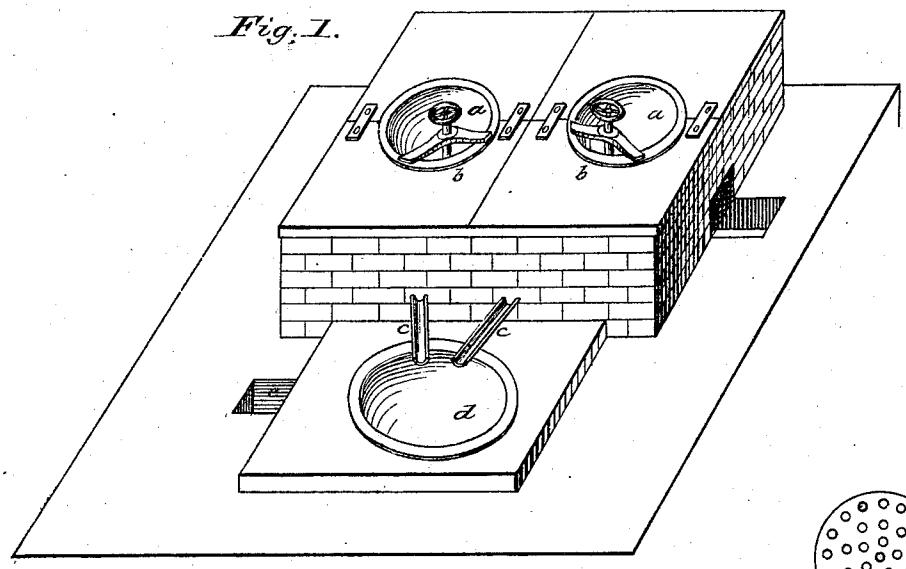
2 Sheets--Sheet 1.

D. P. WEBSTER, C. C. LEWIS & A. P. WEBSTER.

Separating Silver and Gold from Lead.

No. 147,454. Patented Feb. 10, 1874.

Fig. 1.



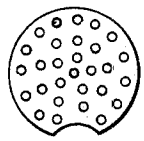
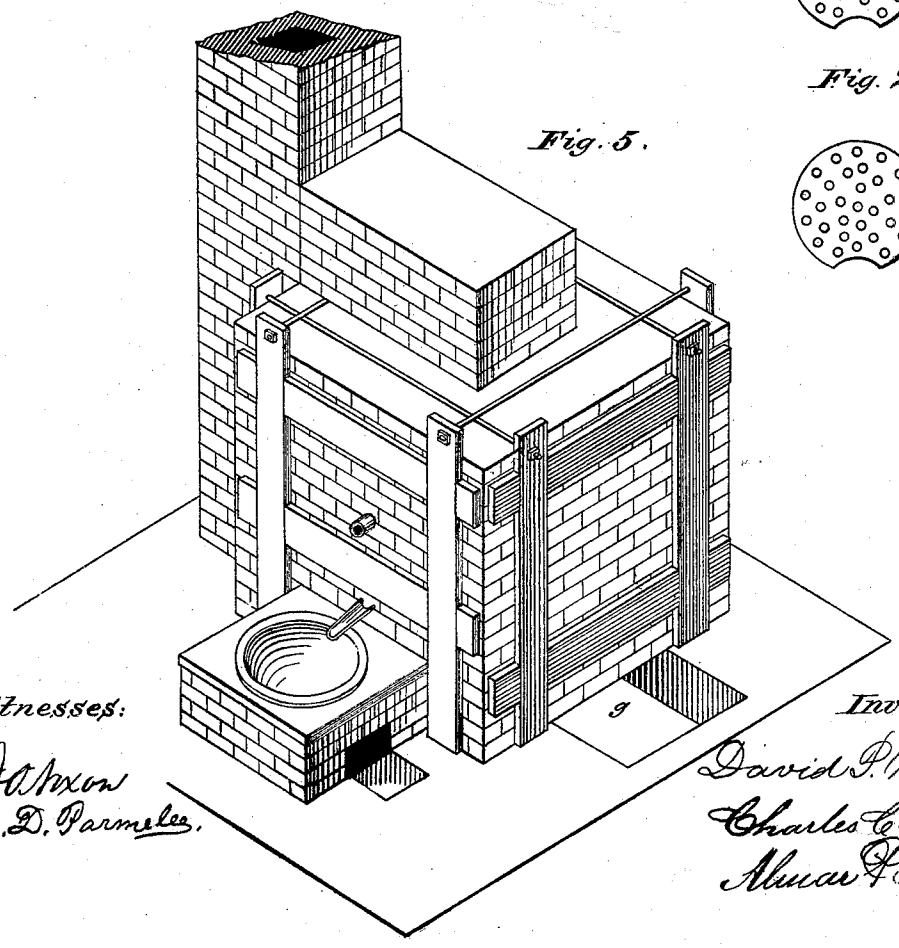


Fig. 2.

Fig. 5.



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2 Sheets--Sheet 2.

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Fig. 3.

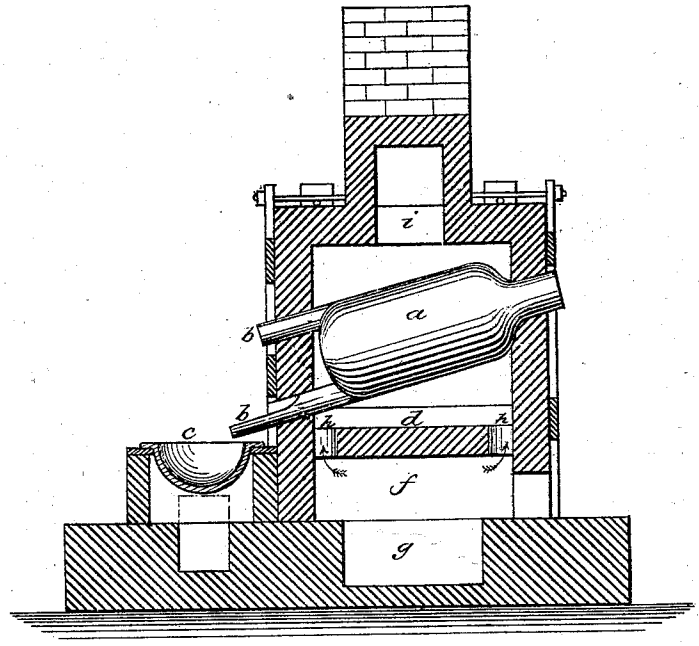
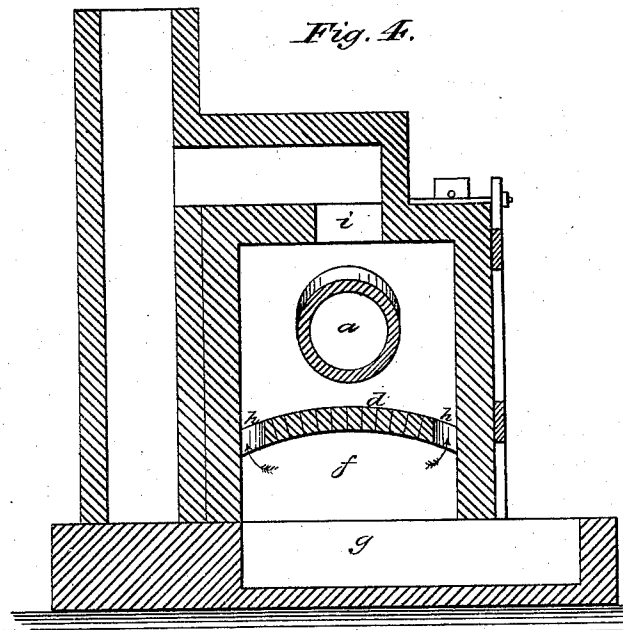


Fig. 4.



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DAVID P. WEBSTER, CHARLES C. LEWIS, AND ALMAR P. WEBSTER, OF NEW YORK, N. Y.

IMPROVEMENT IN SEPARATING SILVER AND GOLD FROM LEAD.

Specification forming part of Letters Patent No. **147,454**, dated February 10, 1874; application filed January 9, 1874.

To all whom it may concern:

Be it known that we, DAVID P. WEBSTER, CHARLES C. LEWIS, and ALMAR P. WEBSTER, of the city, county, and State of New York, have made certain new and useful Improvements in the Arts of Extracting Silver and Gold from Lead, which have not been used or known previous to our invention.

By our improvement, we are enabled to effectually desilver the same weight of metal in one-third less time, and at one-third less expense, than has heretofore been employed for the same purpose.

The following, with the accompanying drawings, is a full and exact description of the apparatus and process employed and practiced by us, which will enable others skilled in the arts of separating silver and gold from lead to practice it.

Figure 1 is a double furnace having three kettles. The upper two kettles are thirty-three inches in diameter each, and eighteen inches in depth, made of cast-iron a half-inch in thickness, holding each two tons of melted metal. The lower kettle is forty-five inches in diameter and twenty-four inches in depth. The furnaces are constructed of brick, with a cover of cast-iron, formed of two sections, each with a flange of four inches projection for holding or binding the brick. The kettles have flanges about four inches in width, which rest on the cast-iron top plate, and thus form a tight connection. At the right of the larger part, having the two kettles, is a door, *h*, opening to the fire-box, which reaches beyond the two kettles, and to a flue for carrying off smoke to the stack. At the left of the lower part, having one kettle, is a pit, *e*, for access to the door and fire-box of this part, for heating the kettle. This lower and larger kettle has the capacity for holding four tons of melted metal.

Fig. 2 is an iron-plate disk a quarter-inch thick, and of diameter corresponding to the interior of the two upper kettles. This disk is perforated by many holes.

The above constitute the apparatus for carrying on the first part of the process.

Figs. 3, 4, and 5 represent the apparatus employed for the second part of the process.

Fig. 3 is a longitudinal section of the furnace, showing the retort *a* and the angle at which it is set. The arch *d*, Figs. 3 and 4, serves to shield the retort from the direct action of the flame. The small flues *h h* admit the flame and heat above the arch, and are located at the four corners of the furnace. The fire-box is indicated by *f* in both figures, and the ash-pit by *g*.

The retort is made, preferably, of cast-iron, in the shape of a bottle, having attached to and cast with it, at its bottom, two pipes, as shown at *b b*, Fig. 3. The body of the retort is cylindrical, two feet diameter outside, and two feet nine inches long between the points where the contraction is commenced. The mouth or neck is nineteen inches long and eleven in diameter. The pipes at the bottom are fourteen inches long each, and four and one-half outside diameter, making the whole length five and one-half feet. The uniform thickness of the metal is one inch.

Fig. 4 is a cross-section of the furnace, in which the arch is more plainly shown at *d* than it is in Fig. 3. The furnace is built of fire-brick, stayed and braced by iron bands and rods, as is usual in the construction of like furnaces.

Fig. 5 is a perspective view of the furnace, showing the mouth end of the retort and part of the kettle at the opposite end *c*, for collecting the melted metal when allowed to run from the retort. The outside dimensions of this furnace are five feet ten inches long, five feet wide, and four feet ten inches high. The walls are nine inches thick. The retort within the furnace rests upon piers of fire-brick built upon the arch. The two necks or pipes at the lower end of the retort are provided so that, when the one on the side placed nearest the fire becomes defective, it may be turned uppermost, and thus the retort is made to last much longer than if only one pipe were provided. The upper pipe is always kept closed.

The first step in the process for extracting the silver or gold from lead is practiced as follows: For example, if the lead to be operated upon contains two hundred ounces of silver to the ton, we put two hundred and forty pounds metallic zinc in the bottom of each of the upper kettles *a a*, Fig. 1. Over each of these we

place the iron perforated disk, Fig. 2; then four thousand pounds of the lead, in pigs, is placed in each kettle vertically on the disk. The fire is next raised, and the pigs of lead melt gradually, and the metal falls through the perforations onto the zinc, which in turn is also melted, and then rises through the lead, carrying the silver with it to the surface. During this time the metal is heated considerably above the degree of its melting temperature, and stirred during forty-five minutes. The dross is next skimmed off at intervals of about ten minutes, during an hour longer, when the lead is drawn off by withdrawing an iron plug, *b b*, by means of a screw and iron rod passing to the bottom of the kettle through the melted metal. It is collected in the lower kettle, and from this cast into pigs. The dross thus formed and now containing the silver and zinc with some lead, is put into the retort (*a*, Fig. 3,) and melted. The lead is drawn off at the small pipe *b* to the kettle C; then, after stopping the pipe, one thousand pounds of bullion or lead containing silver is passed into the retort with the dross and melted, well stirred, then drawn off, as just above described. This operation of adding the silvered lead is repeated twice, making in all three thousand pounds thus added and treated. During this last-named part of the process, the dross rising to the surface in the kettle C is skimmed off and added from time to time to the mass in the retort. The neck or mouth of the retort should be kept closed by inserting the bottom of a plumbago crucible into it as much as practicable, in order to exclude atmospheric air. The lead in the kettle C, now free from silver, is cast into pigs. The rich dross containing the silver remaining in the retort is next removed and placed on an iron plate, and while hot it is granulated. The granulated dross is next put into bottle-shaped plumbago retorts arranged in suitable furnaces, and the zinc distilled and collected in the manner described in technical works relating to the metallurgy of zinc. The silver and remaining lead left in the plumbago retorts is next cast into ingots, and finally placed on the cupel in the cupel-furnace and there refined.

We would here remark that we prefer a cylindrical retort, as described and represented in Fig. 3, for obvious reasons; but other forms might be used, provided such were constructed with a small mouth, which could be readily kept closed, so as to exclude the access of air during the greater time of the treatment.

Having described the process involving our improvements, what we claim as of our invention, and desire to secure by Letters Patent of the United States, is—

1. The perforated iron disk for holding the zinc to the bottom of the kettle until the lead is melted, and then causing it to be distributed through the metal above, so as to come in contact with and take up the alloyed silver.

2. The combination of furnace and inclined retort, substantially as described, and for the purpose set forth.

3. The treatment of the skimmings or dross in a closed retort, substantially as described.

4. The treatment of the silver dross in a chamber in which the air is so highly rarefied that it has little or no oxidizing effect upon the zinc, substantially as described.

5. The concentrating of lead dross containing silver, derived from treatment of lead by any of the usual processes, in a closed retort or chamber from which the air is excluded, substantially in the manner described.

DAVID P. WEBSTER.
CHARLES C. LEWIS.
ALMAR P. WEBSTER.

In presence of—
J. O. NOXON,
D. D. PARMELEE.