

S. WETHERILL.
Making White Zinc.

No. 13,806.

Patented Nov. 13, 1855.

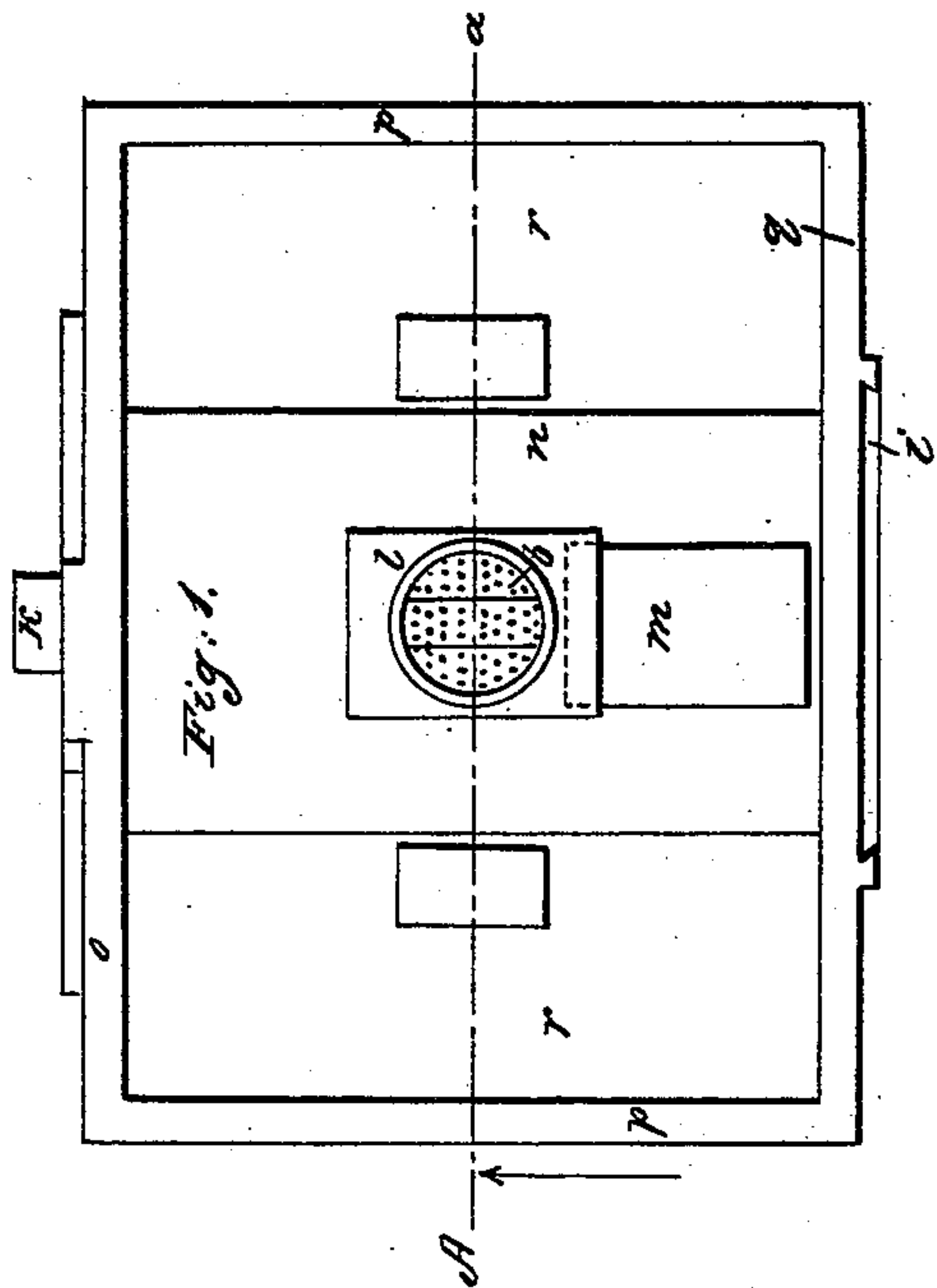


Fig. 2.

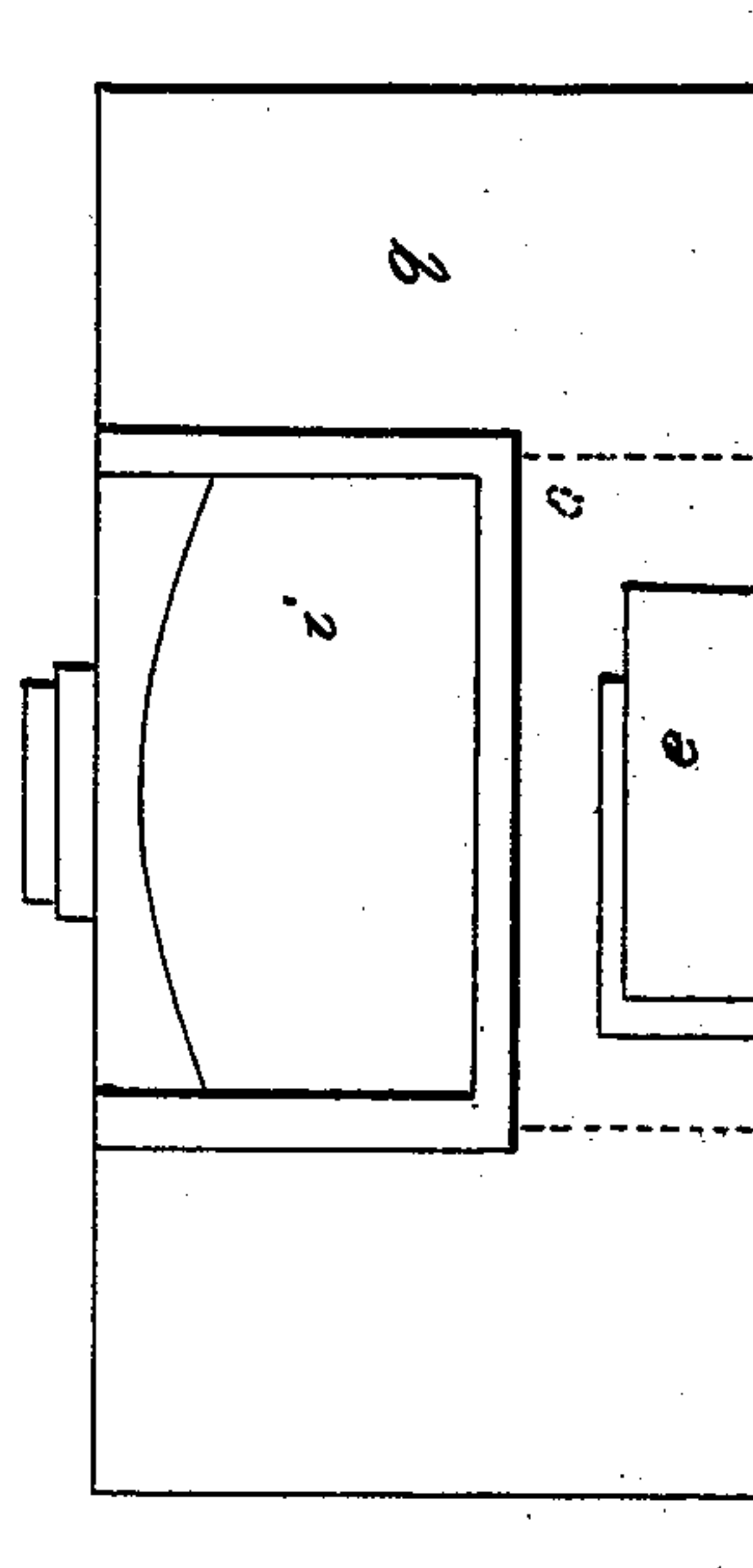


Fig. 3.

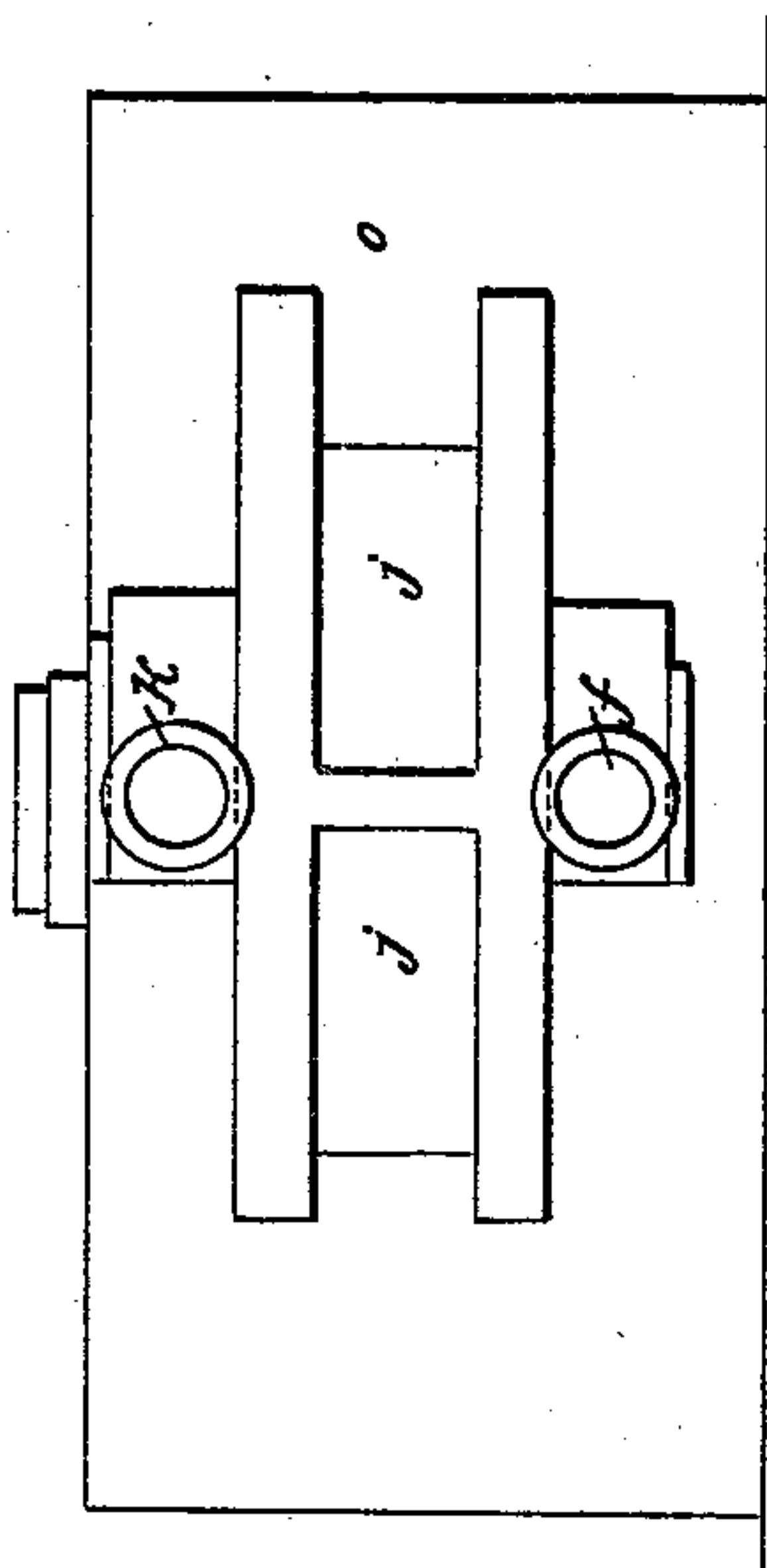
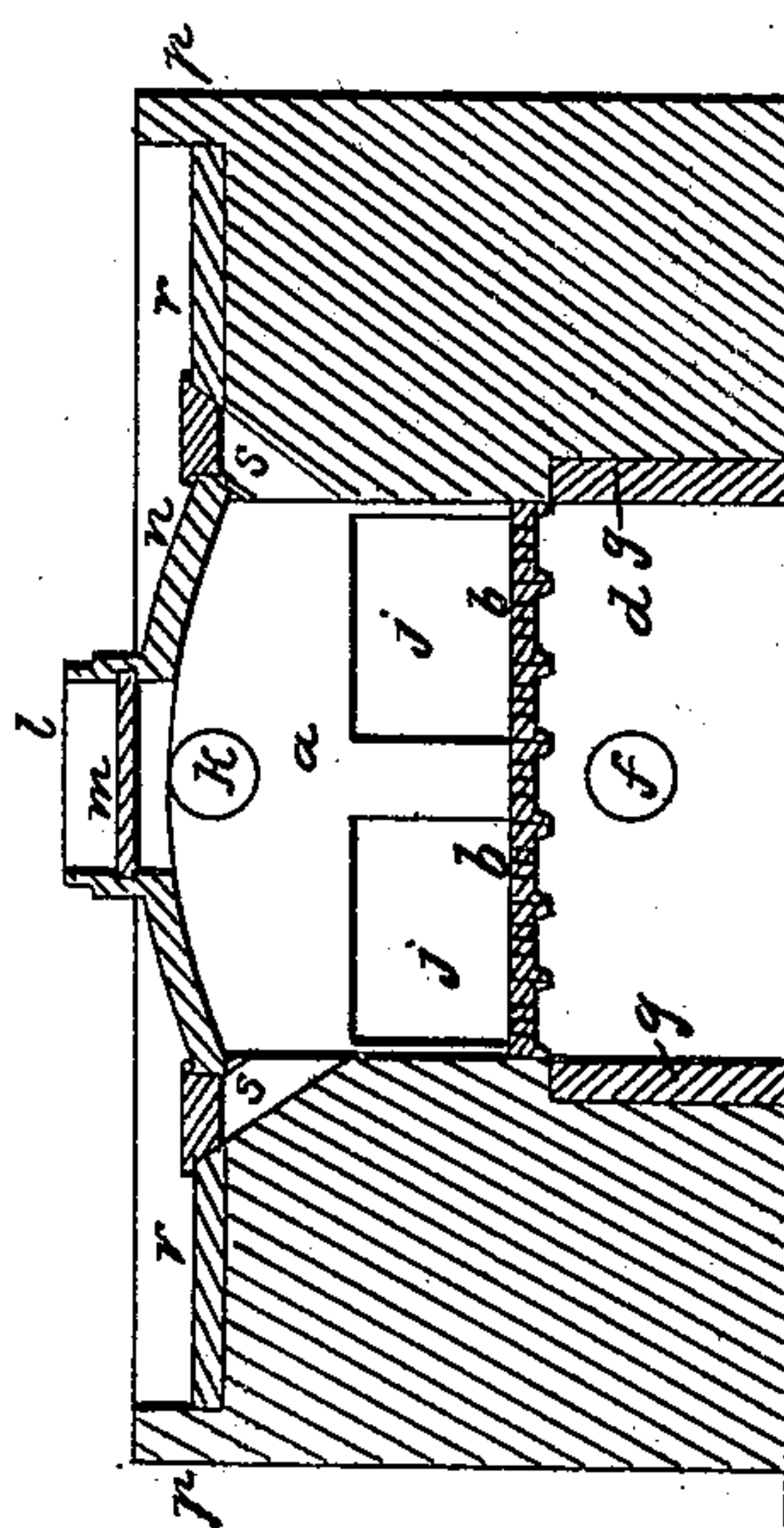


Fig. 4.



UNITED STATES PATENT OFFICE.

SAMUEL WETHERILL, OF BETHLEHEM, PENNSYLVANIA.

IMPROVEMENT IN PROCESSES FOR MAKING ZINC-WHITE.

Specification forming part of Letters Patent No. **13,806**, dated November 13, 1855.

To all whom it may concern:

Be it known that I, SAMUEL WETHERILL, of Bethlehem, in the State of Pennsylvania, have invented a new and useful Improvement in the Process of Reducing the Ores of Zinc and Producing Therefrom the White Oxide of Zinc; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan of the furnace; Fig. 2, a front elevation; Fig. 3, a back elevation, and Fig. 4 a vertical section taken at the line A *a* of Fig. 1.

The same letters indicate like parts in all the figures.

The process heretofore practiced for the production of the white oxide of zinc from the ores of that metal is to pulverize the ore and put it into muffles or retorts mixed with coals or carbonaceous matter, which muffles or retorts are then heated on the outside for the purpose of roasting or deoxidizing the ore to liberate the metal, and then to vaporize the metal which escapes in the gaseous form from the neck or prolongation of the muffles or retorts to unite with oxygen and form the white oxide of zinc, sometimes termed the "flowers of zinc." The objection to this process is the great consumption of fuel and the waste of zinc, together with the rapid destruction of muffles or retorts. The great and wasteful consumption of fuel and the destruction of muffles or retorts arise from the fact that the heat required to be imparted to the charge of mixed ore and coal or other carbonaceous matter to effect the decomposition of the ore and the evaporation of the metal must be transmitted by the fuel outside through the substance of the muffles or retorts and the entire bulk of the charge.

The object of my said new process is mainly to economize fuel and avoid the expense of muffles or retorts, while at the same time I am enabled to work off a greater proportion of the zinc than by the old process; and to these ends my said invention consists in producing the white oxide of zinc from the ores of zinc by the direct application of the fuel to the ore in the crushed state, and in admixture therewith in combination with a blast of atmos-

pheric air introduced in numerous small jets to the charge of mixed ore and fuel in a thin layer, whereby the carbon and heat required for the decomposition of the ore and the heat required for the evaporation of the metal are all derived from the coal or other carbonaceous matter in admixture with the ore, while the blast of atmospheric air supplies the oxygen required for the combustion and for the oxidation of the metallic vapors.

The ore—such as the red oxide of zinc—is pulverized by grinding or pounding, and mixed with fine anthracite coal, known as "pea-coal," in about the proportion of two thousand pounds of ore to five hundred pounds of coal.

The furnace in which I have worked my said process with success is represented in the accompanying drawings, in which *a* is the main chamber, the bottom *b* of which is composed of iron bars perforated with small holes of about one-quarter of an inch in diameter and about one inch apart, and I prefer to make them slightly conical, with the larger diameter downward. The size of the holes should be such as to prevent the crushed ore and coal from falling through. These perforated bars are suitably sustained at the ends on the front and back wall, *c d*. The ash-pit below the perforated bottom is of equal area therewith, and is provided with a door, *e*, in front, and with a hole, *f*, at the back, for the reception of a pipe from some suitable blowing apparatus. The walls *g g* and arch or top *h* should be built of some refractory substance—such as fire-brick. The front is entirely open and provided with sliding doors *i*, by which it can be closed when working the process, or opened to remove the residuum, and at the back there are two sliding jambs *j j*, to give access to the main chamber for stirring the charge and for inspection. At the back, near the arch, there is a hole, *k*, governed by a sliding damper leading to a chimney for carrying off smoke and impure gases in beginning of the operation on a new charge. In the center of the roof there is an aperture, *l*, governed by a damper or sliding door, *m*, leading to a suitable apparatus for the collection of the white oxide of zinc. The exterior walls, *n o p q*, may be built above the top, to form two feeding-troughs, *r r*, one on each side of the arch or roof, and provided each

with an aperture or passage, *s*, leading to the inside or main chamber, and each aperture or passage is provided with a cover, to be put on after the furnace has been charged.

A fire is first made of what is termed "chestnut-coal" in a thin layer well spread over the entire bed, and when kindled the charge of mixed ore and coal, prepared as above specified, is put on and spread evenly over the fire to the depth of about three inches. The charge is put on from the troughs *r r*, let down through the apertures or passages *s s*, and well spread, and then the passages closed. The sliding doors in front are closed, the aperture *l*, leading to the collecting chamber or apparatus, is closed, and the hole *h*, leading to the chimney, opened, and the blast applied; and so soon as the gases evolved from the charge appear of a pale green color, which indicates that the charge is giving off vapors of zinc, the aperture leading to the chimney is closed and the one leading to the collecting apparatus opened. The blast of atmospheric air is continued and the charge is occasionally stirred, and when the charge has given off the zinc, but before the fire is too much reduced, the attendant with a poker or iron bar loosens and removes a light spongy-like residuum or cinder from the sur-

face of the perforated bed, leaving the ignited coal, on which a fresh charge of mixed ore and coal is again put and worked in like manner.

I do not in this application claim the construction or application of the furnace so constructed to the working of the ores of zinc for the production of the white oxide of zinc, as it is my intention to make such claim in another application for Letters Patent. Nor do I limit my claim to the working of my improved process in a furnace of the special construction herein specified, having simply described this construction of furnace as the one in which I have successfully worked my said process.

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

The process of producing the white oxide of zinc from the ores of that metal by the direct application of the fuel to the ore in the crushed state, and in admixture therewith in combination with a blast of atmospheric air introduced in numerous small jets to the charge of mixed ore and coal in a thin layer, substantially as specified.

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Witnesses:

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CHAS. N. BAMBURGH.