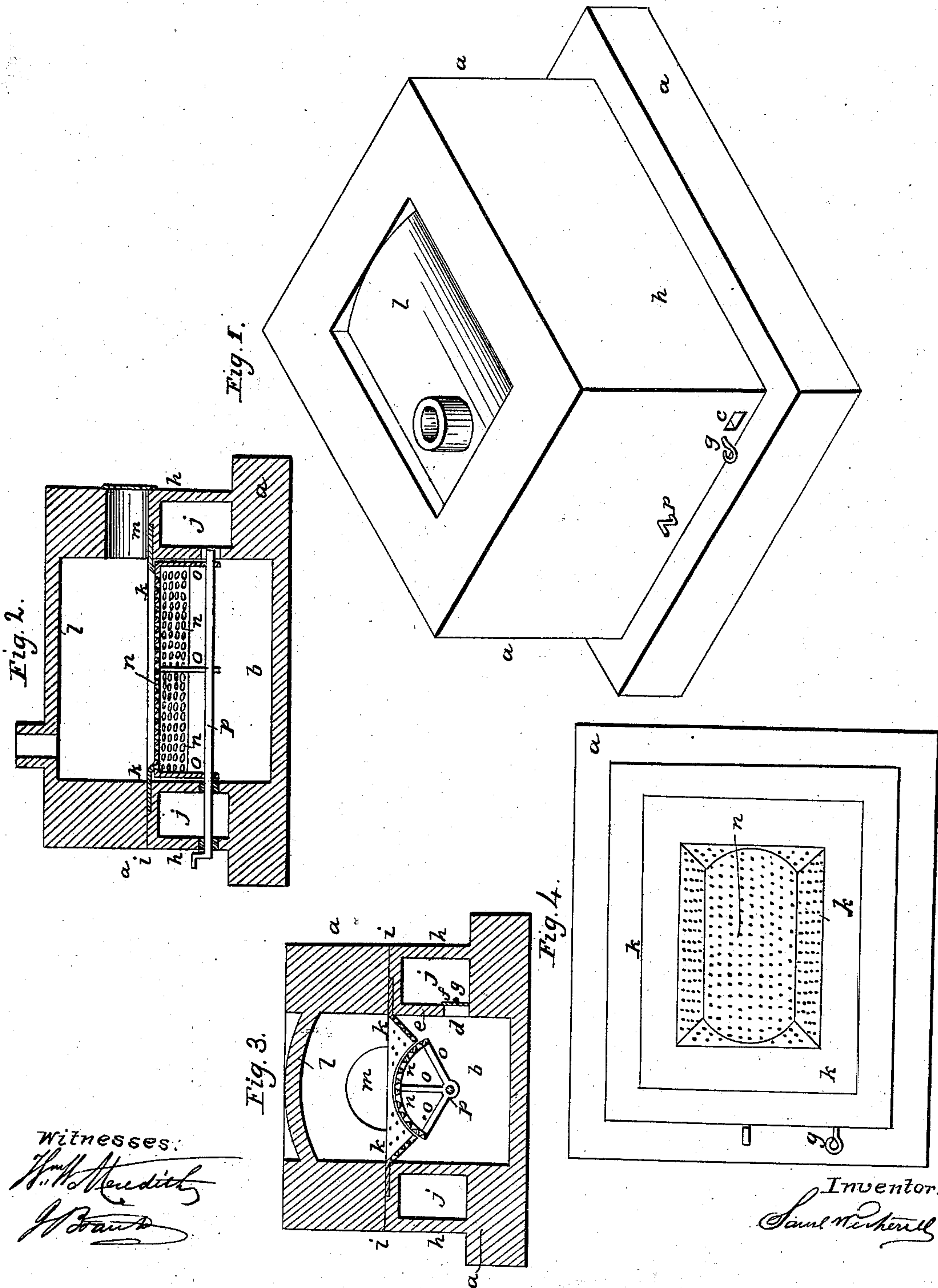


S. WETHERILL.
Making White Zinc.

No. 15,830.

Patented Sept. 30, 1856.



Witnesses:
H. H. Hendrich
J. Brown

Inventor:
Saml Wetherill

UNITED STATES PATENT OFFICE.

SAMUEL WETHERILL, OF BETHLEHEM, PENNSYLVANIA.

IMPROVEMENT IN FURNACES FOR ZINC-WHITE.

Specification forming part of Letters Patent No. 15,830, dated September 30, 1856.

To all whom it may concern:

Be it known that I, SAMUEL WETHERILL, of Bethlehem, in the State of Pennsylvania, have invented certain new and useful Improvements in Furnaces for the Production of the White Oxide of Zinc by the Direct Admixture of the Ore with the Fuel, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of the furnace; Fig. 2, a longitudinal vertical section in the plane of the axis of the grate; Fig. 3, a vertical cross-section, and Fig. 4, a horizontal section taken above the grate and bed of the furnace.

The same letters indicate like parts in all the figures.

In the process of manufacturing the white oxide of zinc by the admixture of the ore with the fuel invented by me, and for which I have heretofore made application for the grant of Letters Patent, I discovered that for the practical working of that process it was necessary to have the bed of the furnace on which the charge of mixed ore and coal is put perforated with numerous small holes leading to a blast-chamber below, so as to subdivide the forced blast of atmospheric air, and thus produce a multiplicity of blow-pipes, each concentrated upon a small proportion of the charge to effect the combustion of the coal at an intensity sufficient to decompose the ore and vaporize the metallic ingredient, and to furnish a supply of atmospheric air sufficient not only to produce the required intensity of combustion, but to reoxidize the zinc as it is given out in the form of vapor; and I also discovered that it was necessary to the practical working of this process that the formation of slag to any considerable degree on the surface of the perforated bed should be prevented.

In view of the process to be worked and the effects required to be produced, my invention consists in making the whole or a part of the bed of the furnace so that it can be vibrated during the working of the furnace to prevent slag from forming and adhering to the bed of the furnace.

My said invention does not consist simply in making the whole or a part of the bed of a

furnace so that it can be vibrated, as the grate for the fire-place of a stove or furnace made to vibrate for loosening the clinker has long been known, but my said invention consists in giving a vibratory motion to the whole or part of the bed of a furnace used for the manufacture of the white oxide of zinc by the direct admixture of the ore and fuel placed on a bed perforated with numerous small holes, and combined with a forced blast, which passes to the mixed ore and fuel in numerous small forced jets to effect the combustion of the fuel, the decomposition of the ore, the vaporization of the zinc, and the oxidation of the vapor thus evolved.

In the accompanying drawings, *a* represents the body of the furnace in which the process is to be worked, and *b* the air-chamber below, in which a forced blast of atmospheric air is to be introduced from some suitable blower through an aperture, *c*, in the front wall, and entering the air-chamber *b* through an aperture, *d*, in the side wall *e*, governed by a sliding damper, *f*, operated by a rod, *g*, which projects in front. The walls *h h* from the foundation up to the line *i* may be double, with an air-space, *j*, between them, and at the top of these walls, at the level of the line *i*, is placed a metal plate, *k*, which forms part of the bed of the furnace. Over the edges of this plate the side and end walls are carried to the required height to form the body of the furnace, which is arched over, as at *l*, leaving an aperture, *m*, to carry off the products, as may be required. The metal plate or part of the bed *k* inclines downward for a short distance at an angle of about forty-five degrees from the side and end walls, the lower edge of the sides being parallel and the ends presenting segments of circles to correspond with the upper surface of a plate, *n*, which is placed under the inclined sides of the plate *k*. This plate *n* is in the form of a segment of a cylinder extending the whole length of the inside of the furnace, and its inner periphery is secured to arms *o*, projecting radially from a horizontal shaft, *p*, hung in suitable boxes in the end walls, one end of the shaft extending through the front wall and there provided with a crank-arm to receive a connecting-rod from some suitable motor by which it can be vibrated during the working of the furnace. The vi-

bration should be very small—say about one-quarter of an inch at the periphery of the cylindrical plate *n*.

In a suitable establishment for the manufacture of the white oxide of zinc several furnaces can be erected in a line side by side, so that all the crank-arms can be operated by one connecting-rod from the steam-engine employed for working the blowers. When the cylindrical plate *n* is in place, its outer periphery will just work freely under the edges of the inclined parts of the plate *k*, and these together constitute the bed of the furnace, and should be perforated all over with holes of about one-quarter of an inch in diameter at the upper surface and larger below, and about one inch apart from center to center. It is important to make the holes conical and smaller at top than at bottom to prevent clogging.

In starting the furnace a thin layer of anthracite coal, of the size known as "chestnut-coal," is laid on the perforated bed and ignited, and then a layer of mixed coal and ore put on top to the depth of about three inches.

The manner of preparing and working the charge is to be conducted as fully described in my application for a patent for the process of manufacturing the white oxide of zinc, and as is well known to the manufacturers of the white oxide of zinc, having been practiced extensively at Bethlehem, Pennsylvania. During the working of the charge the blast of atmospheric air must be continued, and the shaft vibrated to keep the plate *n*, on which the main part of the charge rests, in motion,

the effect of which will be to prevent slag from forming and uniting on the surface of the perforated bed, and thus keep the perforations clear for the free passage of the blast. In this way the serious inconveniences arising from the accumulation of slag and its adhesion to the perforated bed is avoided.

The perforated plates *k* and *n*, constituting the bed of the furnace, may be made of series of perforated bars fitted side by side; and although I have made them of metal, I do not wish to confine myself to metal, as other refractory substances may be substituted.

It will be obvious that instead of making the vibratory part of the perforated bed in the form of a segment of a cylinder it can be made flat and vibrated in a horizontal plane instead of a cylindrical plane; but I do not claim such form.

What I claim as my invention, and desire to secure by Letters Patent, is—

Making the whole or a portion of the bed of the furnace to vibrate for the purpose and in the manner substantially as described, but this I only claim when the bed is perforated with numerous small holes, and when used in combination with a forced blast of atmospheric air, which passes to the charge of mixed ore and fuel in numerous small forced jets, substantially as and for the purpose specified.

SAML. WETHERILL.

Witnesses:

WM. W. MEREDITH,
J. S. RAUCH.