

(No Model.)

B. G. NOBLE, Dec'd.

L. S. NOBLE, Administrator.

PROCESS OF AMALGAMATING GOLD OR SILVER WITH MERCURY.

No. 470,209.

Patented Mar. 8, 1892.

Fig. 1

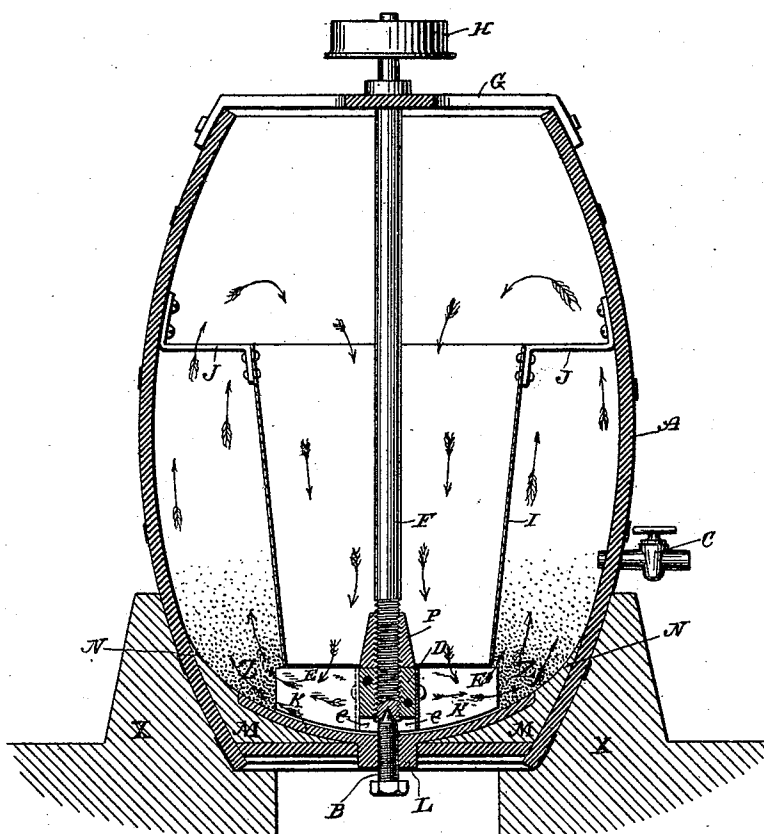
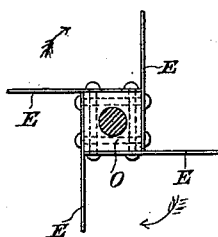


Fig. 2



Witnesses.

Raphael Netter
Robt. H. Duneau

Inventor

B. G. Noble

UNITED STATES PATENT OFFICE.

BUTLER G. NOBLE, OF BROOKLYN, NEW YORK; LOUIS S. NOBLE, ADMINISTRATOR OF SAID BUTLER G. NOBLE, DECEASED, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NOBLE MINING AND MILLING COMPANY, OF NEW YORK.

PROCESS OF AMALGAMATING GOLD OR SILVER WITH MERCURY.

SPECIFICATION forming part of Letters Patent No. 470,209, dated March 8, 1892.

Application filed August 21, 1890. Serial No. 362,604. (No model.)

To all whom it may concern:

Be it known that I, BUTLER G. NOBLE, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Methods of Amalgamating Gold or Silver with Mercury, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same.

The present invention relates to a method or process of extracting gold or silver, or both, from their ores by means of amalgamation with mercury; and it consists, essentially, in the application of hyposulphite of soda for the purpose of coalescing and localizing the atomized mercury or amalgam used or formed during the treatment of the ore pulp.

In carrying out my process I place in a suitable vessel a quantity of mercury, say from three to five pounds to one thousand pounds of ore to be treated at a single charge, although the proportion of mercury may be varied according to the quality and condition of the ore. Finely-pulverized ore carrying gold or silver, mixed with water to form a freely-flowing pulp, is then poured into the vessel with the mercury and by agitation the mercury is atomized and the particles of gold and silver are brought in contact with the mercury and amalgamated therewith. The particles or atoms of mercury or amalgam are then coalesced and localized into a body of liquid mercury or amalgam by the application of hyposulphite of soda, substantially as hereinafter more fully described and claimed.

A simple and convenient apparatus by which the mercury and particles of gold or silver carried in the ore pulp are brought in contact and amalgamated is shown in the accompanying drawings, in which—

Figure 1 is a view in central cross-section of an amalgamating-vessel provided with a revolving displacer, and Fig. 2 is a plan or top view of the displacer.

In the drawings, A represents a vessel of any convenient size, preferably shaped like a common barrel, supported upon the bed-plate X, and adapted to contain the mercury and

pulp and to bring them in intimate contact with each other. The bottom of this vessel is curved and provided with an opening and a screw-plug B for drawing out the enriched mercury or amalgam. A cock C is conveniently located in the side of the vessel for drawing off the pulp or tailings.

D is a displacer composed of wings E, preferably tangential and four in number, and is secured to the lower end of shaft S, which is conveniently stepped at the tapered end of the screw-plug B and held in vertical position by a cross-bar G and driven from a pulley H. The lower edges of the wings E are curved to correspond to the bottom of the vessel, and the displacer is adjustable on its shaft, so that the lower edges of the wings can run in close contact with the bottom of the vessel.

I is a diaphragm, preferably cylindrical and slightly cone-shaped, with open ends, and so fixed in position that its lower end will be in close proximity with the upper edges of the wings E and near their free ends. Its upper end extends, preferably, about one-half or two-thirds the height of the vessel A, where it is fixed in place by the rods J, secured to the cylinder and the wall of the vessel.

A vessel A is cheaply made by taking a stout cask, removing one head, boring a hole of proper size in the center of its other head, and placing a metal plate K, curved to form the bottom of the vessel, this plate being preferably provided with a boss L, to fill the opening in the head of the cask, a screw-threaded hole being bored through the boss to receive the screw-plug B. The plate K may be fixed in position by filling the space between it and the wall and head of the cask with hydraulic cement M or similar material.

The displacer D is conveniently made by securing the wings E to a square-shaped center O by means of screws, bolts, or rivets, and may be secured to the shaft by screwing it upon the threaded portion of the shaft or by means of registering grooves and keys.

P is a jam-nut to hold the displacer in position, and is preferably tapered.

Preferably the center O of the displacer does not extend down so far as the lower

edges of the wings E, so that when the screw-plug B is removed the displacer will rest upon the edges of the wings in contact with the plate K, leaving free exits *e* for the discharge of the mercury.

When the proper quantities of mercury and ore pulp have been placed in the vessel A, preferably to fill it about half or two-thirds full, and the displacer is set in revolution, preferably from two hundred to three hundred revolutions per minute, the operation will be to force the mercury, which is located at the bottom of the vessel and between the wings of the displacer, out centrifugally to the ends of the wings E. Until the displacer has reached a high speed of revolution the mercury will continually flow back between the wings and be repeatedly struck therewith and forced outward, being thereby subjected to violent agitation, which operates to atomize or flour the mercury. When the proper speed of revolution has been reached, a circulation of the ore pulp will be established and a large portion of the atomized mercury will remain banked up around the circumferential path at the ends of the wings of the displacer, forming a zone Z, through which the ore pulp will be forced and the particles of gold and silver be brought in contact with the atomized mercury. The circulation of the ore pulp is caused by the operation of the displacer, which throws the pulp centrifugally outward and upward, forming a partial vacuum beneath the lower end of the diaphragm, into which the pulp is constantly drawn with great force.

The diaphragm I is not absolutely necessary for the successful operation of this apparatus, since substantially the same circulation of pulp would be established and maintained were it dispensed with. The lower end of the diaphragm, however, largely prevents the atoms of mercury which are adjacent thereto from passing over between the wings of the displacer.

By the operation of this apparatus, as above described, the ore pulp is passed successively and continuously through the mercury and the operation is continued as long as it shall be found practicable in order to bring the particles of gold and silver in contact with the mercury to form the amalgam.

If it should be found in any case that the action of the displacer does not sufficiently atomize the mercury, this may be remedied by subjecting the mercury to violent agitation before it is placed in the vessel A or by adding to the mercury when placed in the vessel a weak solution of sugar, sulphate of soda, or of iron, which will facilitate its atomization without materially decreasing its efficiency.

After a charge of pulp has been treated as above described for a sufficient time the discharge C may be opened and the larger portion of the tailings drawn off. Other charges

of pulp may then be admitted and the treatment continued without changing the mercury or by adding such quantity of mercury from time to time as will be sufficient to take all the gold or silver.

For the purpose of coalescing or uniting the particles or atoms of mercury or amalgam and bringing them into a single body at the bottom of the vessel, I add a small quantity of hyposulphite of soda, preferably about one-sixteenth in weight to that of the mercury present. This salt may be added before the tailings are drawn out of the vessel or after a part has been removed and may be mixed with the entire mass of pulp, mercury, and amalgam which may be present, or the pulp or tailings may be removed as closely as practicable and the salt added to and mixed with the remaining mercury and amalgam, the effect in either case being to cause the atoms of mercury and amalgam to become aggregated or coalesced and form one body on the bottom of the vessel. It is desirable for the purpose of securing any fine particles of mercury or amalgam to add the hyposulphite of soda in the vessel in which the amalgam is formed; but it is obvious that substantially the same result of coalescing and localizing the atoms will be produced by drawing off the mercury and amalgam or a part thereof and treating it with the salt in another vessel. After the coalescing and localizing of the particles have been effected by the addition of the hyposulphite of soda the amalgam may be treated by any desirable method for the separation of the gold or silver from the mercury.

It is observed that other forms of apparatus differing essentially from that above described, and shown in the drawings, may be employed for bringing the particles of gold or silver in the ore pulp in contact with the atomized mercury to form the amalgam, and I do not, therefore, wish to limit my invention to any special form or construction of apparatus so far as the working out of the process is concerned.

What is claimed as new is—

1. The herein-described process of treating ore pulp containing gold or silver, which consists in passing the pulp successively through a body or mass of atomized mercury to form an amalgam and adding hyposulphite of soda to coalesce and localize the atomized mercury or amalgam, substantially as set forth.

2. The herein-described method of treating gold and silver amalgamated with atomized mercury, which consists in applying thereto hyposulphite of soda, substantially as described, whereby the atomized amalgam will be coalesced and localized.

BUTLER G. NOBLE.

Witnesses:

ROBT. F. GAYLORD,
ROBT. H. DUNCAN.