(No Model.) 2 Sheets—Sheet 1.

W. H. PECK.

CENTRIFUGAL AMALGAMATOR.

No. 560,641. Patented May 19, 1896.

Fig. 1.

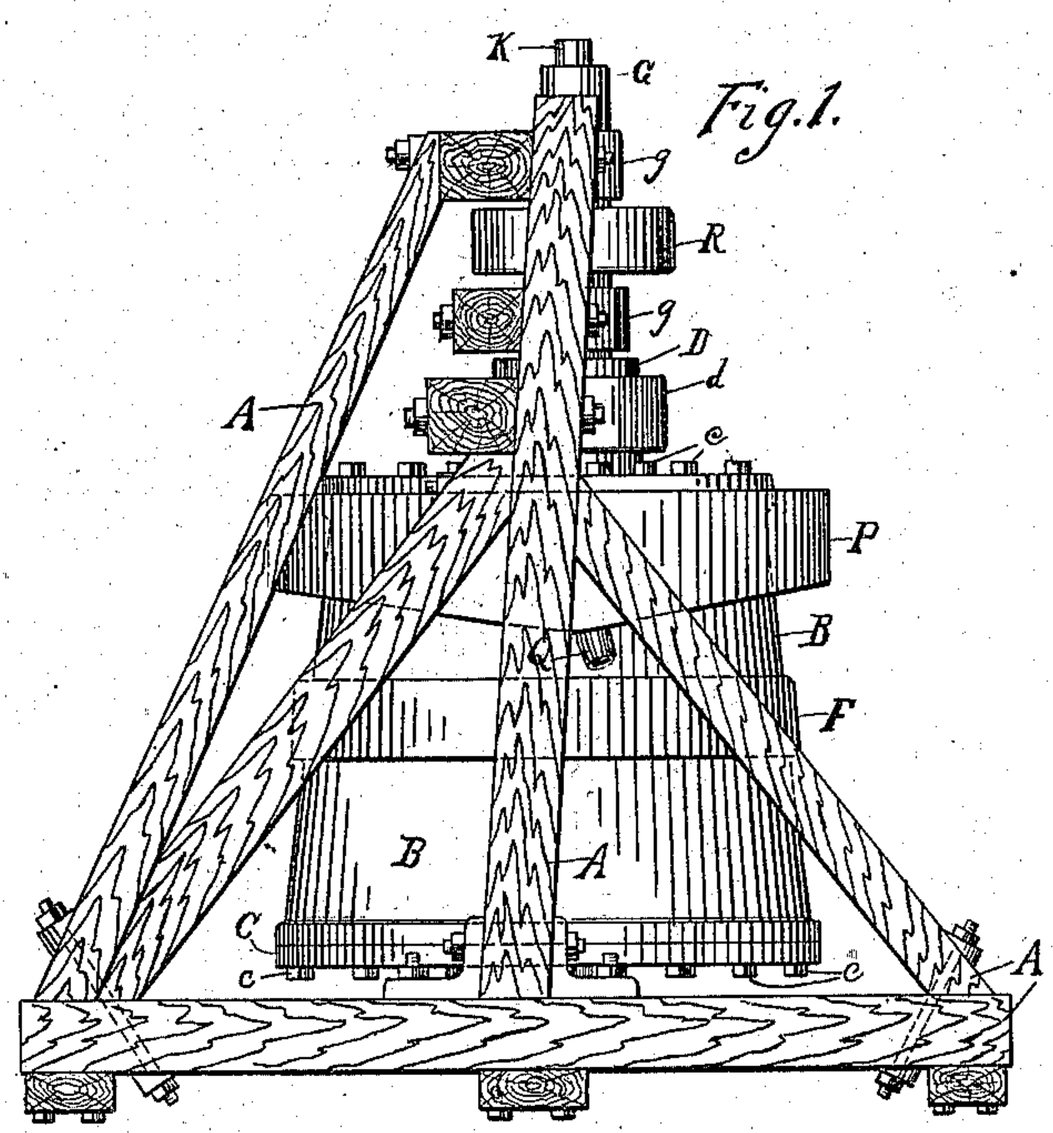
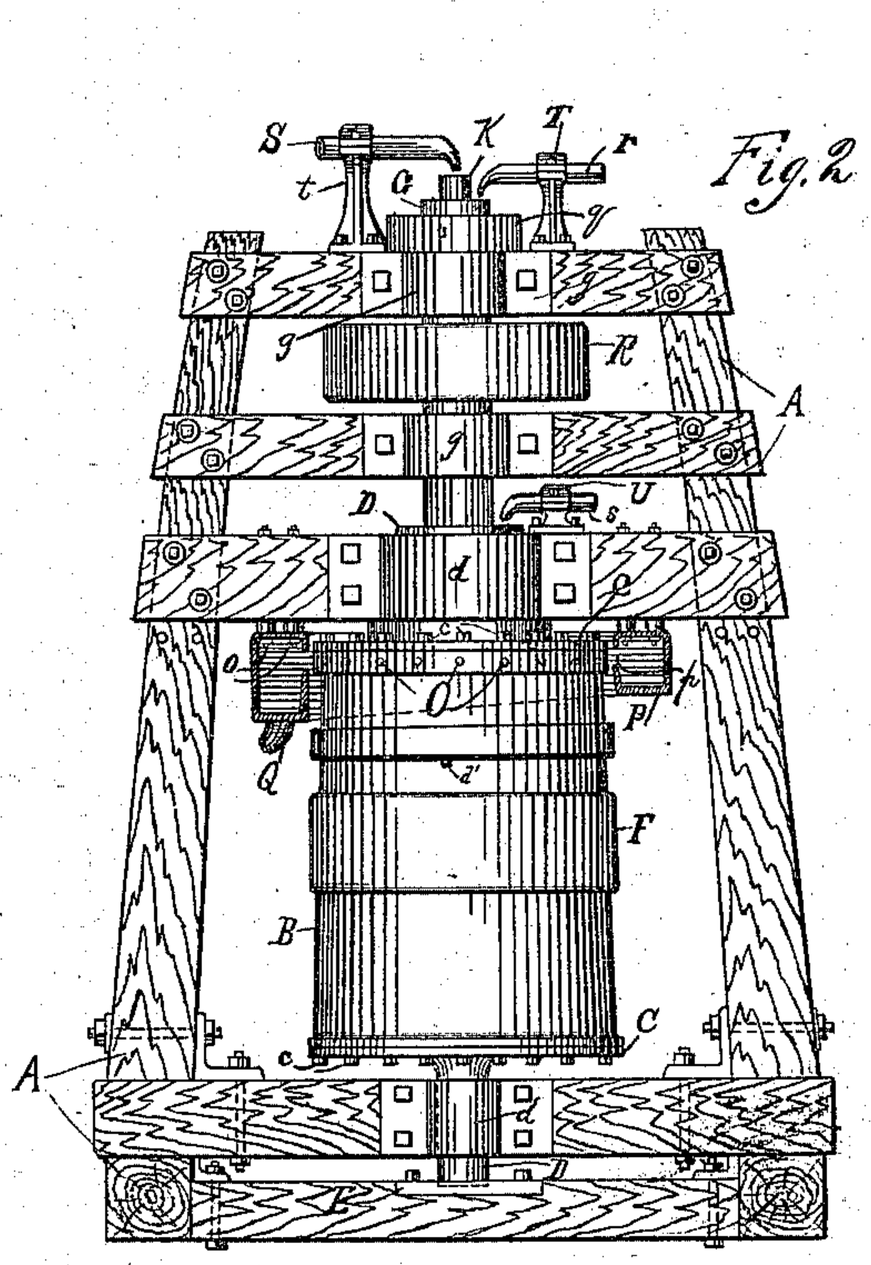


Fig. 2.



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H. B. Lewis

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W. H. Peck

(No Model.) 2 Sheets—Sheet 2.

W. H. PECK.

CENTRIFUGAL AMALGAMATOR.

No. 560,641. Patented May 19, 1896.

Fig. 3.

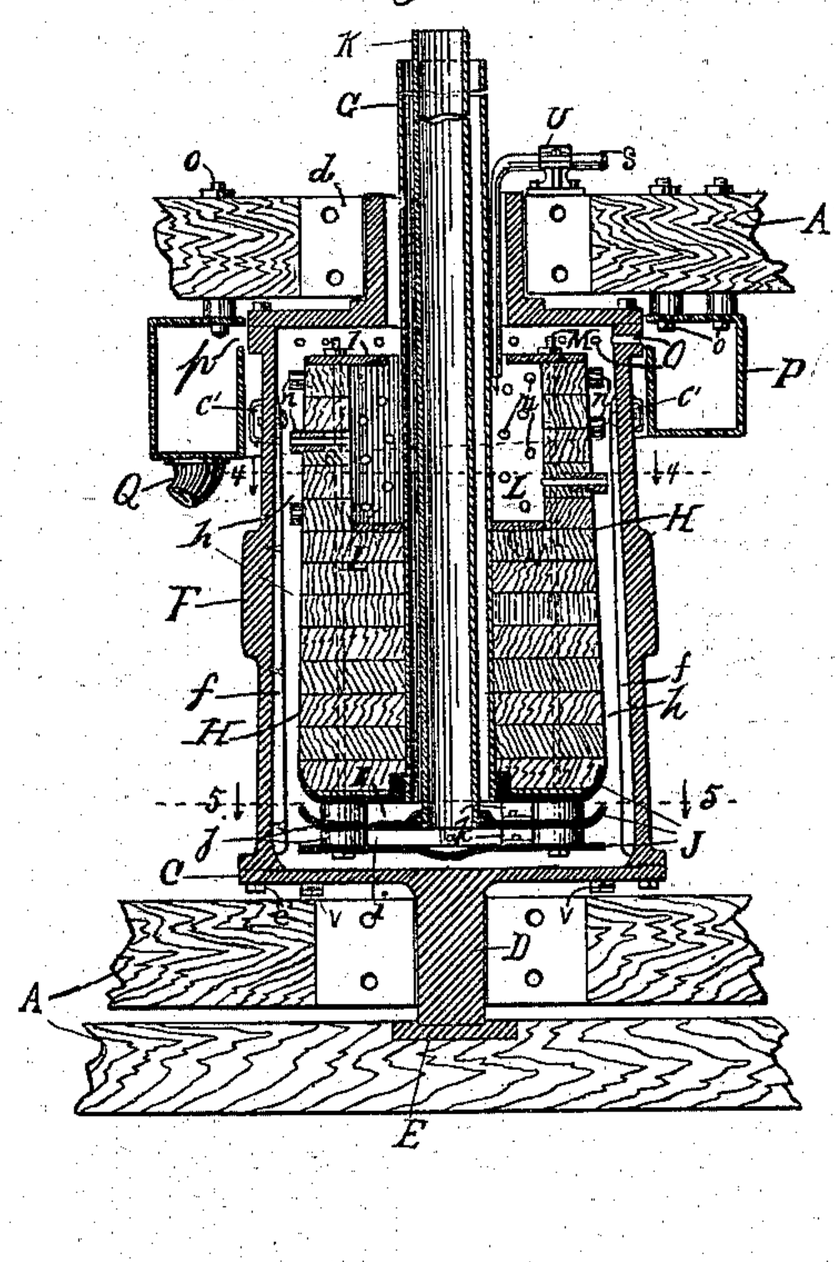


Fig. 5.

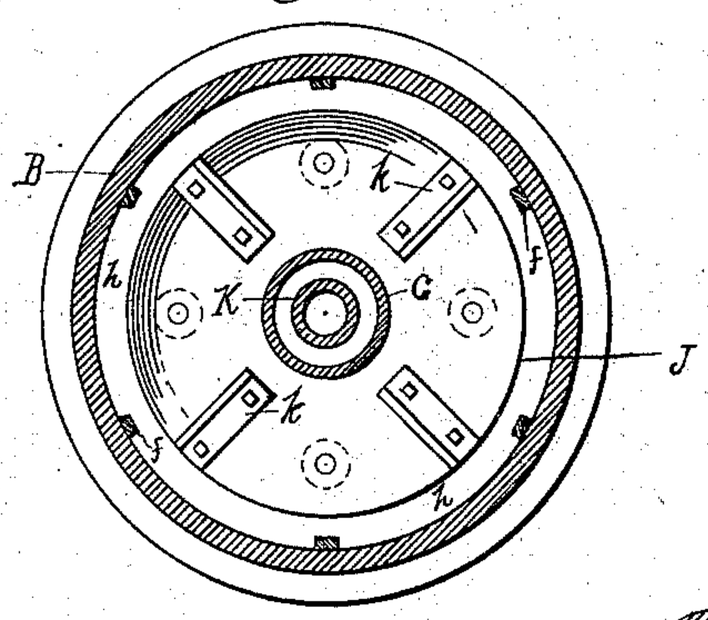


Fig. 4.

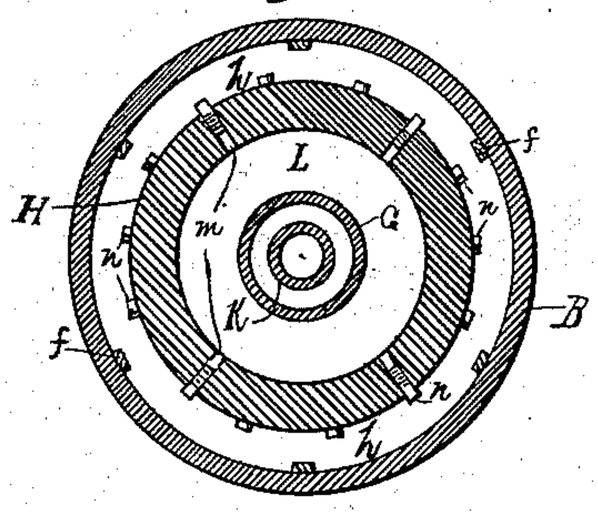
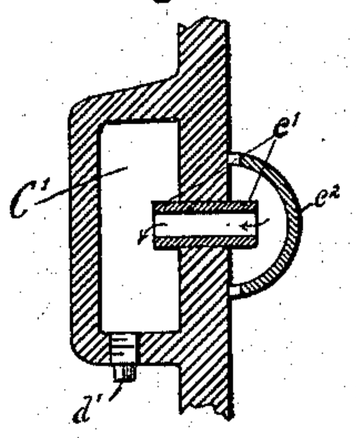


Fig. 6.



Witnesses;
W. M. Young
H. B. Lewis

Inventor;
W. H. Peck

UNITED STATES PATENT OFFICE.

WILBUR H. PECK, OF CHICAGO, ILLINOIS.

CENTRIFUGAL AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 560,641, dated May 19, 1896.

Application filed November 27, 1894. Serial No. 530,201. (No model.)

To all whom it may concern:

Be it known that I, WILBUR H. PECK, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Centrifugal Amalgamators, of which the following is a specification.

The objects of my invention are principally to provide a centrifugal amalgamator wherein the specific gravity of particles of precious metals susceptible of amalgamation or precipitation may be greatly accentuated by the action of centrifugal force, and actuated by such force will be quickly and strongly thrown down into the mercury and recovered, and to provide means whereby material and water will be readily and conveniently forced or pumped through the amalgamating vessels and the material will be prevented from accumulating or packing therein, and also to prevent the escape of particles of precious metals or mercury that may be commingled with the waste material. I accomplish these objects by the mechanism illustrated in the accompanying drawings, of which—

Figure 1 is a side elevation of my improved amalgamator with the various feed-pipes omitted. Fig. 2 is a front elevation of an amalgamator illustrated in Fig. 1 with the trough in section and somewhat different in proportions, showing the mercury-overflow chamber located somewhat lower down on the vessel. Fig. 3 is a central vertical section of the amalgamating vessel, the internal parts, and the trough, showing parts of the supporting-frame, also showing the central pipes or tubes with a sectional portion near their upper ends removed. Fig. 4 is a cross-section of an entire vessel and internal parts on line 4 4 of Fig. 3, looking in the direction of the arrows; and Fig. 5 is the same kind of a section on line 5 5 of Fig. 3, looking in the direction of the arrows, showing in addition, however, a section of the outer hollow shaft or tube. Fig. 6 is a cross-section of that portion of the side of the amalgamating vessel around which the mercury-overflow chamber passes, showing one of the overflow-passages in section.

In making my improved centrifugal amalgamator I provide a suitable frame A, adapted to support and maintain the parts in proper position that are secured to it. I also provide an amalgamating vessel or receptacle B, adapted to contain mercury, preferably made cylindrical in form, and operated in a vertical position. It may be made of any suitable material, but in most instances I prefer to make it of steel or iron.

The amalgamating vessel or cylinder B preferably has removable heads or ends C, secured to the sides or body of the vessel by bolts *c* or in other suitable way, and the heads or ends are provided with outwardly-extended trunnions D, the lower one of which is solid, that end of the vessel being entirely closed, while the upper trunnion is preferably made somewhat larger in diameter and is made hollow, for the purposes hereinafter described. The trunnions D serve as journal-bearings for the vessel and are journaled in boxes *d*, secured to the supporting-frame. The lower trunnion is also stepped on a plate or suitable step-bearing E, and thereby serves to support the weight of the vessel and its contents.

To catch or receive any surplus mercury that may be collected from materials treated that may contain the same, preferably around the amalgamating vessel, in proper contact with or in position relatively to said vessel is provided a suitable mercury-overflow-receiving chamber C′, communicating with the interior of the vessel by one or more tubes *c′*, which extend sufficiently therethrough so that when the mercury within the vessel in operation has reached the maximum desired quantity any surplus or addition thereto will flow through the tube into the chamber C′. Over the end of the tube *c′* is located a cap c^2 with its edges bent down to exclude ingress of water and sand. The mercury may be drawn from the chamber C′ by the removal of the screw-threaded plug *d′*.

Preferably around the outer circumference of the amalgamating vessel is provided a suitable belt-surface F, through which, by means of a belt properly driven by any desired motive power, rotation may be imparted to the vessel, and secured within the vessel, preferably located in a vertical manner equidistant around the inner circumference thereof, are a number of ribs *f* extended out only a short distance from the inner surface of the vessel, and preferably extending from the

bottom of the vessel up nearly, if not quite, to its top.

Preferably supported on a rotatable depending hollow shaft or conduit G, maintained in journal-boxes *g*, is a cylinder or deflector H, which is somewhat smaller than the internal dimensions of the amalgamating vessel, so that there is a preferably annular space or channel *h* around between the outside surface of the deflector and the inner wall of the vessel. The ribs *f* are located within this channel and extend out to approach as closely as desired to the outer surface of the deflector. Within this channel also is placed the mercury for amalgamation, and, further, this channel serves as the passage through which material for amalgamation is flowed, as will be hereinafter described.

The deflector may be made of wood or any other suitable material, and is intended to be short enough to leave somewhat of a space or clearance between its upper end and the vessel and also to leave clearance at its lower end as well as space to accommodate the parts attached to it at that point.

At the lower or bottom end of the deflector are provided two feed or receiving channels or spaces I and *i*, which serve as means for receiving and forcing or pumping material and water through the channel *h*, and which are preferably formed by means of plates J, preferably removably secured to the lower end of the deflector, as particularly shown in Fig. 3, and held some distance apart by interposed collars *j*. The bottom plate is preferably imperforate and the central one is provided with a central opening in which the lower end of a pipe or conduit K is secured, thereby communicating with the space *i*. The pipe K is considerably smaller than the hollow in the shaft or conduit G and extends up through it and out somewhat above its top, as illustrated in the drawings. The central plate is also held some distance from the plate in contact with the lower end of the deflector by collars, as above stated, forming the space I, and the hollow shaft G is extended sufficiently down and communicates with this space through a central opening in the plate above. The openings in the two latter plates preferably have surrounding bosses, as illustrated in Fig. 3, and are internally screw-threaded to receive the screw-threaded ends of their respective pipes or tubes. These two plates are also preferably turned or curved up somewhat around their outer circumference, by which means the space I is given that form, and material passing through this space will be diverted in an upward direction at this point, assisting to prevent it from becoming lodged and packed in the lower end of the vessel, as will be hereinafter more particularly described.

Within the spaces I and *i* are preferably located radial wings or partitions *k*, which serve to quickly impart rotation to the material or water passing through the spaces in which they are located. The wings also divide the spaces into compartments.

In the upper portion of the deflector is preferably provided a chamber L, the top end of which is partly closed by a plate *l*, which may be secured in place by the bolts M, that may extend down through the deflector and also hold it together, as well as the plates J in place, and in the lower end of this chamber may be located a plate N, held in place by screws or otherwise.

Preferably through the circumferential wall of the chamber L, which is formed by the upper portion of the deflector, are provided perforations *m*, and registering with them around the outer diameter of the upper portion of the deflector are screwed or otherwise secured preferably hollow tubes or agitating-studs *n*. These studs extend out to approach well toward the inner surface of the amalgamating vessel, but, however, not sufficiently far to contact with the ribs *f* thereon. Of course agitating studs or means may be provided throughout as great a portion of the circumference of the deflector as may be desired.

Around near the top of the amalgamating vessel are provided discharge-passages O for the discharge of material and water thereat, and located around the same, supported by bolts *o*, is a trough P, provided through its inner wall with an annular channel *p*, in radial alinement with the passages O, so that as the material is discharged or thrown off from the vessel it will be caught by the trough and by a pipe or spout Q therefrom will be deposited in a conduit or other receptacle that may be provided for conveying it away as desired.

To vertically support the hollow shaft G and the deflector there is a collar *q*, secured to the upper portion of the former and contacting with one of the boxes *g*, and to impart rotation to this shaft and the deflector I provide a pulley R, mounted on the upper portion of the shaft, and over which a suitable belt driven by any desired motive power may pass.

To feed material to the amalgamating vessel is provided a pipe *r*, and to supply water to the lower part of the vessel through the tube or pipe K is provided a pipe S, and, further, to supply water to the chamber L is provided a pipe *s*, with its feed end preferably extended down through the hollow trunnion of the vessel. The pipes *r*, S, and *s* are supported, respectively, by suitable brackets T, *t*, and U.

While I have shown the amalgamating vessel in the form of a cylinder, I do not wish to confine myself to any specific form or shape, but wish to include any vessel or receptacle to hold the mercury, operate in conjunction with the other parts of my invention, and otherwise subserve the purposes required of it. If desired, the amalgamating vessel may be provided with journal-bearings around its outer diameter in which it may be supported

and revolved, and the trunnions and bearings at the ends may be dispensed with, and, further, it is not necessary that the top end of the amalgamating vessel be closed or provided with a head nor that the lower end be closed only sufficiently to retain the mercury therein, although I prefer to make the vessel with the heads or ends and trunnions. The deflector may be wholly made of metal, if desired, or of any suitable material, and may be provided with a bearing at its lower end to assist in maintaining it in a central position. Its purpose, of course, is to deflect or guide the material for amalgamation and the water along near the surface of the mercury.

In operation a desired quantity of mercury is introduced into the amalgamating vessel, which together with the deflector is revolved at the desired rate of speed, the two preferably at a sufficiently great differential speed so the agitation within the channel between them, caused by the agitating-studs and otherwise, will be sufficient to assist to such extent as may be advisable to stir up the material passing through the channel in the amalgamating vessel to assist in separating any particles of mercury and precious metals that may tend to pass off commingled with the waste material.

As the amalgamating vessel is revolved at a sufficient rate of speed, the mercury contained therein, which during a state of rest will settle to the bottom of the vessel, will, actuated by centrifugal force, assume a position around the sides or interior wall of the vessel, forming a layer or lining of mercury from the bottom of the vessel up such distance therefrom as may be desired, depending on the velocity at which the vessel is rotated. This layer or lining affords a mercury surface for the outer wall of the channel between the circumference of the deflector and the vessel or such part thereof as may be desired, and consequently a mercury surface over which material for amalgamation passes while being subjected to centrifugal force and flowed through the channel.

The material for treatment for amalgamation is introduced, preferably mixed with water, into the hollow shaft of tube G, around outside of the pipe K, and passes down into the space I, when it is caught by the radial wings therein and quickly forced or carried around at the velocity of revolution of the circumference of the space, and the upturned edges of the plates forming the space tends to divert the material upward into the channel over the mercury surface or lining.

To assist in diverting the material through the channel in an upward direction and prevent it from settling and lodging in the bottom of the vessel, clear water is introduced into the central pipe K, passing down into the space *i*, and by the radial wings therein it is also quickly carried around with the deflector and thereby pumped or driven by the centrifugal force so developed out of the space and up, commingling with the water and material coming from the space I just above.

The material and water within the channel *h* is forced by that issuing from the spaces I and *i* and constantly driven upward through the said channel over the mercury to the points of discharge, from whence it is thrown off or discharged. As the material passes over the surface of the mercury and is acted upon by centrifugal force, the particles of precious metals susceptible of amalgamation or precipitation in the mercury are strongly thrown down thereon and either amalgamated or precipitated therein, or both, and consequently are recovered. As the material is discharged from the vessel it is caught in the trough P and from that flows out of the passage Q to such further conduit as may be provided.

The ribs within the vessel serve to assist in keeping the mercury in place and in carrying it around with the rotation of the vessel, and the studs or agitating means serve, as hereinabove stated, to agitate material passing through the channel in which they operate to assist in its travel therethrough and in the separation of any commingled particles of mercury or precious metal it is desired to amalgamate that might otherwise escape and also in preventing the fixed lodgment of waste material within the vessel, the agitation being of such intensity as to keep practically all the lighter substances in suspension in the body of liquid, but allow the precipitation of the heavier and valuable portion. The water issuing through the orifices from the chamber L serves the same purpose. During operation water is introduced to the chamber L through its supply-pipe *s*.

When it is desired to remove the mercury from the amalgamating vessel, the vessel may be stopped and the screw-threaded plugs *v*, Fig. 3, may be removed, permitting the mercury to flow out of the holes in which they are located, and into such vessel as may be provided to receive it. It will be seen that in this way the portions having the spaces I and *i*, with their radial wings or partitions therein, serve as centrifugal pumps or means for forcing the water and material through the amalgamating vessel. In some instances to accomplish this pumping or forcing purpose the deflector carrying these parts may be revolved at a much greater speed than the vessel, and further, if desired, these pumping or forcing portions, with their spaces and parts forming them, may be made separate from the deflector and rotatable irrespective of it. For brevity both the deflecting and pumping portions are spoken of as the "cylinder," though of course they need not necessarily be truly cylindrical in shape.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a centrifugal amalgamator, the combination of a vertical rotatable amalgamating vessel, a rotatable portion or cylinder

therein provided with one or more spaces for receiving material, one or more spaces located farther from the discharge end of the vessel for receiving clear water, and conduits for introducing the same to their respective spaces, substantially as described.

2. In a centrifugal amalgamator, the combination of a vertical rotatable amalgamating vessel, a rotatable portion or cylinder therein provided with one or more spaces for receiving material, one or more spaces located farther from the discharge end of the vessel for receiving clear water, a chamber for receiving water nearer the discharge end of the vessel, and conduits for introducing material and water to their respective spaces and said chamber, substantially as described.

3. In a centrifugal amalgamator, the combination of a vertical, rotatable amalgamating vessel, a deflector located therein with a channel or passage between them, one or more plates secured to the lower end of the deflector forming nearest to the bottom of the vessel spaces for receiving clear water, and above the same for receiving material, and conduits communicating therewith, substantially as described.

4. In a centrifugal amalgamator, the combination of a vertical rotatable amalgamating vessel, a rotatable portion or cylinder therein provided with one or more spaces at one end thereof for receiving material, one or more spaces located farther from the discharge end of the vessel for receiving clear water, a water-chamber nearer the discharge end of the vessel, discharge-passages therefrom, and conduits leading thereto, substantially as described.

5. In a centrifugal amalgamator, the combination of a vertical rotatable amalgamating vessel, a rotatable portion or cylinder therein provided with one or more spaces at one end thereof for receiving material, one or more spaces located farther from the discharge end of the vessel for receiving clear water, conduits leading thereto, and agitating means for effecting the suspension of material within the vessel, substantially as described.

6. In a centrifugal amalgamator, the combination of a rotatable amalgamating vessel, a rotatable portion or cylinder therein provided with spaces at one end for receiving material and water, a chamber for receiving water nearer the discharge end of the vessel, and projecting studs provided with passages communicating with such chamber, substantially as described.

7. In a centrifugal amalgamator, the combination of a vertical, rotatable amalgamating vessel, a deflector therein provided with one or more spaces at its lower end for receiving material, one or more spaces located farther from the discharge end of the vessel for receiving clear water, a hollow shaft communicating with the former spaces, and a pipe or conduit extending through and communicating with the latter, substantially as described.

8. In a centrifugal amalgamator, the combination of a vertical, rotatable amalgamating vessel, a pipe or conduit for feeding material extending into the same, and a second pipe or conduit for clear water passing through the first to a point nearer the bottom of the vessel, substantially as described.

9. In a centrifugal amalgamator, the combination of a rotatable amalgamating vessel, a deflector located therein, plates secured to the lower end of the deflector forming two or more spaces for material and clear water, the latter being farthest from the discharge end of the vessel, wings or partitions within such spaces, and conduits communicating therewith, substantially as described.

10. In a centrifugal amalgamator, the combination of a rotatable amalgamating vessel, and a space or chamber for receiving surplus mercury communicating therewith, substantially as described.

11. In a centrifugal amalgamator, the combination of a rotatable amalgamating vessel, a supplementary chamber in proximity to said vessel for receiving surplus mercury, and a passage or tube communicating between the two and extending into the vessel, substantially as described.

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Witnesses:
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H. B. LEWIS.