(No Model.) 2 Sheets—Sheet 1.

H. M. THOMPSON.

AMALGAMATOR.

No. 346,517. Patented Aug. 3, 1886.

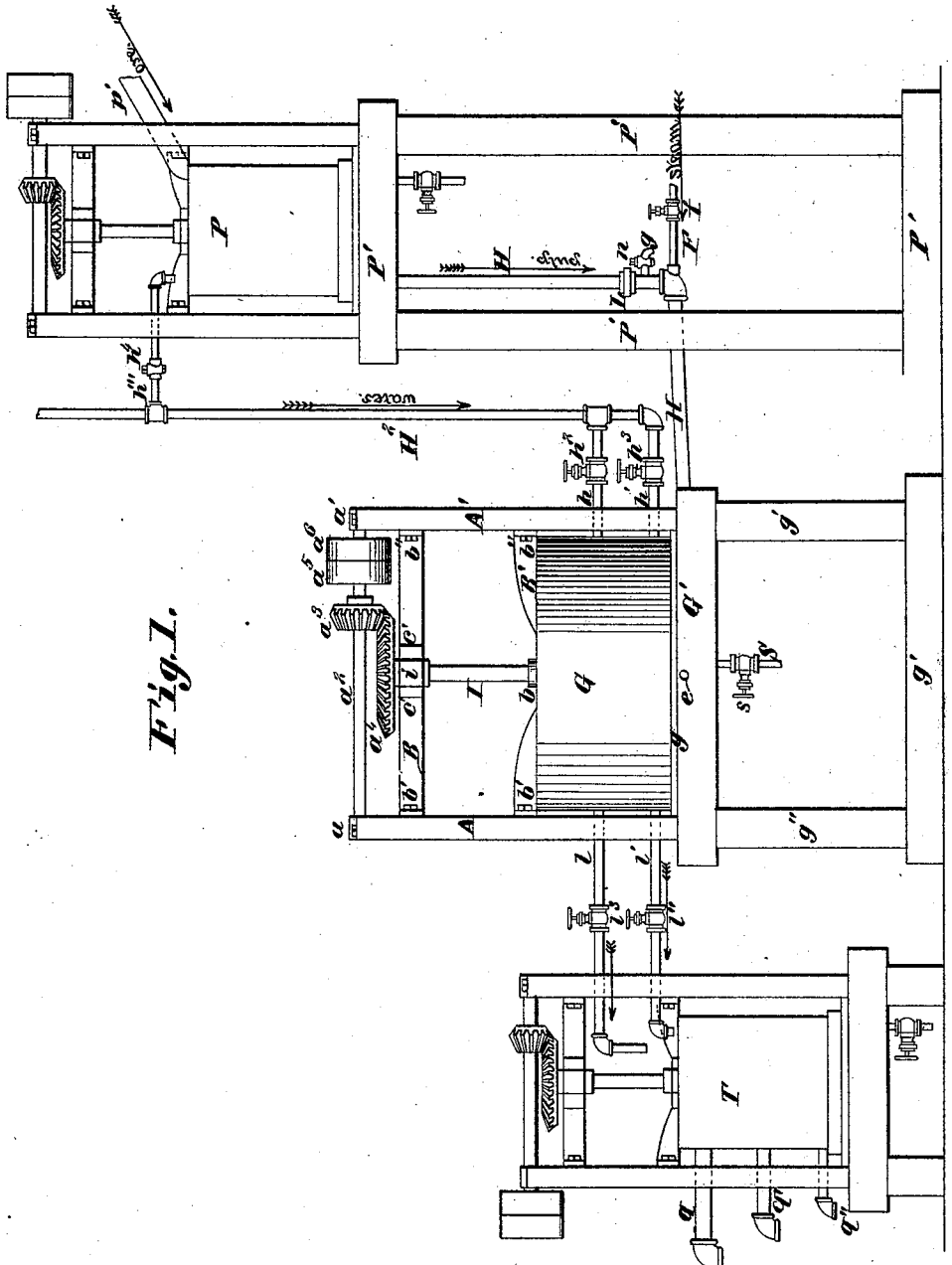

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

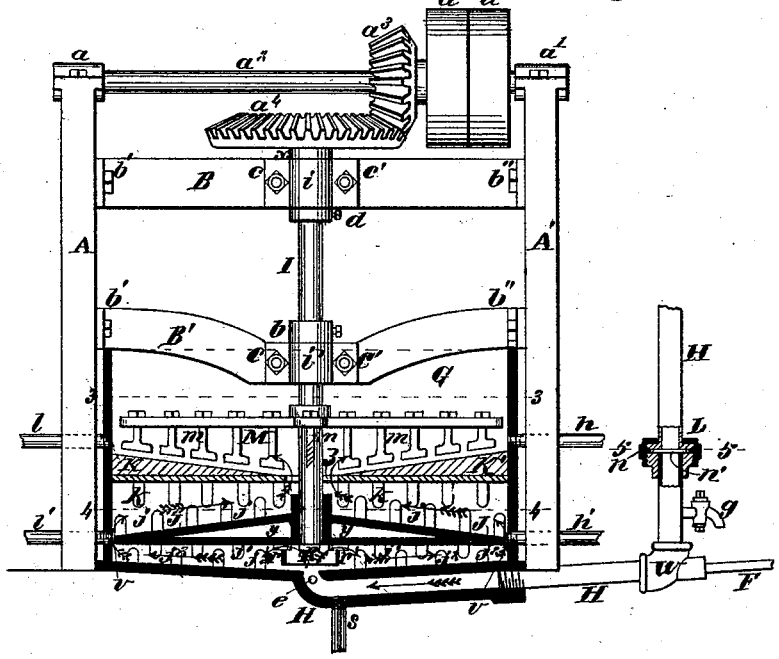


Fig. 3.

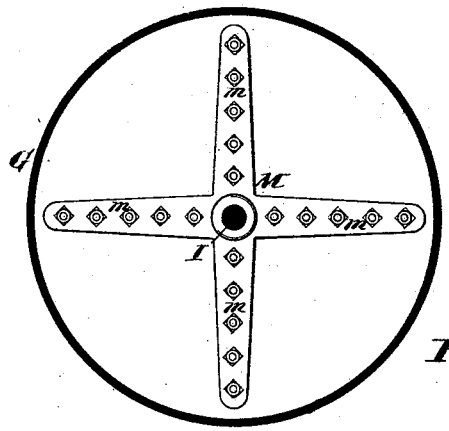


Fig. 4.

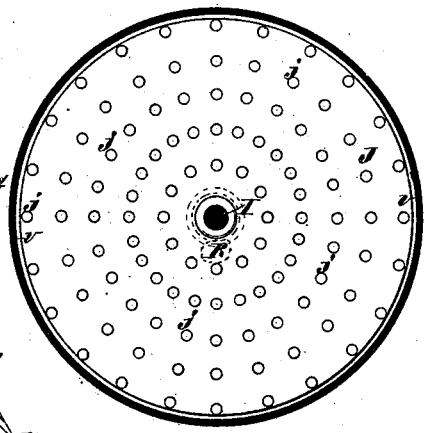
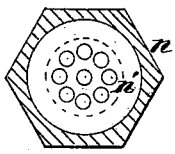


Fig. 5.



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UNITED STATES PATENT OFFICE.

HUGH M. THOMPSON, OF ST. LOUIS, MISSOURI.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 346,517, dated August 3, 1886.

Application filed December 15, 1884. Serial No. 150,463. (No model.)

To all whom it may concern:

Be it known that I, HUGH M. THOMPSON, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Amalgamators, of which the following is a specification, reference being had therein to the accompanying drawings.

The present invention relates to improvements in the amalgamators and separators for working the ores of and precious metals, as described in Letters Patent No. 255,209, granted March 21, 1882, and also in Letters Patent No. 282,131, dated July 31, 1883, both granted to me, and as well, also, to certain new features of construction and arrangement, as will be hereinafter described.

The objects of my invention are, first, to make an amalgamator wherein all the journals or bearings to the running parts shall be above contact with the mercury, so as to avoid grinding or "flouring" it, as is the case where journals run standing immersed in mercury; secondly, to pass the ore mixture through mercury on the plan of an "upward filter;" thirdly, to break the inflowing stream of ore mixture up into numerous small jets at different points in its course of flow, and spray it as well as to otherwise agitate it in the mercury; fourthly, to warm and strike the particles of ore mixture by the force of live-steam jets into the mercury; fifthly, to separate the mercury and amalgam from the tailings by washing them with water inside the amalgamating chamber or tub.

Figure 1 is a side elevation showing the relative position of a mixer, amalgamator, and trap. Fig. 2 is a vertical section of the amalgamator and separator combined. Fig. 3 is a horizontal section on a line, 3 3, of Fig. 2. Fig. 4 is a horizontal section on a line, 4 4, of Fig. 2. Fig. 5 is a horizontal section in line 5 5 of the pipe in Fig. 2.

G, Fig. 2, represents an amalgamator and separator chamber, which is preferably an open-top tub, made of any suitable material and dimensions, and provided with out or over flows, as l l', and it has the inflow water-pipes h, h', and e, the latter not shown, which carries water or steam into the chamber underneath the disk J, for washing out, &c. It also has the large inflow connecting-pipe H entering its bottom centrally, a part of which is preferably made in the cast-iron bottom by using a core, (as thereby the depth of mercury can be decreased;) or a separate pipe and curve may be used. The bottom is preferably sloped from the circumference toward its center to secure complete discharge of the contents. It has projections j'' j''' on its inner surface for agitators. It is elevated on a platform and suitable frame.

G, Fig. 1, represents the amagamator-chamber in a working position, supported upon a platform, G', and frame-timbers g' g''. The tub or chamber G rests upon and is securely fastened by bolts or otherwise to the platform g G' and its supporting-timbers. It is located centrally between the vertical side standard-frames, A A', which, with the horizontal cross-pieces B B', form a substantial support for the driving parts of the amalgamator, and they are also bolted firmly to this platform and its frame.

B B' in Fig. 2 are horizontal cross-beams, having the boxes i i' vertical at their lineal centers, and at their ends they are properly bolted or fastened rigidly to the sides A A'. At b' b'' the caps of the boxes i i' are preferably secured removably by the bolts and their nuts c c'.

I, Fig. 2, represents a vertical spindle or shaft, which is journaled in the boxes i i' and held suspended at its lower end by the collar b and shoulder x, which prevent the shaft from working down, while the collar d, held by set-screws, keeps it from rising up from forces below the disks J. At its upper end is a gear-wheel, a^4, which gears into the driving-gear a^3 upon the horizontal shaft a^3, that is journaled in the boxes a and a' on the top of the standards A A'. This shaft also has upon it one or more pulleys, as a^5 and a^6, by the application of power to which the driving-shaft a^2 and driven shaft I, with all the parts fastened or attached to them, are rotated in their bearings, and thereby agitate and thoroughly intermingle the contents of the amalgamating-chamber, in which the shaft I and other parts rotate suspended.

The disk J, Fig. 2, is vertically adjustable, and is attached to the spindle I by means of a set screw or key, and rotates suspended in the ore mixture and mercury in the chamber G on the lower end of the suspended vertical shaft I, so that there are no bearings

or grinding of the running parts of the machine together, "iron to iron," with mercury between them, as in many amalgamators, whereby much mercury is finely ground and "floured," causing it to flow over and waste in the tailings. This rotating disk J on its upper surface slopes, preferably from its center to its circumference, roof like, to carry the mercury downward. It is close-faced and may be made hollow or not, as at *y y*. The under face may be flat or convex or concave. Upon both of its faces are projections *j j'*, for agitators. It also has on its under face, located centrally, the deflector R. (Elsewhere described.) In diameter the disk is made enough smaller than the inside diameter of the chamber to give about one-half an inch space, *v*, Fig. 4, all around it between its circumference and the tub or chamber G, so the inflow from under the disk may rise above it, or the mercury and amalgam flow back beneath it. The under face of this disk and the stationary disk K may or may not be faced with copper, as desired, and dynamic or galvanic electricity may be used or not, as is desirable, by connecting the positive and negative poles of a battery, one into the mercury and the other to copper on the disks K above.

K, Fig. 2, represents a stationary disk tapering from its circumference toward its center, and it has projections *k k'* on its under surface, and may or may not have them on its upper surface, as preferred. These, like the projections on the bottom of the tub *j'' j'''*, are so placed as to pass those on the disk J when it is in motion, and thus stir and agitate the contents of the chamber. This disk is supported and held stationary in the chamber G a few inches only above the disk J. At its center there is a circular opening, *z*, through which the shaft I is put, inside of which it runs, which is enough larger than the diameter of the shaft to leave about one inch of open space all around between it and the shaft, through which the washed tailings flow up above it. Its diameter is equal to that of the inside of the chamber, and it may be held in place removably, and in such a way that it can be raised or lowered in the chamber by set-screws through the sides or lugs on the inside of the chamber. On the shaft I, and above this stationary disk, is the stirrer M, with its fingers *m*, Fig. 3, as an additional agitator above the disks.

The deflector R, Fig. 2, consists of a ring, say, five or six inches in diameter and about one inch deep, with numerous small openings or holes, *r r'*, all around it on the edge that goes next to the disk J, to which it is fixed centrally on its under face, either cast on or screwed on; or, in lieu of the small openings *r r'*, this ring and other larger ones may be set out, say, about one-eighth of an inch from the lower face of the disk J by small washers or projections on it, and secured in place by suitable screws. By either of these devices or others similar the inflowing ore mixture from the pipe H is broken up and spread or sprayed out thin and finely into the mercury, greatly assisting in accomplishing amalgamation. One or more of these deflectors and larger, similarly attached, may be made use of; or they may be suspended below the disk J, between it and the head, on supports attached to the walls or the inside bottom of the chamber G. The large connecting-pipe H, Fig. 2, is joined to and extends from the center of the bottom head of the chamber G a short distance horizontally, and thence by a curve runs up vertically to any required height, in order to obtain sufficient force in the inflowing mixture by gravity to overcome the resistance of the mercury underneath the disk J and in the horizontal and lower part of the pipe, together with that of the contents of the chamber G below the outflows *l l'*. At the curve *w*, preferably, the small steam-pipe F, with the cock *f* in it, is connected. This pipe is located at this elevation for the reason that it is below the feed-tube *n*, Fig. 5, which is located in the union L on the line 5 5 of Fig. 2. This tube may be placed at some other elevation in the pipe H, or dispensed with and a small pipe leading into a larger one used instead; or the pipe H can be used full size. The object in using it is to diminish the size and quantity of the inflowing stream, so it shall be equal to only about one-third the capacity of the pipe H, the other two-thirds of it being filled with mercury in its horizontal part, and also upward in the vertical part to, on a line with, that of the top of the mercury in the chamber G. This tube *n* is perforated with several small holes, *n'*, thereby spraying the ore mixture as it runs through it down into the mercury below, where it is struck by the live steam through the pipe F from the boiler with great force into the mercury. The steam also heats the mercury and contents of the chamber, and aids in forcing it (the mixture) through the pipe and the deflector-ring R and the agitators *j j'* and other parts of the chamber G.

For emptying the pipe H of ore mixture, the cock *g* is provided, also the pipe S and cock *s*, Fig. 1. The pipe H is joined to some suitable agitator or mixing-chamber at its upper end, as shown in Fig. 1, P, which consists of any suitable mixing-tub, with a stirrer therein, and proper mechanical parts for rotating, driving, and supporting the same. This tub P is provided with the water-supply *h'''*, having a cock, *h⁴*, with or without the ore-spout *p'*, and it stands securely fastened upon a platform erected on and supported on the timbers P', elevated to any desired height thereon.

H², Fig. 1, represents a water-pipe having the branch pipes *h'''*, *h'*, and *h*, with the cocks *h²*, *h³*, and *h⁴*. The pipe *h'''* has been mentioned. The pipe *h*, Fig. 2, enters the chamber G at a point just above the disk J, between it and the stationary disk K, and supplies water for thinning and washing the contents of the chamber at this point, to separate

the mercury or amalgam therefrom and carry the tailing up through the space *z* in the stationary disk K, where it may be further stirred by the stirrer M and washed by water from the pipe *h*.

The pipes *l l'* represent out or over flow pipes, and may or may not have the cocks *l'' l³* in them.

l is the outflow above the stationary disk K.

l' is a discharge-pipe for emptying the contents of the chamber between the disks J K. They may discharge into the trap-chamber T, Fig. 1, which consists of an open tub having a stirring device therein, and suitable mechanical parts for supporting and driving or rotating the stirrer, whereby the contents of the chamber is agitated and carried out at the discharges *q q' q''* at any desired elevation, and flows away. This chamber may be elevated or not. Its use is to catch or gather any mercury or amalgam which, by accident or otherwise, may flow out of the chamber G into it. It, as well as the chambers G and P, has at its bottom a draw-cock and pipe, as shown in Fig. 1, for emptying the contents at any time.

The operation of my apparatus is as follows: The fine-ground ore is fed into the mixing-chamber P, Fig. 1, where it is mixed with water and chemicals, if desired, and stirred. From thence it flows down the connecting-pipe H, through and past the feed-tube *n*, into the mercury standing in the pipe at the curve *w*, where it is struck with a jet of live steam from the small pipe F, which connects with boilers and warms and sharply intermixes it with the mercury as it is carried forward through the horizontal part of the pipe H, and forced up into the deflector-ring R, by which it is mostly spread or sprayed out in all directions into the mercury under the suspended rotary and stirring disk J, Fig. 2, by which the contents of the chamber is more thoroughly agitated and intermingled, and that under the rotating disk worked laterally out to its circumference, and is carried up through the space *v*, Fig. 4, to the space above it, between the disks J and K, where it comes in contact with a stream of water from the water-pipe *h'*, by which means the mercury and amalgam are washed out and thoroughly separated at this point from the ore, and the mercury runs down the slope of the disk to below it, while the washed ore is carried up through the opening *z*, around the spindle I in the disk K, into the upper part of the chamber, where it is again agitated by the stirrer M, and rewashed by more water, if necessary, from the pipe *h*, after which it discharges through the overflow-pipe *q*, Fig. 1, into the trap T, where it is again operated upon and washed to save and separate out still more closely any floured or other mercury and amalgam which may have escaped from the chamber G, after which the tailings discharge out through the pipes *q q' q''*, and are of no more use.

The mercury used in the amalgamator can be fed into the mixing-chamber P or poured directly into the chamber G, as may also any chemicals requisite to amalgamation.

The description herein given of the operation and process made use of in amalgamating precious metals or their ores in my apparatus is herein inserted for information to the public, without any intention on my part of making any claims therefor in this application; but I will make a separate application for Letters Patent of the United States for the process mentioned.

I am aware of the use of electrical currents and of rotary and stationary disks in sets, and of stirrers; also, of the introduction of the ore mixture from below upward in amalgamating-machines; and I do not herein broadly claim either of these features.

I claim—

1. In an amalgamator, the disk J, having one or more deflectors, R, secured to its lower face, and the vertical shaft I, which is provided with suitable means of support and for rotation, in combination with the chamber G, having in its wall one or more inflow and outflow pipes, and in its bottom the pipe H, entering which is the steam-pipe F and the draw-off pipe S, with their cocks *f* and *s*, and the stirrer M, substantially as and for the purpose named.

2. In an amalgamator, one or more deflectors, R, secured to the lower face of a disk, J, which is adjustably fastened upon the vertically-suspended shaft I, provided with suitable means for its support and rotation, in combination with an amalgamator-chamber, G, in the bottom of which is the pipe H, and in its wall one or more inflow-pipes and outflows, and the stirrer M, substantially as and for the purpose mentioned.

3. The disk J, secured upon the lower part of a vertical shaft, I, which is held in suspension and rotates the disk suspended in the contents of a chamber, G, the bearing or boxes to the shaft being located above said disk, said disk having projections *j j'* upon either or both of its faces, and the deflector R, attached thereto, in combination with suitable driving parts, and the chamber G, having the inlet-pipe H at the bottom, together with one or more inflow water-pipes, *h h' e*, and one or more outflows, *l l'*, and the stationary disk K and stirrer M, all properly supported, substantially as and for the purpose mentioned.

4. The standards A A', the cross-bars B B', shaft a^2, boxes *a a'*, gear a^3, pulleys a^5 a^6, and gears a^4, collars *d b*, shoulders *x*, box *i i'*, vertical shaft I, with the stirrer M, disks K and J, deflector-ring R, and projections *j k*, in combination with the chamber G, having the inlet H at its bottom, and provided with suitable water-pipes and overflows, substantially as and for the purpose specified.

5. In an amalgamator, one or more deflectors, R, held stationary and suspended upon stud-pins (or other suitable means) attached

to the bottom of an amalgamator-chamber, whereby it is suspended between the bottom and a revolving disk above it without other contact with either of them, in combination with the chamber G, the disk J, and the vertical shaft I, provided with suitable means of support and for rotation, substantially as set forth.

6. In an amalgamator, the chamber G, having the inlet for ore mixture located in its bottom, on which are the projections j^2, in combination with the pipe S and its cock *s*, substantially as and for the purpose named.

7. The chamber G, having in its wall one or more suitable inflow and outflow pipes, and the pipe H in its bottom, in combination with the steam-pipe F and cock *f*, and the draw-off pipe S and its cock *s*, substantially as and for the purpose mentioned.

HUGH M. THOMPSON.

Witnesses:
CHARLES F. THOMPSON,
S. I. LOVETT.