J. G. TROTTER.

CONSTRUCTION OF FURNACES FOR ZINC WHITE.

No. 12,333. PATENTED JAN. 30, 1855.

fig 2

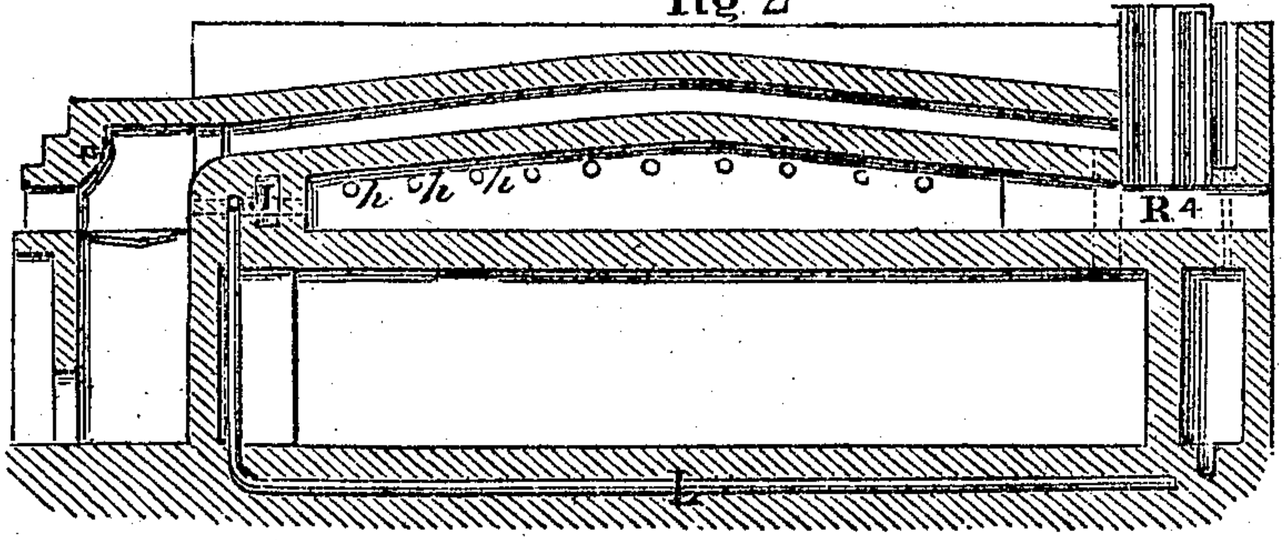
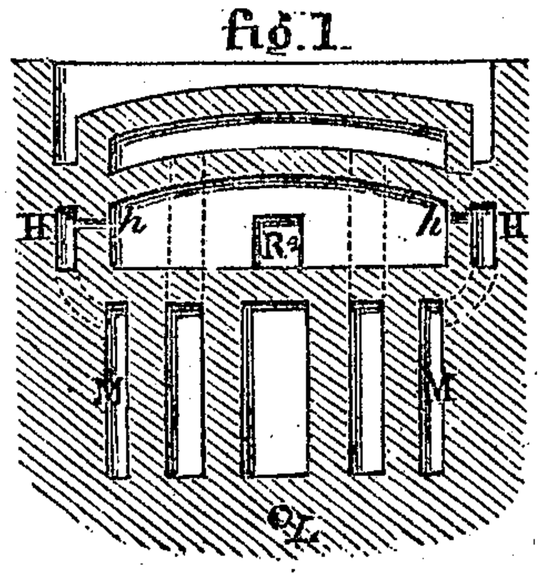


fig. 1



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UNITED STATES PATENT OFFICE.

JONATHAN G. TROTTER, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN THE CONSTRUCTION OF FURNACES FOR ZINC-WHITE.

Specification forming part of Letters Patent No. **12,333**, dated January 30, 1855.

To all whom it may concern:

Be it known that I, JONATHAN G. TROTTER, of Newark, Essex county, and State of New Jersey, have invented a new and Improved Furnace and Method of Manufacturing White Oxide of Zinc from its Ores or Metal; and I do hereby declare the following to be a full description of the same.

The nature of my invention and improvements consists, in the mode of constructing a furnace on the reverberatory plan for working zinc or other ores, so as to introduce into it and the oven a series of jets or small streams of heated atmospheric air or oxygen gas, to fuse or work the ores more perfectly, and also to commingle and diffuse itself as an excess of oxygen throughout the fumes or vapors of zinc as it is liberated from the ores or metals in process of reduction, for the purpose of oxidizing it and converting it into white oxide of zinc.

To describe my invention more particularly I will refer to the accompanying drawings, forming a part of this schedule, the same letters of reference, wherever they occur, referring to the same parts.

Figure 1 is a perspective view of the furnace collecting-chamber and conveying-pipes. Fig. 2 is a longitudinal cut section of the collecting chamber. Fig. 3 is a plan view cut section of the furnace through the line *x x*, Fig. 7. Fig. 4 is a plan view cut section of the furnace through the line x^2 x^2, Fig. 7. Fig. 5 is a plan view cut section of the furnace through the line x^3 x^3, Fig. 7. Fig. 6 is a longitudinal cut section of the furnace through the line x^4 x^4, Fig. 7. Fig. 7 is a transverse cut section of the furnace through the line x^5 x^5, Fig. 6. Fig. 8 is a front elevation of the furnace. Fig. 9 is a plan view of a section of the furnace on a line with the oven-bed.

Letters A A are the walls of the furnace, made of the usual materials for such purposes. B is the fire-place arranged in front of the oven. C is the grate of the furnace, under which is a closed ash-pit, and into which is forced a blast of atmospheric air to support the combustion of the coal on the grate-bars.

Leading from the furnace to the oven are two flues, an upper one, D, and a lower one, E. The upper flue, D, is intended to carry off the lighter gases of the furnace through the flue D^2, made between the upper and lower shell of the arch of the oven, and then down through the flues D^3 D^3 into the flues D^4 D^4, under the bed F of the oven, and running to the front end of the oven, where they unite in a middle flue, D^5, which returns to the back end of the oven and discharges into the chimney G, thus completing the operation of the direct draft to the chimney by the upper flue, D, of the furnace. The lower flue, E, is made branching, and is intended to carry the denser portions of the flame and gases from the furnace over and through the coal and ore mixed on the bed of the oven for the purpose of subliming or liberating in a state of vapor the zinc contained in the ore, and at which point of liberation it is oxidized by the numerous jets or streams of heated atmospheric air or oxygen gas issuing from the perforations *h h*, &c., through the sides of the oven. These perforations pass through the sides of the oven-wall and bridge-wall of the furnace into the chambers H in the side walls of the oven, chamber J in the bridge-wall of the furnace, and chamber K in the side walls of the furnace. These chambers are all independent of each other, except as to the supply air pipe or flue L, made and arranged underneath the chimney-flues D^4 and D^5 in the foundation of the furnace. This pipe or flue L is supplied with a current of atmospheric air by a blower apparatus, and by a triple branch at the front end of the pipe discharges a portion of its volume of air through the branches l^2 l^2 into two side flues, M M, arranged in the same plane with the chimney-flues at the outside and parallel thereto. Through these side flues, M M, the air passes to the back end of the furnace, and thence passes up through openings m^2 m^2 into chambers H H, made and arranged in the side walls of the oven, through which are the apertures *h h*, for discharging the currents of air heated by contact with the walls of the oven.

Letter N is the main stem of the pipe L, binding upward to a level with the bed of the oven, and dividing into four branches, *p p* and *q q*. The branches *p p* supply the chamber J in the bridge-wall of the furnace, through which are a series of perforations to allow it to escape in and over the flame issuing from the furnace, and the branches *q q* supply the chamber K in the wall of the furnace, also having perforations in it to allow the air to

escape in and over the flame in the furnace to promote the combustion of the carbon in the furnace. From this application of the currents of heated atmospheric air it will be apparent that I obtain the following results: First, the presence of an excess of oxygen to oxidize the vapors of zinc at the instant of liberation from the ore; second, that I promote the liberation of the vapor of zinc by more thorough combustion of the carbon mixed with the ore, in consequence of the presence of oxygen; third, that I do not reduce the temperature of the furnace by adding an excess of oxygen, but, on the contrary, economize fuel, as it is a well-known fact that heated blasts of air are decidedly preferable to cold blasts of air for sustaining combustion; and, lastly, that I make a more perfect oxide of zinc by commingling and diffusing the blasts of heated air throughout the escaping vapor of zinc than could possibly be accomplished by a solid column of air entering with the blast from the ash-pit through the furnace-fire.

Letter R is a flue through which the oxidized vapors of zinc escape to the main conveying-pipe *s*. This flue has a series of perforations through its sides. Surrounding it is an outer air-tight case, R^2, and in the space between them is forced a blast of air through the pipes *i i*, which, passing through the perforations in the flue R, commingle with the vapors of zinc as it is escaping from the furnace. The object of this is to keep an excess of oxygen always in a diffused state with the vapors of zinc, so as to oxidize every particle of it, if possible, before it escapes too far from the furnace and becomes so reduced in temperature as to prevent oxidizing it, and consequently the deposit of a gray powder or inferior product than is obtained when a perfect white oxide of zinc is made. The upper end of the flue R is made to enter a main conveying-pipe, *s*, placed at an ascending elevation of about twenty to thirty degrees over the back end of the furnaces. At the point where the pipe R enters the pipe *s* it is bent by a gradual curve so as to have its outlet discharging toward the upper end of the pipe *s* and into the chamber T. At the lower end of *s* is inserted the end of a blast-pipe, U, and through which a blast of atmospheric air is blown. The object of introducing this blast of air is to oxidize any unoxidized vapors of zinc escaping from the furnace; second, to cool the oxidized zinc so as to cause it to deposit more rapidly in the catching-chamber; and, third, to carry the oxide of zinc through the pipe and into the catching-chamber in contact with atmospheric air, in preference to the use of an exhausting apparatus in the catching-chamber, which would have a tendency to fill the chamber with the heated products of the furnace.

Letter T is the catching-chamber, which is a large brick building suitable for such purposes, and lined with copper, tinned or galvanized iron. In the chamber, crosswise of it, are two pendent and one elevated deflector-partition, V V, &c. The object of these deflectors is to cause the currents of oxide of zinc to come in contact with some obstacle to cause it to deposit, and also to cause it to traverse a greater distance in going from end to end of the chamber than would be the case if no deflectors were used. At or near the back end of the chamber is a partition, W, entirely across the end of the chamber and from the roof to the collecting-floor. This partition is a frame-work of metal and covered with a flannel or woolen screen, P, through which the unconsumed vapors and air carried into the chamber with the oxide of zinc escapes, and thence through openings g^2 g^2 in the end wall of the chamber into the open air.

Letters r^2 r^2, &c., are ventilators in the top of the chamber, also for the escape of the air or vapors from the chamber.

Letter *y* is a cooling air pipe extending across the chamber and having a series of perforations in it for discharging currents of cold air into the chamber to cool the oxide and cause it to deposit.

Letter *z* is the collecting-floor of the chamber. This floor is composed of a series of hoppers joined together at their upper edges and converging at their bottom into a throat, through which the oxide of zinc deposited in the chamber slides by a little jarring into suitable boxes placed on the ground floor underneath. Letter z^2 is the door for entering the collecting-chamber.

The operation of my invention is, first, I ignite a fire in the furnace and apply a blast through the ash pit. I then feed in my ore and coal (which has been previously broken up to about pea size, or less, and mixed in the proportion of about two hundred pounds of coal to one ton of ore) through an opening, R^3, in the flue R. At the same time this is being done I push the feed forward toward the furnace end of the oven by means of a rake through the opening R^4 in the back end of the furnace. When the bed of the oven is covered to about four or five inches deep, I close the feed and raking openings, and as soon as I see the vapors of zinc begin to pass off in a blue vapor I let on the blasts of air through the perforations in the sides of the oven to oxidize the vapor, which is then carried into the conveying-pipe S, and by means of the blast of cold air from the pipe U is forced into the collecting-chamber, and is then deflected and deposited on and against the walls and sides of the chamber and deflecting-partitions, and thence falls into the hoppers and through the openings in their lower ends into the boxes underneath, when it is carried away by the attendant, while the air and gases carried into the chamber escape through the ventilators at the top and back of the chamber.

Having now described my invention and its

operation, I will proceed to state what I claim and desire to secure by Letters Patent.

What I claim as of my invention for the manufacture of white oxide of zinc, whether from native ores or metals, is—

1. The use of the atmospheric air-supply pipe L, flues M M, heating-chambers H H and J, and series of apertures *h h* in the sides thereof, or substantially like parts, for the purpose of conveying into the oven a great number of infinitely small jets or blasts of heated atmospheric air, independent of the blast of atmospheric air supplied through the ash-pit of the furnace to support combustion, for the purpose of more thoroughly consuming the gases from the ore and carbon.

2. The application and use of an independent blast of cold atmospheric air, in combination with the exhaust-pipe R of the furnace or furnaces, and a main conveying-pipe, S, having an upward inclination toward the point of connection with the catching-chamber of about twenty to thirty degrees, the said blast of cold atmospheric air being supplied from an independent blowing apparatus by means of the pipe U, inserted into the lower end of the pipe S, for the purpose of more thoroughly oxidizing, cooling, and causing the products of the furnace to deposit more rapidly.

3. The application and use of the series of alternating pendent and elevated division-walls V V, &c., in a catching-chamber, in combination with a self-collecting floor, composed of a series of hoppers, *Z*, &c., and flannel or woolen ventilators at the end and top of the chamber, or substantially the same devices, for the purposes hereinbefore set forth.

JONN. G. TROTTER.

Witnesses:

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CHARLES L. BARRITT.