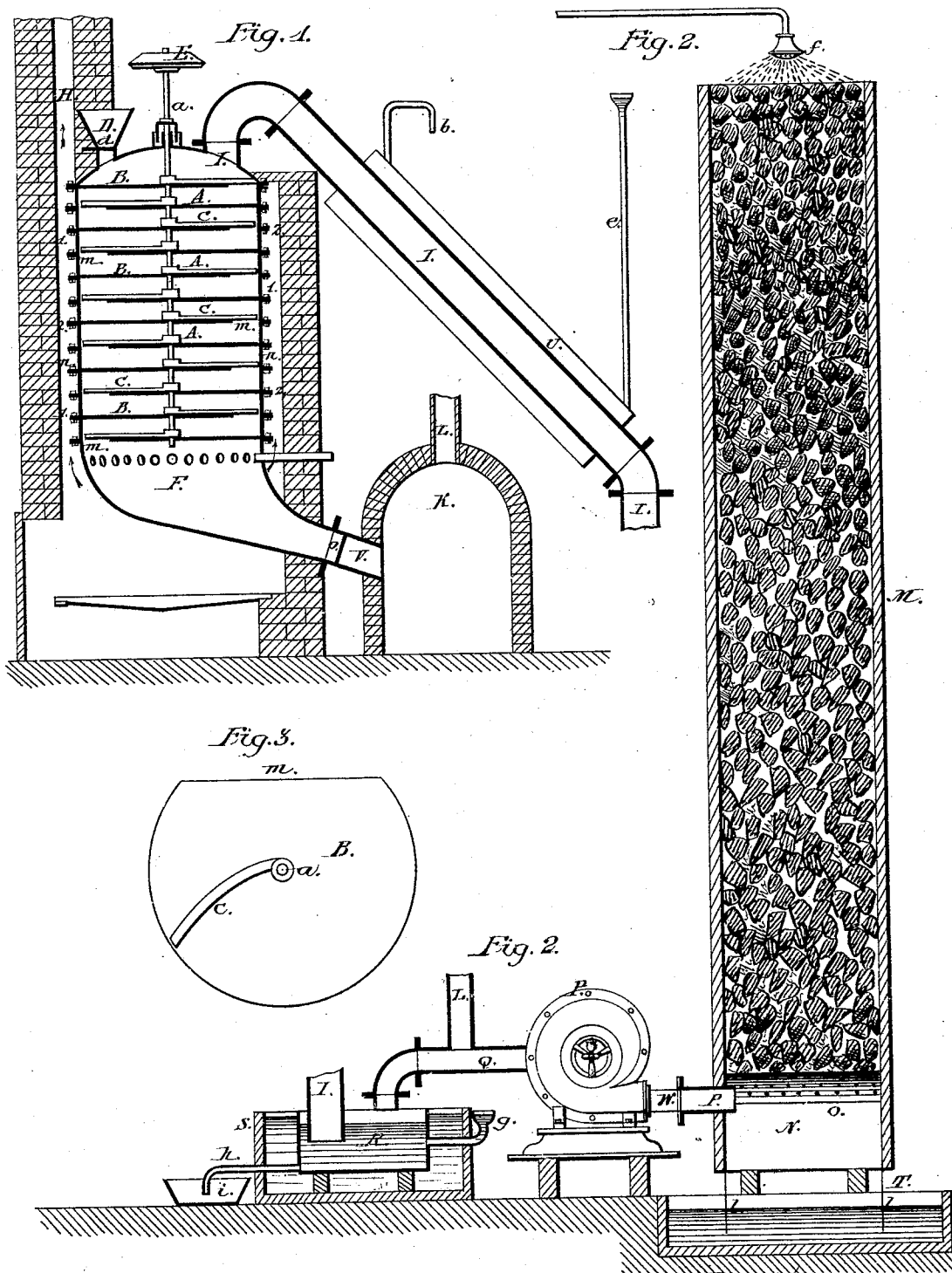


H. H. EAMES & R. D. WALBRIDGE.
Processes and Apparatus for Manipulating the Ores of
Mercury.

No. 152,943.

Patented July 14, 1874.



Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY H. EAMES AND RUSSEL D. WALBRIDGE, OF OAKLAND, CALIFORNIA.

IMPROVEMENT IN THE PROCESSES AND APPARATUS FOR MANIPULATING THE ORES OF MERCURY.

Specification forming part of Letters Patent No. **152,943**, dated July 14, 1874; application filed May 21, 1874.

To all whom it may concern:

Be it known that we, HENRY H. EAMES and RUSSEL D. WALBRIDGE, of Oakland, California, have invented a Process and Apparatus for Manipulating the Ores of Mercury, of which the following is a specification:

The nature of our invention consists in the construction of an apparatus that will completely eliminate the whole of the mercury contained in cinnabar by subjecting the ore in continuous streams to the ascending heat and the vapors of mercury while the ore is descending upon alternate diaphragms mixed with carbonate of lime, or other equivalent, and condensing the vapors of mercury as soon as they leave the apparatus, and subjecting the attenuated vapors to a descending stream of water while they ascend in a column of porous material, to obtain the greatest possible amount of mercury from the cinnabar ore by mixing the ore with carbonate or other form of lime, and prevent at the same time the escape of the vapor of mercury.

We have found that when large bodies of ore are operated upon, and in the usual manner, not only does a large percentage remain in the ore in the furnace, but a great quantity escapes condensation and passes into the air, proving very prejudicial to health, from the fact that the vapor is carried along by the products of combustion of the fuel used to eliminate the mercury.

Figure 1 is a vertical section of our apparatus for eliminating the mercury. Fig. 3 is a detailed view of a part of the same. Fig. 2 is a vertical section of our apparatus for the condensation of the mercurial fumes.

1 1 1, Fig. 1, are cylinders, made of metal, or of fire-clay and other fire-proof material, of circular form, provided with metal plates or diaphragms B and flanges 2. These cylinders are firmly bolted together, one above the other, by their flanges 2, with cement packing between said flanges, so as to form a vapor-tight chamber, divided into a series of compartments, A, communicating with one another through openings *m* in diaphragms B, which are placed

four inches, more or less, apart, and form the partitions between compartments A, as clearly illustrated in the figure.

The diaphragms B may be bolted on the inside of a cylinder formed of one piece, instead of a series of cylinders, 1, and thus form the desired vapor-tight chamber. As to the diaphragms B, or compartments A, they may be varied in size and number to suit the requirements of the ore.

a is a shaft passing through the centers of diaphragms B, which communicates motion to the arms C. I is a pipe to convey the vapor from the vapor-chamber to the condensing apparatus, and passing under the surface of the water in the reservoir R. U is a water-jacket, being supplied by a constant flow from the pipe *e*, which has its exit at *b*. F is the lower compartment of vapor-chamber to hold residuum, which is conveyed by the pipe V to the receiver K. To the shaft *a*, at the point where it comes through the upper part of the furnace, we place a seal to prevent the vapors from passing out, the annular space marked being filled with fusible alloy or mercury. L is a pipe to convey any vapor that may arise from the residuum in K to the condensing apparatus, Fig. 2, and may connect with Q or I, as deemed advisable. *nn* are flues, constructed to pass around the vapor-chamber, having their exit at H. D is a hopper to conduct the ore into the vaporizing-chamber. *d* is a damper to regulate the supply in the same. E is a bevel-gear, from which the shaft *a* receives its motion. M is a tower, four feet, more or less, square, by twenty feet, more or less, in height, and is filled with coke, pumice, or other porous material. *f* is a spray of water, which, by falling through the porous material, condenses the ascending vapor. O is an arch with perforations, through which the mercury falls into the receiver T. *l* is an apron to prevent the vapor from passing under the tower from N.

We do not confine ourselves to one tower, but may use two or more, in which case the top of the first tower would be made vapor-tight above the spray *f*, and the escaping va-

por be conducted by means of a pipe to the bottom of the second, and so on.

R is a reservoir of water, which condenses the vapor from pipe I, and by means of pipe *h* conveys the mercury to the general receiver *i*. S is a reservoir of water to keep reservoir R cool.

The reservoirs R and S may either or both be supplied by a constant stream of water.

g is a gage to regulate the level of water in R. P is an exhaust-blower. Q is a pipe through which any vapor that may escape condensation in R is carried to the tower M.

Fig. 3 shows a plan of diaphragms B and arms C.

We operate our invention, when constructed substantially as above described, as follows: The ore, being first ground to about the size of a pea, (more or less depending on the character of the ore,) is mixed with a certain percentage of carbonate of lime or other equivalent. We have found that five per cent. of the carbonate suffices in most cases, but do not confine ourselves to that amount. The fire is then started, and after the apparatus becomes sufficiently heated the openings *y* are securely closed or opened, according to the nature of the ore to be operated upon; the shaft *a* and exhaust-blower P are started, the former communicating motion to the arms C.

y y are openings in bottom of apparatus, which can be opened or closed at pleasure, used as a means of supplying air to the descending ore, when required.

At this moment a continuous supply of ground cinnabar, mixed with five per cent. of carbonate of lime, is allowed to pass through the hopper D into the upper compartment, and thence onto the upper diaphragm, from which it is moved by the arm C on that diaphragm to the opening *m* in said diaphragm, into the compartment, and onto the diaphragm, and moved by the arm next below, and so on down from the upper compartment to the lowest compartment. The cinnabar being diffused in thin stratum over the diaphragms, being constantly moved and subjected to reflected heat of the chamber, will very materially hasten its vaporization. The blower P, now forming a partial vacuum in Q, draws the vapor through I, which, after passing the

cold surface caused by the water-jacket U, is drawn through the water in reservoir R, any vapor that may escape R being forced through the pipe Q and blower P into the bottom of the tower at *p*, where, meeting with the spray of water from *f* descending through the porous material in M, condenses, the mercury passing through the perforations in the arch O, and finding its way to the receiver T. The residuum descending into the lower compartment F is allowed to accumulate until it shall form a seal above the damper *o*, where a portion is permitted to escape through V into K. The seal being thus constantly preserved prevents the escape of the vapor through F by the action of the blower P. Such vapor as may arise from the residuum in K passes through the pipe L, which connects with either the pipe Q or the pipe I, and is condensed as heretofore described.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The method herein described of treating cinnabar ore with carbonate of lime, the same consisting in subjecting the ore with lime in their descending stratum, the ore being disintegrated by pulverizing or grinding, substantially as set forth.

2. The apparatus composed of mercurial-vapor generator and condenser combined.

3. The mercurial-vapor generator, composed of the cylinders, and diaphragms, and mercury-vapor seal, as set forth.

4. The condensing-tower and other condensers, in combination with the mercurial-vapor generator described.

5. The discharging-pipe with valve, and ore-discharge chamber with air-chambers *y*, substantially as set forth.

In testimony that we claim the above-described certain new and useful apparatus for vaporizing mercury in cinnabar ore, we have hereunto signed our names this 5th day of December, 1873.

HENRY H. EAMES.
R. D. WALBRIDGE.

Witnesses:

D. HENSHAW WARD,
T. W. MORGAN.