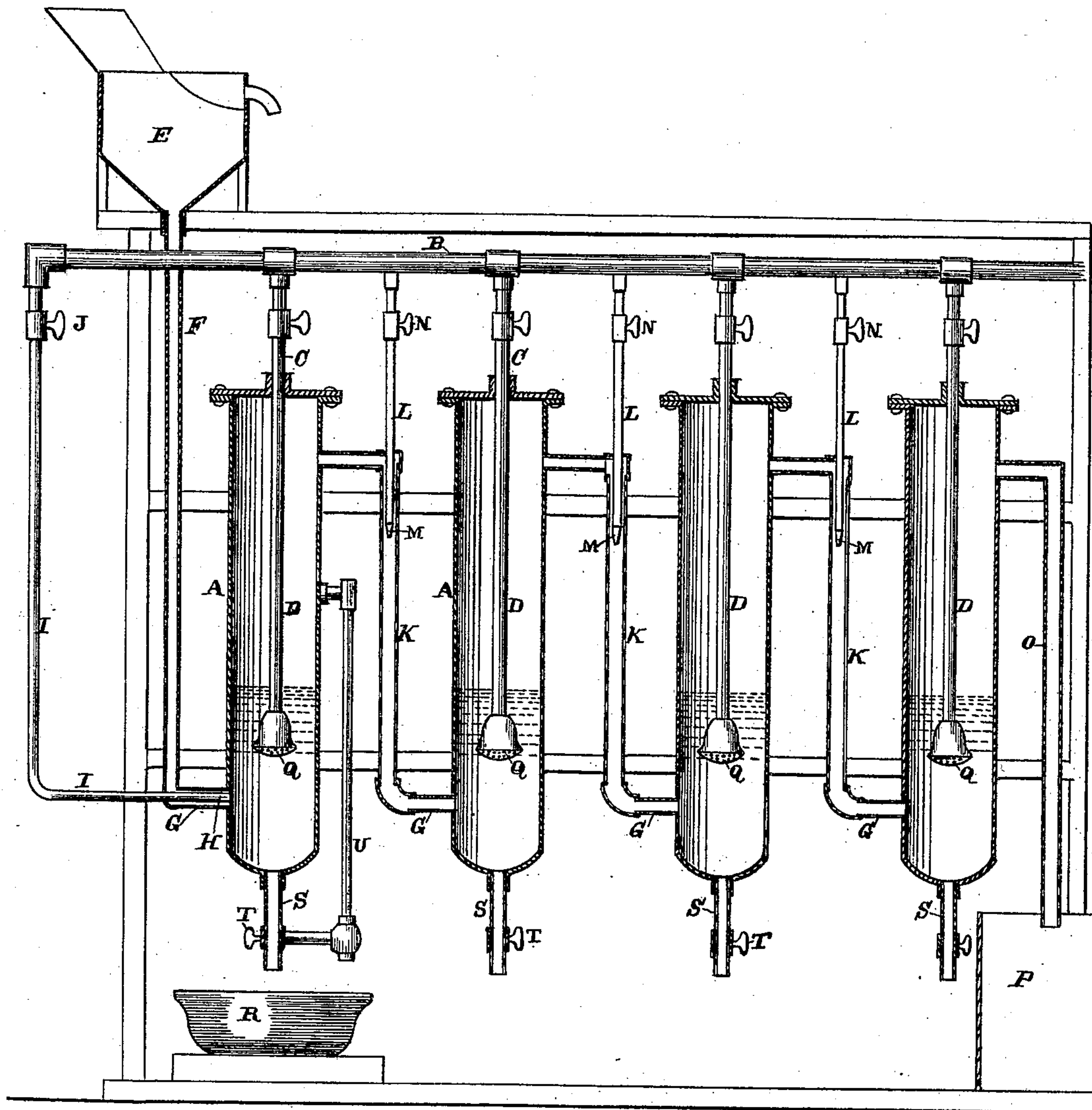


J. B. REYNOLDS.
Amalgamator.

No. 211,588.

Patented Jan. 21, 1879.



Witnesses

Geo. H. Strong
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UNITED STATES PATENT OFFICE.

JOHN B. REYNOLDS, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO CHARLES H. BAKER, OF SAME PLACE.

IMPROVEMENT IN AMALGAMATORS.

Specification forming part of Letters Patent No. **211,588**, dated January 21, 1879; application filed July 8, 1878.

To all whom it may concern:

Be it known that I, JOHN B. REYNOLDS, of the city and county of San Francisco, and State of California, have invented an Improved Amalgamating Apparatus; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to an improved apparatus for amalgamating the precious metals, by means of which every particle of ore is brought in contact with the mercury, so as to effect a thorough amalgamation.

It consists in the use of a series of cylinders, in each of which a certain quantity of mercury is placed. The pulp is forced by a jet of steam into these cylinders and into the mercury, being heated and agitated at the same time. As it rises up through the mercury another spray-jet of steam is forced against the pulp, before or after it rises out of or on the surface of the mercury, thus breaking up any lumps or masses of pulp, and agitating the pulp and mercury together. The pulp passes out of the top of the cylinder, and another jet of steam forces it down under the mercury in the next cylinder. Any number of these cylinders and steam-jets may be used. The process is continuous, the pulp being violently agitated while entering each cylinder, and receiving an accession of heat from fresh jets of steam as it passes from one to the other. Means are provided for controlling the supply of steam, preventing leakage, and for cleaning up the cylinders.

Referring to the accompanying drawings, Figure 1 is a section of my apparatus.

Let A represent the closed vertical cylinders, in which the quicksilver is placed and in which the ore is treated. I mount, on suitable frame-work, a series of these cylinders, proportionate in number to the capacity of the crushing machinery used. On the same frame-work, over the cylinder, extends a horizontal pipe, B, connected with the boilers, and through which steam is conducted, suitable branch pipes C being placed on said pipe, with cocks N, for controlling the steam, for the purpose hereinafter described.

A large tank or hopper, E, is placed in an elevated position over the frame-work, into which the ore is led from the batteries, a suitable quantity of water being admitted with said ore into the tank. The lower portion of this tank is inclined toward the center, at which point is secured a pipe, F, leading down into a horizontal pipe, G, as shown. This pipe G enters the first cylinder A near its bottom, and quicksilver is placed in said cylinder so as to fill it to a higher point than where the pipe G enters.

The pipe F, leading from the tank, enters the pipe G, one end of said pipe G entering the cylinder, as described, and the other end extending back. Into the pipe G is introduced the point or nozzle H of the branch steam-pipe I, connecting with the main steam-pipe B, as shown, and a cock, J, serves to control the supply of steam at this point.

At the upper end of the cylinder A, on the opposite side from which the pipe G enters, is the pipe K, bent at right angles, so as to extend downward, and again bent, so as to enter the next cylinder near its bottom and into the mercury in said cylinder.

Into the downward-extending portion of this pipe K, at its upper end, is introduced the branch pipe L from the main steam-pipe B. The lower end of this pipe L is contracted, as shown at M, for the purpose hereinafter described. A cock, N, serves to control the admission of steam into the pipe K.

The rest of the series of cylinders are connected in the manner described by means of the pipes K, separate branch pipes L being admitted into each of the pipes K for a similar purpose, and each pipe K leading into the cylinder under the surface of the mercury, as shown. The last cylinder of the series has a discharge-pipe, O, through which the tailings discharge into the tank V, from whence they may be removed.

In each of the cylinders is the steam-pipe C D, connecting above with the main steam-supply pipe B, and having at its lower end the spray-nozzle Q, which opens under the surface of the mercury in the cylinder. The object of this is that steam may be admitted under

pressure, which will so agitate the mercury as to break up any pulp which may have a tendency to rise through the quicksilver in lumps, as hereinafter described. A suitable cock controls the supply of steam in this pipe.

Under each cylinder is placed the bowl or receptacle R, which is intended for use in catching any leakage which may run from the cylinders, and is also useful in cleaning up. These bowls are connected with the bottoms of the cylinders by pipes S, having cocks T, so that when the ore is all driven out of the cylinders, and the amalgam and mercury remain, said mercury and amalgam may be drawn from the bottom of the cylinders into the bowls.

A gage, U, is placed on the side of the cylinders, for the purpose of showing how much mercury each cylinder contains.

The operation of my device is as follows: The pulp from the batteries is admitted into the tank E, where its consistency may be regulated with more or less water, as desired; but usually it will come from the batteries in proper condition for passing through the amalgamating apparatus. The pulp is allowed to flow from the tank down the pipe F, at the lower end of which is the pipe G, leading into the front cylinder. Steam is turned on from the branch steam-pipe I, through the nozzle H, into the pipe G, which has the effect of forcing the pulp through the pipe G into the cylinder, under the mercury in said cylinder. The action of steam under these circumstances is to draw the pulp down from the tank through the pipe F and force it through the pipe G, at the same stirring and agitating it in a violent manner, so that it enters the mercury in the cylinder in a finely-disseminated condition, most favorable for amalgamation of the precious metals contained in said pulp.

The mercury in the cylinder only occupies a portion of the space in said cylinder, being filled up to about that point indicated by the dotted lines on the drawings. As the pulp is forced in under the body of mercury it rises through it, and on its way up meets the spray from the spray-nozzle Q, on the pipe P, which violently agitates both the mercury and pulp, thus breaking up any lumps or masses of pulp which may have escaped the action of the first injecting-nozzle. As the pulp continues to be forced in it rises to the top of the cylinder over the mercury, and passes out into the pipe K. As it reaches the end of the short arm of said pipe K it meets the downward-descending jet of steam from the nozzle on the end of the branch pipe L, which forces said pulp down said pipe K, and into the next cylinder, under the mercury in that cylinder, where the operation herein described is repeated, the pulp each time passing under the mercury and being subjected to the agitating action of the steam-jets, as well as to the action of the heat supplied by the introduction of fresh steam at different points.

The gages show the height of mercury in

the cylinders at all times. The last cylinder of the series may not need any mercury, and may be used to catch any particles of that metal which may be forced over with the pulp.

The tailings pass out of the discharge-pipe of the last cylinder into a tank, and, if necessary, they may be passed through the cylinder again; but this I do not consider necessary, as the amalgamating process described is very thorough, and will take from the ore all the precious metals it is practicable to save.

It will be seen that this process is continuous in its action, and that no machinery is necessary for carrying the ore along through the cylinder. Steam may be supplied from the boilers which furnish steam for the crushing apparatus. The process employed is much more thorough than where amalgamation is attempted by passing the pulp over amalgamated copper plates, and is much less expensive than when the pulp is treated in pans, no loss of quicksilver being involved.

When the cylinders are once filled with mercury, whatever may pass over will be caught in the succeeding ones or the last one. The manner of injecting the steam for transferring the pulp from one cylinder to the other is very effective, not only for that purpose, but for agitating and beating it as it goes through. Every particle of ore must go through the bath of mercury, with no possible means of avoiding it, and the mass is so stirred and agitated during its passage that a thorough amalgamation of the precious metals is effected. The pulp is thus agitated over and over, receiving a fresh agitation and a fresh supply of heat as it enters each cylinder. The use of the kettles or bowls saves any loss by leakage.

The supplemental agitating-pipe, with the spray-nozzle on its lower end, under the surface of the mercury, assists in overcoming one of the main objections previously urged against the plan of forcing ore under a body of mercury. When brought under the mercury by a tube in the center of the bath the pulp is apt to rise in lumps, the outside portions of which only are in contact with the mercury. This is caused by the weight of the metal keeping the pulp in the same shape in which it enters it. By violently agitating the mercury in the manner described, and forcing the pulp into it in a finely-disseminated condition, and by the addition of this supplemental agitating-tube, any lumps that may have formed will be broken up and the pulp distributed evenly throughout the mass of mercury, thus allowing all the particles of precious metals in the pulp to come in contact with the mercury.

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

1. The mercury-containing chambers A, the pipes F G K, to feed the material to them, in

combination with the injecting and distributing pipes I L, the whole constructed to operate substantially as and for the purpose herein described.

2. The mercury-containing chambers A, with their feed-pipes F G K and injecting and distributing pipes I L, in combination with the pipes D, to discharge a counter-blast within

the chamber, substantially as and for the purpose herein described.

In witness whereof I hereunto set my hand and seal.

JOHN B. REYNOLDS. [L. s.]

Witnesses:

CHAS. G. YALE,
L. D. CRAIG.