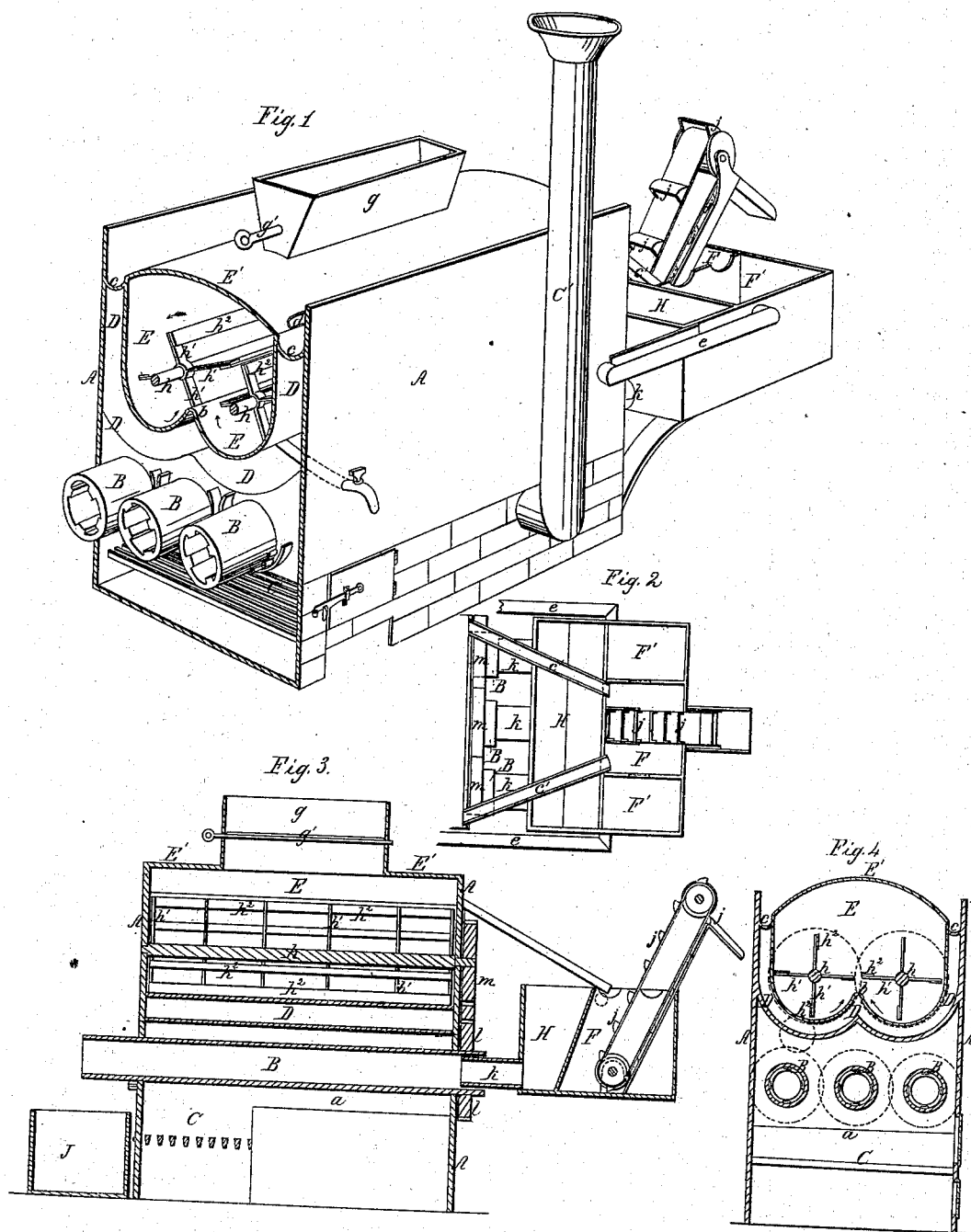


R. SPENCER.
APPARATUS FOR TREATING ORES.

No. 47,874.

Patented May 23, 1865.



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IMPROVED APPARATUS FOR TREATING ORES.

Specification forming part of Letters Patent No. 47,874, dated May 23, 1865.

To all whom it may concern:

Be it known that I, ROBERT SPENCER, of the city and county of New York, State of New York, have invented a new and Improved Mode of Treating Ores; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of my desulphurator and amalgamator combined, the front part of the machine being left open. Fig. 2 is a top view of the feeder, which is arranged at the rear end of the apparatus. Fig. 3 is a vertical longitudinal section through the center of the machine. Fig. 4 is a vertical transverse section through the apparatus.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates particularly to the treatment of "tailings" or powdered ore, or sand containing precious metals, for the purpose of separating the particles of metal from the matrix.

The first part of my invention relates to the amalgamation of the metals and the washing of the same by means of an apparatus, which consists of a vessel having a ridged bottom and a series of revolving floats or stirrers, which latter are so arranged as to create two opposing currents or waves of the mercury during the process of mixing the ore-sand with it, and to dash one wave into another in such manner that the atoms of metal are thoroughly agitated and mingled with the mercury, as will be hereinafter described.

My invention also consists in providing the amalgamating-vessel with vertical sides and longitudinal troughs, which latter conduct off the muddy water during the operation of washing and amalgamating, as will be hereinafter described.

Another object of my invention is to partially surround the vessel in which the amalgamating and washing processes are performed with a chamber which is adapted for containing water to be warmed and kept warm, for the purpose of rendering the mercury thin and keeping it in a good condition to dissolve the metal, as will be hereinafter described.

Another object of my invention is to combine an amalgamator which employs a warm-water jacket with a furnace having calcining-

vessels arranged within it, so that the heat of the furnace will not only calcine or desulphurize the ore, but keep the amalgamating-vessel warm, as will be hereinafter described.

To enable others skilled in the art to understand my invention, I will describe its construction and operation.

In the accompanying drawings, A A represent the walls of my apparatus, which may be made of metal or masonry.

In some cases I shall construct the entire apparatus of metal and mount it upon wheels, so that it can be readily transported from one point to another; and in some cases I shall construct the walls and arches of the apparatus of masonry.

If desirable, the foundation of the apparatus may be made of masonry and the upper portion of metal.

B B B are cylinders, which are arranged within a furnace, C, and extend in a longitudinal direction from one end to the other of the walls A A, and at these ends said cylinders are supported upon friction-rollers, which allow the cylinders to be rotated freely.

At one end of the apparatus is a furnace, C, the flue *a* of which extends back under the cylinders B and communicates with the smoke flue or chimney C'.

Above the cylinders B is a chamber, D, and above this is a vessel, E, having a central ridge, *b*, extending along its bottom. The sides of this vessel extend up nearly to the top of the side walls, A A, and terminate in troughs *c c*, which extend in a longitudinal direction from one end to the other of the apparatus and terminate at one end in inclined troughs *c' c'*, which lead into a tank, F. The troughs *c c* form covers for the side passages of the hot-water chamber D, as shown in Figs. 1 and 4, and they are intended for conducting off the muddy water from the vessel E during the process of washing and amalgamating. The vessel E is covered by an arch, E', through which holes are made at *d d*, that should be covered with gauze or finely-perforated plates. Through these holes the muddy water escapes from the vessel E and enters the troughs *c c*, from which it flows into the tank F, where it is allowed to settle. This tank F is elevated to a sufficient height to admit of the use of pipes *e e*, which lead from side tanks, F' F' into the chamber D, and

keep the water at the proper height in this chamber.

Through the crown of the arched cover *E'* is an opening provided with a hopper, *g*, having a valve, *g'*, in its throat, through which opening the metal-bearing sand is fed in proper proportions into the amalgamating-vessel *E*. Within this vessel *E* are two horizontal shafts, *h h*, extending longitudinally through the apparatus, and to these shafts arms *h' h'*, having paddles or floats *h² h²* secured to them, are applied, as shown in Figs. 1, 3, and 4. These shafts *h h* are rotated in opposite directions to each other, so as to produce two opposing currents of the mercury, or mercury and sand, which will meet each other and break directly over the intermediate elevation, *b*, of the vessel *E*. The bottom of the vessel *E* is so formed that the paddles *h²* work close to it and dash the mercury and sand from one side of the vessel to the other. The upper edges of the partitions which separate the chamber *F* from the side chambers, *F'*, are provided with strainers, through which the water which overflows the chamber *F* passes and empties into the side chambers, *F' F'*. These strainers are intended for filtering or partially purifying the water, so that muddy water will not flow into the vessel *D* from the side chambers.

In Figs. 1, 2, and 3 I have represented elevators applied to the chamber *F*, consisting of an endless band of buckets *j j*, so arranged as to carry off the mud which settles to the bottom of the chamber *F*, and to leave the water behind. Such buckets will be provided with perforated bottoms. I also propose employing endless bands of buckets for conducting the dry sand into the amalgamating-vessel *E* through the hopper *g*.

H represents a vessel into which the sand containing metal is put, and from which the cylinders *B B B* are supplied. This vessel *H* communicates with the three cylinders by means of short pipes *K*, which may be provided with valves or screws, by which the supply of sand can be regulated.

In practice I shall incline the bottom of the vessel *H* and also the feeding-tubes and provide this vessel with a cover, so as to prevent the rapid escape of the sulphurous gas from the cylinders, or, rather, from this vessel. The cylinders *B* may incline toward the furnace *C*, or they may be arranged in a horizontal plane, and provided on their inside surfaces with ribs of a spiral or screw form, so as to impel the sand slowly through them and discharge it into the water-tank *J*, as shown in Fig. 3. These cylinders may all be rotated by means of spur-wheels *l*, which are arranged outside of the furnace, and these spur-wheels may engage with spur-wheels *m* on the ends of the shafts *h* of the paddles.

The operation of my invention is as follows: The sand containing metal is put into the vessel *H* and slowly passed through the

highly-heated cylinders *B B B* and discharged into the water-tank *J*. During the passage of the sand through the cylinders *B* the sulphur will be thrown off and burned or allowed to escape into the vessel *H*, and immediately after this desulphurating process the sand, while in a highly-heated state, is suddenly dropped into water, which has the effect of disintegrating the atoms of quartz and exposing the metal. From the bath the sand is conveyed into the amalgamating-vessel *E*, through the hopper *g*, where it is subjected to the action of the beaters or fans *h² h²* and the mercury.

If desirable, the sand may be washed before mercury is put into the vessel *E*; but I prefer to employ water during the amalgamating process for washing out and dissolving the more soluble particles of the matrix. When the heaters on the shafts *h h* are rotated very rapidly, there will be a very violent agitation of the contents of the vessel *E*, and the water will be thrown out through the openings at *a a* into the troughs *c c*, from which it will escape into the vessels *F F'*, *F*, to be again used for keeping the amalgamating-vessel *E* warm and preventing the bottom of this vessel from rapid destruction by the heat of the furnace *C* below.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. Applying a series of revolving or oscillating wings or paddles within a vessel, *E*, which is constructed with a central ridge, *a*, over which the currents of mercury are interrupted in their passage from one side of the vessel to the other, substantially as described.
2. The use of a double-concave-bottom amalgamating-vessel having revolving agitators arranged within it, substantially as described.
3. The receiving-troughs *c c*, in combination with a perforated cover, *E'*, to the amalgamating-vessel, substantially as described.
4. Conducting the waste water from the amalgamating-vessel into the chamber *D*, substantially as described.
5. The feeding-vessel *H*, in combination with two or more movable cylinders, *B*, communicating with said vessel, substantially as described.
6. The use of a water-chamber, *D*, partially surrounding an amalgamating-vessel, whether it is mounted over a furnace or not, substantially as described.
7. The combination of one or more rotating or oscillating cylinders, *B*, with an amalgamating-vessel and a furnace, *C*, substantially as described.

Witness my hand in the matter of my application for a patent for treating ores.

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Witnesses:

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