(No Model.) 3 Sheets—Sheet 1.

B. TYSON.

AMALGAMATOR.

No. 342,272. Patented May 18, 1886.

Fig. 1.

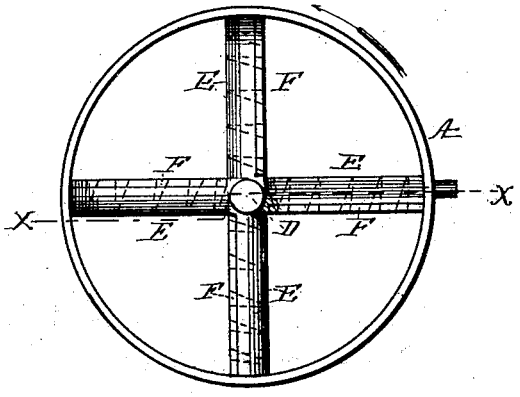
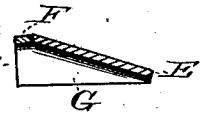


Fig. 4.



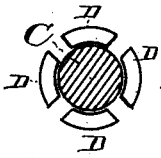


Fig. 3.

Fig. 2.

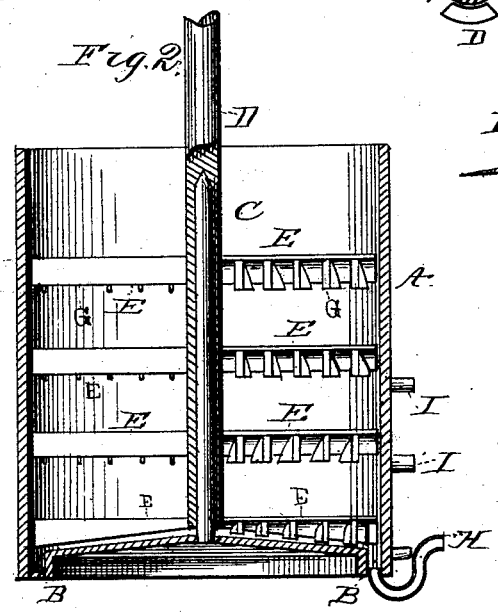
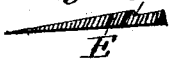


Fig. 9.



Witnesses

J. W. Reynolds

H. A. Hall

Inventor

Bryan Tyson

By Daniel Breed

Atty.

(No Model.) 3 Sheets—Sheet 2.

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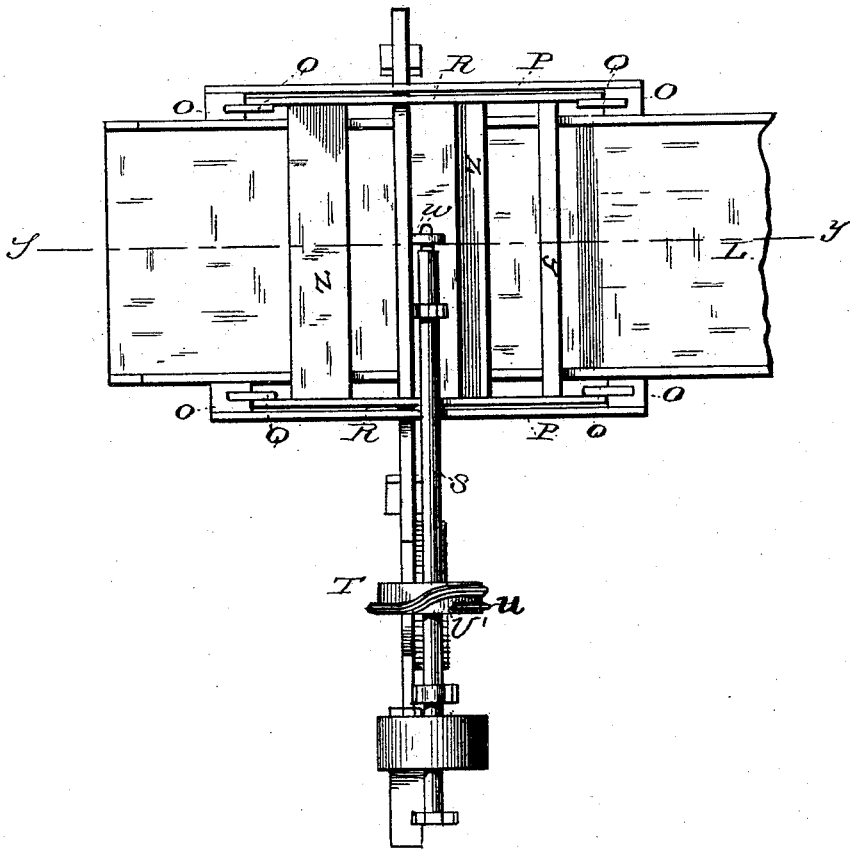
Fig. 5.



Witnesses:
J. W. Reynolds
H. A. Hall

Inventor:
Bryan Tyson
By Daniel Breed
Atty.

(No Model.)

3 Sheets—Sheet 3.

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Fig. 6.

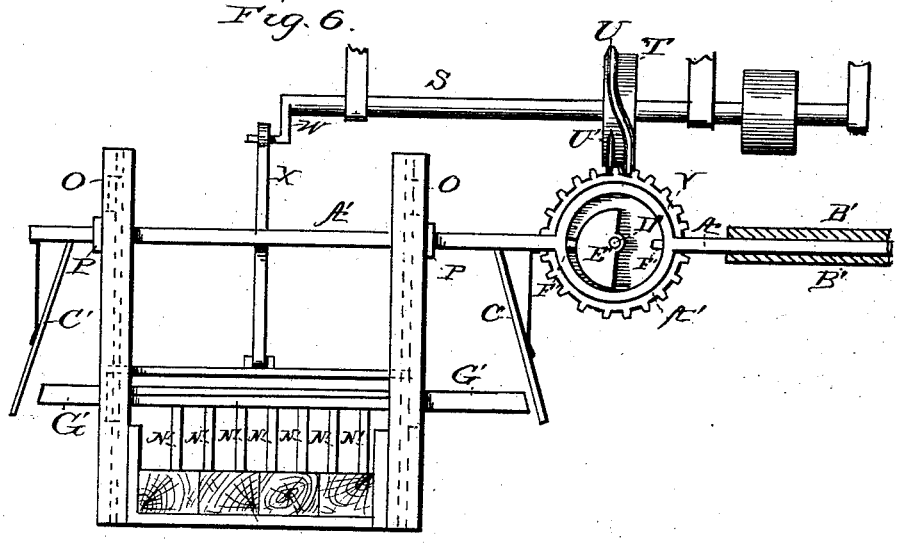
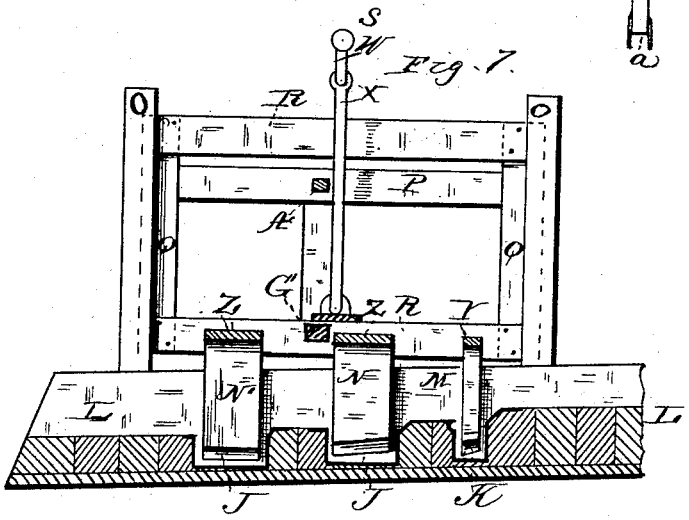


Fig. 8.

Fig. 7.



Witnesses
J. W. Reynolds
H. A. Hall

Inventor
Bryan Tyson
by Daniel Breed.
Atty.

UNITED STATES PATENT OFFICE.

BRYAN TYSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 342,272, dated May 18, 1886.

Application filed August 14, 1883. Serial No. 103,705. (No model.)

To all whom it may concern:

Be it known that I, BRYAN TYSON, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Amalgamators, of which the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to first amalgamate, by means of a circular pan and other appliances where chemicals can, if desired, be employed, and, second, to secure the quicksilver that has become disintegrated and mixed with the pulp, without employing what is known as a "settler," thus largely decreasing ordinary expenses, and at the same time increase the yield of the precious metals and also prevent any material loss of quicksilver.

In the accompanying drawings, Figure 1 is a top view of my amalgamator. Fig. 2 is a sectional view of same, cut on line *x x*, Fig. 1. Fig. 3 is an enlarged sectional view of the shaft and step. Fig. 4 is an enlarged sectional view of the blade E and scraper G, situated beneath. Fig. 5 is a plan view of my machine for catching the quicksilver discharged with the pulp from the pan. Fig. 6 is an end view of same. Fig. 7 is a longitudinal sectional view of same cut by line *y y*, Fig. 5. Fig. 8 is a side view of one form of the plungers. Fig. 9 is a cross-sectional view of the blade E with the amalgamating-plate F detached.

In the construction of my improved amalgamator I employ a circular stationary pan, A, Fig. 1, of proper dimensions, resting on some suitable foundation. The bottom of the pan is preferably raised at the center, and at or near the periphery we have an annular chamber, B, Fig. 2, as a receptacle for quicksilver.

C, Fig. 2, is a vertical bearing made fast to the pan at the center.

D is a shaft, provided with vertical arms having an open space between each, and rests on the bearing C at or near the upper ends of said arms where they unite with the shaft D. The portion of the shaft that extends below the upper end of the bearing C will be constructed hollow, and this hollow portion, as shown by the drawings, Fig. 3, is subdivided into four parts; but any convenient number of subdivisions may be employed.

E E are blades properly secured to and extending from the subdivisions of the shaft D. Four of these blades may be termed a "set," and any convenient number of sets may be employed. In the drawings, Fig. 2, four sets are shown, the lower set working near the bottom of the pan. Said blades E E are preferably constructed on a suitable incline, Fig. 4, and when in operation the lower edges, which should be sharp, are in front. The width of the three upper sets of blades may be uniform throughout their entire length. The width of the lower set may be gradually increased from the shaft to its outer end, so as to conform to the incline of the bottom of the pan. When in operation, the shaft D revolves, carrying the blades with it. By reason of the incline of said blades they raise the pulp gradually while passing under it, thus affording facilities for circulating the pulp and amalgamating the precious metals that will shortly be described more definitely.

F F, Figs. 1 and 4, are plates composed of copper or other metal suitable for amalgamating purposes. The blades E E are constructed with suitable grooves or depressions, F, extending their entire length, for the reception of said plates, Fig. 9. The bottom sides of the blades E E are provided with scrapers G, Fig. 4, preferably constructed in the form of thin plates, and extending obliquely across said blades at a proper angle. The bottom edges of said scrapers are preferably placed on a level and the front ends made sharp. They should extend a suitable distance below the front edges of the blades E E. Thus arranged the scrapers will work the pulp to or from the center of the pan according to the construction. As constructed in the drawings, Figs. 1 and 2, the two upper sets of blades and accompanying scrapers will work the pulp to the center of the pan, and the two lower sets will work it to the circumference of same. The pulp being raised by means of the incline of the blades E E, a vacuum or partial vacuum is formed beneath them, thus enabling the scrapers to more readily move to the right or left, the pulp coming in contact therewith. A constant circulation of the pulp will thus be maintained, by which means the precious metals will more readily be brought into contact with the amalgamating-plates F F. Quicksilver should be

applied to the pulp at the surface as constantly and steadily as may be found practical. This can be done by any suitable automatic device, the quicksilver being preferably first broken into fine particles by any appropriate means before the same is deposited on the pulp. The agitation of the pulp by means of the blades E E will readily cause the quicksilver to settle to the bottom of the pan, gathering up the precious metals in its descent downward.

B, Fig. 2, is an annular chamber of suitable dimensions, situated at or near the periphery of the pan. Before commencing operations this chamber should be filled with quicksilver.

H is a pipe leading out of said chamber. The bottom of the outer caliber of this pipe should be on a level with the top of said chamber. Thus constructed, all surplus quicksilver that comes into said chamber above the quantity necessary to keep it full will flow out through the pipe. The inner end of the pipe being inserted in the annular chamber near the bottom of same, no pulp can get into the pipe so long as said chamber is kept properly filled with quicksilver.

I I are suitable apertures in the side of the pan for the discharge of the pulp at proper intervals.

The operation of the pan is as follows: The shaft D, to which the blades E E are properly secured, is made to revolve by means of any appropriate power. Said blades passing under the pulp will raise it by means of the inclines, and the scrapers G will circulate it to the right and left, as already described. Necessary facilities are thus afforded for the quicksilver deposited at the surface of the pulp to circulate downward through it, thus causing the plates F F to more readily amalgamate the precious metals coming in contact therewith. Much of the precious metals will doubtless be wiped off the plates by the action of the blades passing through the pulp; but after the particles of metal have once been amalgamated it matters but little whether they adhere to the plates or not. If they fail to unite with the main body of quicksilver below, they can be readily taken by means that will hereinafter be described. The surplus quicksilver will flow out through the pipe H, where it can be caught in any suitable vessel, from whence it can be taken and again distributed to the pulp by means already described. The same quicksilver can thus be fed to the pulp over and over again until the free metal in it is all taken up, when the pulp may be discharged. When desirable to discharge the pulp, the apertures I I may be opened and the pulp washed out. It will not be possible to settle by means of the blades E E all the quicksilver and precious metals that have been amalgamated therewith, nor will will it be practical to attempt to do so. Therefore when the pulp is discharged, a considerable percentage of quicksilver and metal amalgamated therewith will flow out with same. This can be readily and cheaply taken as it flows from the pan by means that will now be described.

J J K, Fig. 7, are receptacles for holding and working quicksilver, being placed at right angles across the sluice-box L. They may be constructed of wood or metal, the surface, in order to prevent wear, being preferably constructed of some hard metal. These receptacles may all be constructed with a projecting lip on the lower side, for the purpose of turning the under current of water backward after the manner of receptacle K; or they may be constructed without said projection, as shown by receptacles J J, as may be found best in practice. The plungers M N N′ for working in said receptacles may be constructed of metallic plates brought to a single sharp edge at lower end; or they may be constructed of wood of proper thickness, having a plate on either side brought to an edge at the bottom, as shown by N′, Fig. 8, as may be found best in practice. The form for plunger last mentioned, N′, will serve for sinking the pulp into the quicksilver.

O O P, Figs. 5, 6, and 7, is a frame, square or rectangular in form, properly secured to the sluice-box L. Each of the four posts O contains a groove, in which the sliding boards Q of the vertical sliding frame work. R R are cross-pieces made fast to the sliding boards Q, thus forming a substantial sliding frame.

S, Figs. 5 and 6, is a shaft working in proper bearings, and is provided with a wheel, T, and crank W. Upon the face of said wheel a thread, U, is constructed, that extends around the whole circumference of same, the ends thereof passing each other for a short distance. Said thread meshes with the wheel V. This thread for about three-fourths the circumference is constructed near one edge and parallel therewith. It thence crosses the face at a proper angle until the other edge of the wheel is reached, when the course is changed to a parallel with this edge and soon thereafter ceases. In operation the angle of the thread will cause the wheel V to move a suitable distance for the end of the thread U when it comes around to mesh with a new space, and thus a new cog will be taken up at each revolution of the wheel T. In this way the wheel V will be caused to revolve slowly.

X, Figs. 6 and 7, is a connecting-rod connecting the crank W with the vertical sliding frame, above described. Y and Z Z, Fig. 7, are bars that form a portion of a horizontal sliding frame. The ends of said bars work through suitable apertures in the cross-boards R of the vertical sliding frame, preferably the cross-boards that are situated nearest the bottom of said frame. To said bars the plungers M N N′ are properly secured.

A′, Figs. 6 and 7, is a sliding bar that works through suitable apertures in the cross-boards P of the stationary frame. The end of said sliding bar that is situated farthest from the sluice-box is held in position by means of pieces B′ B′, thus forming a suitable groove

for the bar to slide in. Said bar is provided with standards C′, extending at a proper angle downward for a suitable distance.

To the axle D′ of the wheel V, Fig. 6, is properly secured a cam, E′. The sliding bar A′ is of proper dimensions at this point for the construction of a suitable aperture therein, in which said cam works. F′ F′ are lugs projecting from the inside of said aperture at opposite points, against which the cam impinges, first one and then the other, when being revolved, and thus causes said bar to slide to and fro.

G′ is a sliding bar that works through suitable apertures in the bottom boards, R, of the vertical sliding frame. To said sliding bar are properly secured the bars Y Z Z, that sustain the plungers M N N′, thus forming a substantial horizontal sliding frame. The operation of this device is as follows: The pulp after being discharged from the pan A, containing considerable quicksilver and precious metals amalgamated therewith, is conducted into the sluice-box L. Across this sluice-box the receptacles J J K, for holding and working quicksilver, are so placed as to cause the water and pulp to properly flow over them. Said receptacles should be properly filled with quicksilver before commencing operations. Power being applied, the crank W and connecting-rod X raise and lower the vertical sliding frame, to which the plungers M N N′ are attached, at each revolution of the wheel T. The bars Y Z Z, that sustain the plungers and the sliding bar G′, being properly secured to said vertical sliding frame, will be reciprocated up and down to the same extent as said frame. The plungers M N N′ will thus be lowered into and raised out of the quicksilver in the receptacles J J K at each revolution of the wheel T and crank W. In order that we may cause the position of the plungers to be changed before making each downward stroke, thus causing them to cut the pulp overlaying the quicksilver in a new place at each stroke, we employ the following devices: The construction of the cam E′ should be such that it will constantly or nearly constantly impinge on one of the two lugs F′, first one and then the other. At each revolution of the wheel T the wheel V and cam E′ will receive a slight movement, which will cause the sliding bar A′ to slide to the right or left, according to the lug impinged on by the cam. At each upward movement of the vertical sliding frame one of the ends of the sliding bar G′ will impinge against one of the two standards C′—the one that last received a movement in the direction of the sluice-box L—thus causing said bar to slide. The bars Y Z Z, that sustain the plungers, being secured to the sliding bar G′, will receive the same movement of said bar, and in this way the position of the plungers will be changed. This movement will continue until the cam ceases to impinge on this lug. It will then impinge on the lug on the opposite side, causing a similar sliding movement in the opposite direction. A lateral reciprocating motion to and fro will thus be given the plungers, by which means the pulp overlaying the quicksilver in the receptacles J J K can be kept loose throughout their entire length, the plungers in each tier being of proper distance apart to admit of this. In lieu of the cam E′ a crank and connecting-rod may be employed to give the sliding bar A′ the necessary sliding motion; but a cam having the face thereof so constructed that the sliding movement given the sliding bar A′ will be the same at each revolution of the wheel T, if preferred. The plungers operated as aforesaid will agitate the pulp overlaying the quicksilver in said receptacles, and will keep it loose, by which means the quicksilver discharged with the pulp from the pan can be readily precipitated and united with the quicksilver in said receptacles.

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

1. The pan A, provided with an annular chamber, B, apertures I, for discharging the pulp, and a pipe, H, for discharging quicksilver, in combination with the blades E, provided with amalgamating-plates F, and scrapers G, operated by the shaft D, substantially as and for the purposes described.

2. The sluice-box L, having receptacles J J K, for holding and working quicksilver, in combination with the plungers M N N′, which are secured to the bars Y Z Z, the wheel T, thread U, wheel V, cam E′, sliding bars A′ and G′, crank W, and connecting-rod X, substantially as and for the purposes described.

BRYAN TYSON.

Witnesses:

DANIEL BREED,

H. A. HALL.