J. E. BURROWS.

Improved Spelter producing Apparatus.

116551

PATENTED JUL 4 1871

Fig. 1.

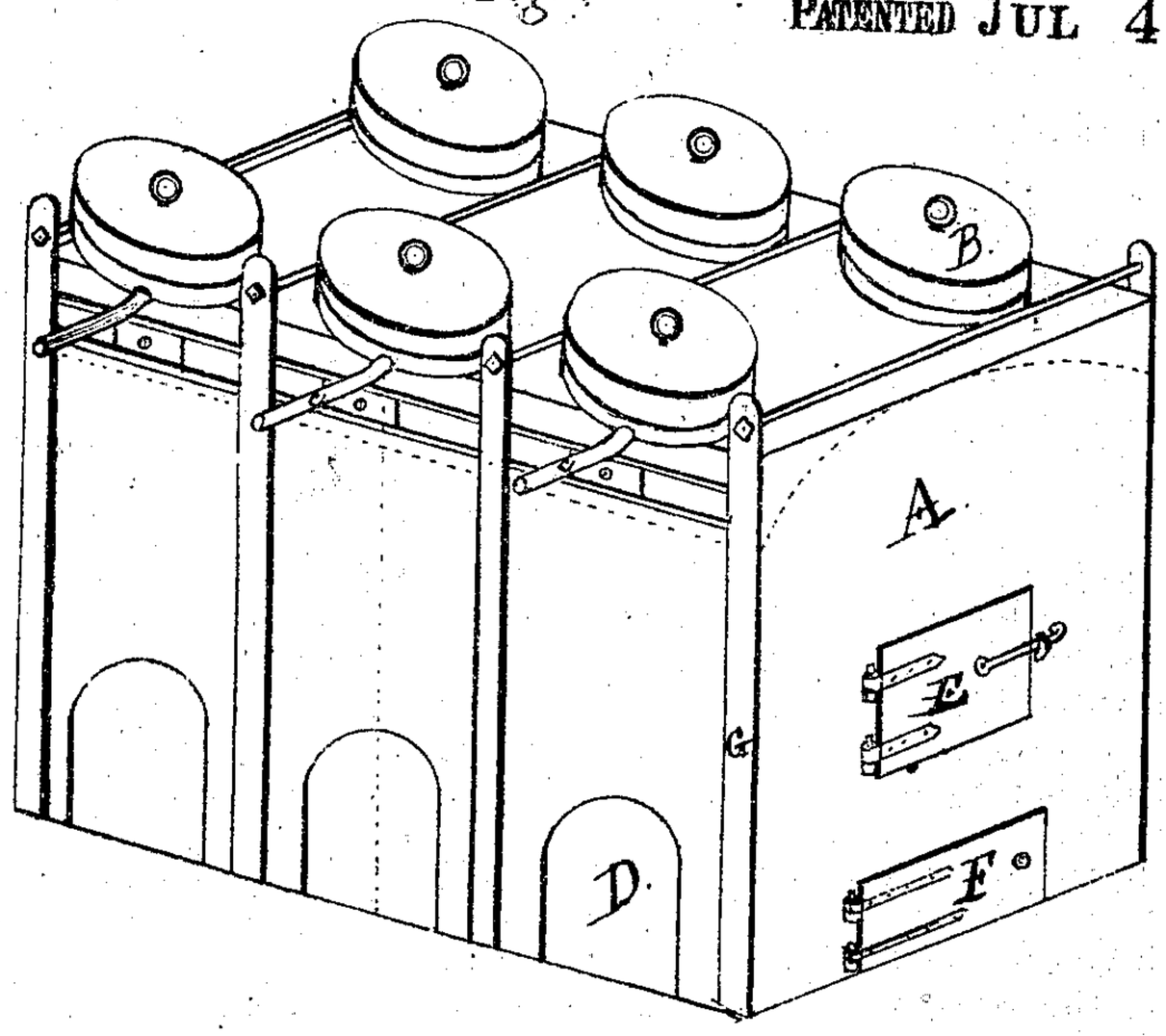


Fig. 3.

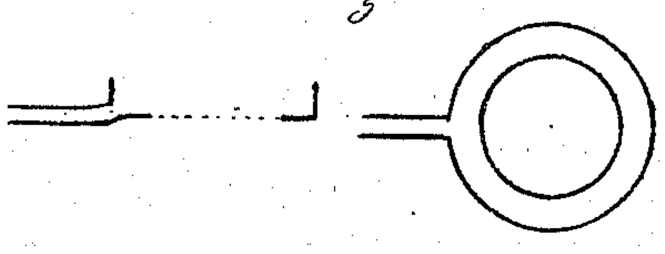


Fig. 2.

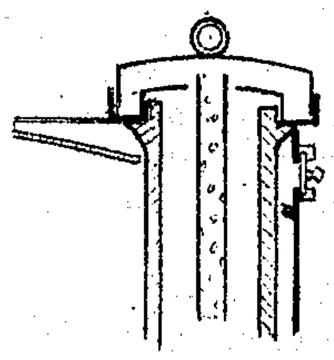


Fig. 4.

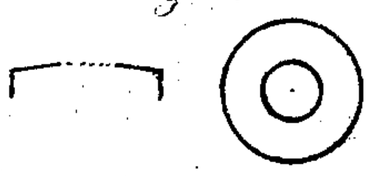
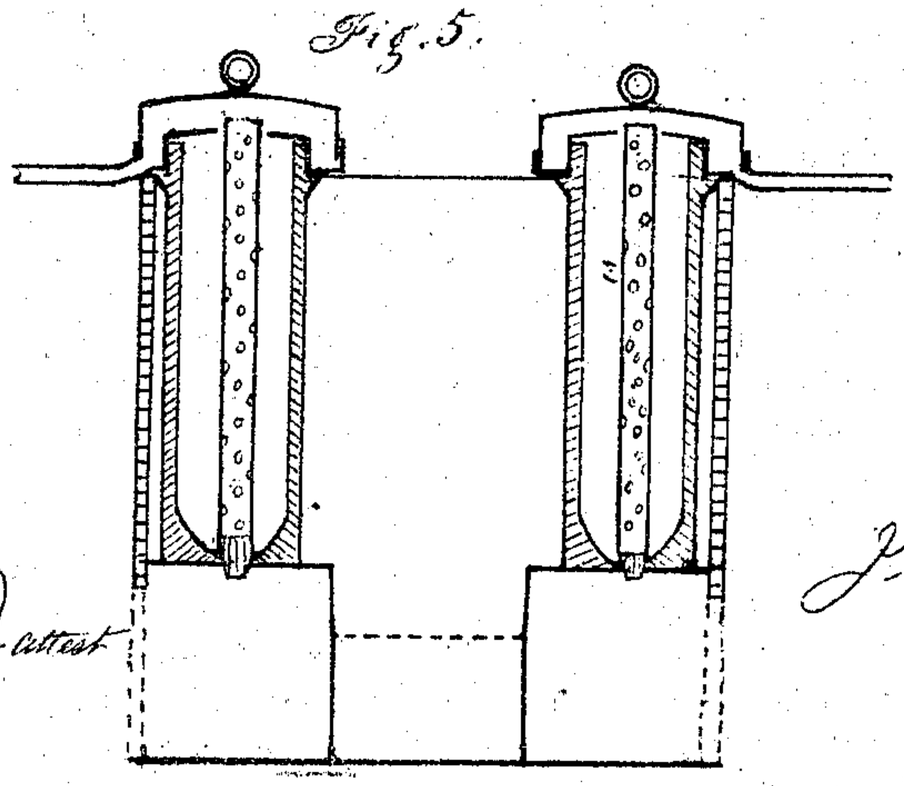


Fig. 5.



Witnesses:
Wm. H. Groding
Alfred Lester
} attest

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UNITED STATES PATENT OFFICE.

JOHN E. BURROWS, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR THE MANUFACTURE OF SPELTER.

Specification forming part of Letters Patent No. 116,551, dated July 4, 1871.

To all whom it may concern:

Be it known that I, JOHN E. BURROWS, of Newark, in the county of Essex, in the State of New Jersey, have invented a new and Improved Apparatus for the Manufacture of Spelter or Metallic Zinc; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawing.

The object of my invention is to produce metallic zinc direct from the ores of zinc without first reducing to oxides, as is now the usual practice, and also to produce metallic zinc in a more economical manner than has heretofore been accomplished. The nature of my invention consists in mixing the previously broken or granulated ores of zinc with any carbonaceous material and placing them in a suitable retort, having a condenser placed on the top of retort to receive the vapors of zinc formed, and then subjecting said vapors to the requisite temperature to form melted zinc, and to completely separate the zinc from other metals and impurities.

I have found that when the ores of zinc, such as carbonates, sulphurets, and silicates, &c., are granulated and mixed with the proper proportion of granulated carbon or coal and placed in a suitable reservoir or retort, they can be readily decomposed, and that the volatile properties of the zinc can be made subservient, and also that the gases produced by the decomposition of the ore will pass up and over with the vapors of zinc without contaminating the metal produced.

I have also found that the metallic flame of zinc will condense readily when brought in contact with a receiver heated to a temperature of about 650° Fahrenheit, and that, by a continuous operation, this receiver, if heated to a temperature of about 700° Fahrenheit, without allowing the vapors of zinc to come in contact with the atmosphere, will be reduced to a melted state and run out through a suitable pipe fitted to the receiver.

I have also found that, when the ores of zinc contain other metals, such as lead, copper, iron, &c., they can be easily separated in my apparatus: 1st, by the vapor of zinc passing up through the mass and being condensed in the domes or receivers above; and the continued heat of the retort, reducing the other metals to a melted state, can be drawn off at the bottom.

I am aware that metallic zinc has been produced direct from the ores by causing the vapors to pass out at the bottom of the retort and made to condense in water. This product requires to be again melted, and this method is slow, tedious, expensive, and is destructive to the retorts.

To enable others skilled to make and use my invention, I will proceed to describe it, reference being had to the accompanying drawing.

Out of any suitable material, but I prefer ordinary brick, I construct a furnace of about the following dimensions, viz., twelve (12) feet long and about eight (8) feet wide by about eight (8) feet high, lined on the inside entirely with fire-brick. About three (3) feet from the bottom I construct a floor with openings to allow the retorts to set in, and also for the discharging of spent charge and metals. On this floor, and below the retorts, at each end of the furnace, I form a fire-place for heating the furnace and retorts, about the following dimensions: two (2) feet wide by four (4) feet long, the ashes falling in the space left under the floor before described. About five (5) feet above this floor I form arches of brick, or use large flat fire-tiles to completely cover in the top of the furnace, leaving openings corresponding to the openings below to receive the retorts. I then construct flues about twelve (12) inches square running across the top of the furnance and close to the openings for retorts. These flues are used to carry off the products of combustion and to heat the receivers or condensers placed on top of the retorts about to be described. These flues are filled with suitable dampers and connected with a chimney.

I do not limit myself to the above dimensions of furnace, but the size should be governed by the quantity of ore required to be reduced.

I then construct my retorts of clay or iron; or I line an iron retort with fine fire-clay or any suitable material. The material I find best suited to my purpose is that known as the Stowbridge clay and is the same as used for melting glass.

The size of my retorts is about as follows, viz., about five (5) feet high and about two (2) feet in diameter, made at one end conical, with an opening about three (3) inches in diameter. These retorts are allowed to dry and become quite hard before using, and are placed in the furnace with the conical end looking through the openings in the floor. About two (2) inches from top of retorts I

place a ring or collar on the retort. This collar is about two (2) feet six (6) inches in diameter, with an opening to correspond with the size of retorts, and is made of iron or any other suitable material. These rings or collars are to receive the domes or condensers, and have an opening about four (4) inches in diameter placed about two (2) inches from the outside edge, to allow the metallic zinc and impure gases to pass out; and connected to this opening is an iron pipe or prolong about two (2) inches in diameter, to conduct the melted zinc to the cooling mold. The condensers are made of cast-iron or clay, or any suitable material, and are about the following dimensions, viz.: the first one is about two (2) feet one (1) inch in diameter and about four (4) inches deep, covered with a plate having an opening in the center about four (4) inches in diameter, through which the metallic flame passes. This first condenser is placed over the top of the retort and rests on the rings or collars. The second cover or condenser is about twenty-nine (29) inches in diameter and about six (6) inches deep, covered with a solid plate, and rests on the collar. I then construct a pipe of iron or any suitable material, about five (5) feet six (6) inches long and about three (3) inches in diameter. This pipe is perforated with holes about three-eighths ($\frac{3}{8}$) of an inch in diameter, at about equal distances over the entire surface of the pipe, and is placed inside the retort, one end fitting into the opening at bottom of cone in retort, and is closed by means of clay or metallic stopper; the other end reaches up to the opening of first condenser.

Having so far described the construction of my apparatus, I will proceed to describe its operation, which is as follows: I start a brisk fire in my furnace, urged with or without a blast underneath the fire-bars, and when the retorts are heated I remove the condensers from the top of the retorts and fill the retorts about two-thirds ($\frac{2}{3}$) full with granulated zinc ore and coal or carbon mixed in about the following proportions, viz., one hundred (100) pounds of zinc ore and about sixty (60) pounds of coal or any carbonaceous material well mixed together. I then place the condenser on the top of the retorts, and as soon as the ore becomes sufficiently heated the vapors of zinc rise into the condensers and are condensed, and then in turn are melted and run out at the pipe before described. When all the zinc has been vaporized from the ore I then remove the condensers and withdraw the perforated pipe, and the copper or lead, &c., contained in the ore runs out at the bottom of the retort together with the slag. The pipe and condensers are replaced with the next charge of ore and coal, and the operation is continued.

To more fully illustrate my invention, I herewith attach a drawing.

Figure 1—A is the furnace; B, the covers or condensers; C, the prolongs or pipes for conducting the melted zinc; D, space under floor of furnace for discharging metal and slag; E, door of furnace; F, ash-pit door; G, braces; H, the flues for heating collars or rings and condensers. Fig. 2, section of retort with condensers and prolong or pipe attached; Fig. 3, collar or ring with prolong; Fig. 4, section and elevation of first condenser; Fig. 5, section of two retorts, showing the perforated inside pipe and position of retorts in furnace.

What I claim, and desire to obtain Letters Patent for, is—

1. The apparatus above described for the manufacture of spelter or metallic zinc direct from ores of zinc.

2. The mode of condensing and heating the vapors of zinc when manufacturing spelter or metallic zinc.

3. The separation of metals by the process before described, when used in the manufacture of metallic zinc.

JOHN E. BURROWS.

Witnesses:
W. M. GOODING,
ALFRED LISTER.