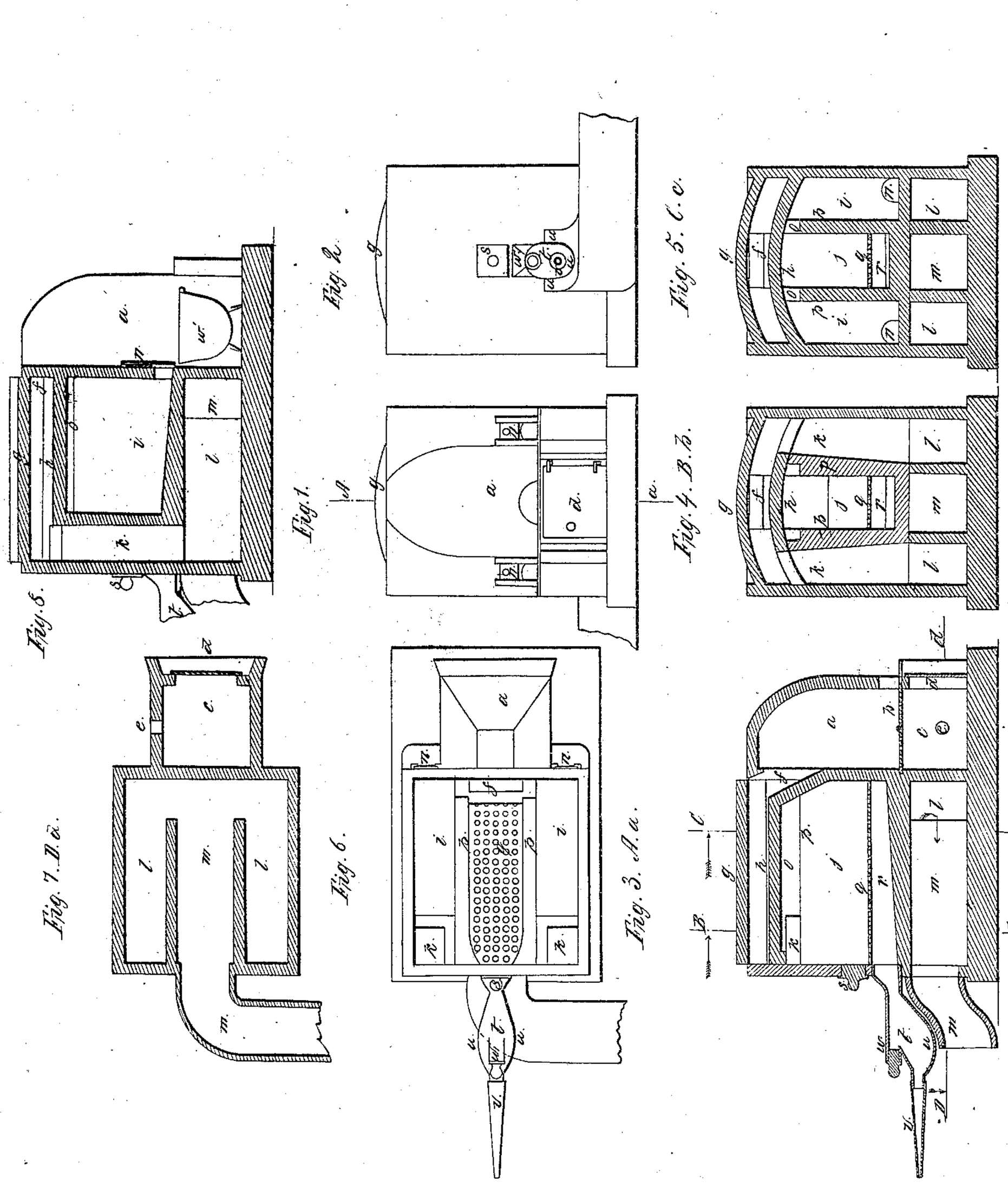
S. WETHERILL.

METHOD OF OBTAINING METALLIC ZINC FROM THE ORES OF ZINC.

No. 16,362. Patented Jan. 6, 1857.



Witnesses:
Wm H Bishop
Andrew De Lacy

Inventor:
Samuel Wetherill

UNITED STATES PATENT OFFICE.

SAMUEL WETHERILL, OF BETHLEHEM, PENNSYLVANIA.

IMPROVEMENT IN PROCESSES FOR REDUCING ZINC ORES.

Specification forming part of Letters Patent No. **16,362,** dated January 6, 1857.

To all whom it may concern:

Be it known that I, SAMUEL WETHERILL, of Bethlehem, in the State of Pennsylvania, have invented a certain new and useful Improvement in the Method of Obtaining Metallic Zinc from the Ores 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 front elevation; Fig. 2, a back elevation; Fig. 3, a longitudinal vertical section taken at the line A *a* of Fig. 1; Figs. 4 and 5, cross vertical sections taken at the lines B *b* and C *c* of Fig. 3; Fig. 6, a top view with the two arches removed to exhibit the several chambers and some of the flues; Fig. 7, a horizontal section taken at the line D *d* of Fig. 3, and Fig. 8 is a section of one of the muffles to represent the manner of obtaining when treating the mixed ores of zinc and lead.

The same letters indicate like parts in all the figures.

The object of my invention is to obtain metallic zinc directly from the ores of that metal alone or mixed with the ores of other metals; and my said invention consists in causing the metallic vapors of zinc when driven off from the ore or ores by heat to pass through a charge of heated or incandescent coal or other carbonaceous matter in an oven or chamber from which atmospheric air is excluded.

The construction of furnace which I have invented and applied for the working of my improved process is represented in the accompanying drawings, in which *a* is a fire-chamber with a grate or perforated bed, *b*, and ash-pit *c* below, provided with a door, *d*, in front and a hole, *e*, at the side for the entrance of air to supply combustion. From the upper parts of this fire-chamber a flue, *f*, rises, which communicates with a space between two arches, *g* and *h*, the one, *g*, constituting the top of the furnace, and the other, *h*, the top or cover of two muffles, *i i*—one on each side—and a deoxidizing-chamber, *j*, in the middle; and the arch *h* is pierced at the two back corners that the products of combustion, after passing between the two arches, may divide and pass down two diving-flues, *k k*, at the back corners, and these flues in turn communicate with horizontal flues *l l*, one under each of the muffles *i*, and these two in turn communicate with a central return-flue, *m*, leading to a suitable chimney. The muffles *i i* are inclosed on all sides except a feeding-door, *n*, in front for the introduction of and access to the charge, and a long, narrow passage, *o*, between the arch *h* and the upper edge of the walls *p p*, which separate each of the muffles from the deoxidizing-chamber *j;* and the said deoxidizing-chamber *j* is open along the upper edge of its side walls, as already explained, and it is provided with a perforated bed, *q*, and a channel-way, *r*, below the perforated bed. Access is given to this deoxidizing-chamber through a door, *s*, at the back, and the channel-way *r* below communicates at the back with a condenser, *t*, into which the metallic zinc is collected from the channel-way. This condenser is curved at bottom and sides, as at *u*, to give it capacity, and the extremity of it is provided with a prolong, *v*, having a small hole in the extreme end, and above this prolong there is a short tube, *w*, provided with a stopper placed in line with the aperture or neck, which communicates with the channel-way, so that by removing the stopper access may be given to the neck and channel-way for the purpose of inserting a rod to keep the passage clear when necessary. The condenser is placed over the flue *m*, which leads to the chimney, to keep it at a temperature sufficiently high to prevent the metallic zinc from solidifying. The ores of zinc to be treated are pulverized or ground and calcined, but without a flux, simply to expel moisture and such impurities as will be driven off by heat alone; and then it is mixed with about one-half its weight of fine coal or other carbonaceous matter.

The furnace having been heated by a suitable fire in the fire-chamber *a*, excited either by draft or blast, the deoxidizing-chamber is charged with chestnut size anthracite coal, charcoal, or coke, or other suitable carbon. I prefer to fill it from the perforated bed to the top of the side walls. The coal in this oven-like chamber is heated to an incandescent state by the fire in the fire-chamber and the passage of the products of combustion around it. The mixed ore and coal is charged to the depth of about twelve inches in each of the muffles, and when so charged the doors should be closed and luted to exclude atmospheric air as much as possible. The heat applied

by the products of combustion from the fire-chamber *a*, passing over and under the muffles, decomposes the ore and vaporizes the metal, and the vapors thus given off pass over into the deoxidizing-chamber and through the charge of incandescent coal or other carbon, which takes up any oxygen which may have been or which might be taken up by the vapors of zinc before they reach the channel-way *r*, where they are condensed to the metallic state and run into the condenser from which the metal is taken out with a ladle. During the working of the charge the prolong *v* is kept on the condenser, and at the extreme end this prolong is pierced with a small hole for the escape of foreign gases, which are not taken up by the carbon, and thus relieve the apparatus from pressure. The aperture should be large enough to relieve the pressure and not large enough to permit the entrance of atmospheric air.

If desired, the condenser may be tapped in the lower part for the more convenient discharge of the metal at *u*.

When metallic zinc is to be obtained from the ores of zinc mixed with lead ore, I make the bed of the muffles inclining downward toward the doors, as represented in the separate figure, 8, and discharging into a pot, *w'*, near the door, into which the molten lead runs. This pot should be covered to prevent the charge of ore and coal from falling into it. In this way I am enabled to obtain metallic zinc and metallic lead from the same charge and with the same fuel; and although I have described and represented a form of furnace in which to work my improved process, and which I have found to answer a good purpose, I do not wish to be understood as limiting my claim of invention to the working of the process in such a furnace, as other equivalent furnaces may be found to answer the purpose. I do not claim the said charcoal or carbonaceous matter for condensing in or upon it the said zinc vapor.

What I claim as my invention, and desire to secure by Letters Patent, in the process of obtaining metallic zinc directly from the ores of zinc, is—

Causing the metallic vapors of zinc driven off from the ore by heat to pass through a charge of heated or incandescent coal or other carbonaceous matter, substantially as and for the purpose specified.

SAML. WETHERILL.

Witnesses:

ALEX. PORTER BROWNE,

JAS. J. MAPES.