

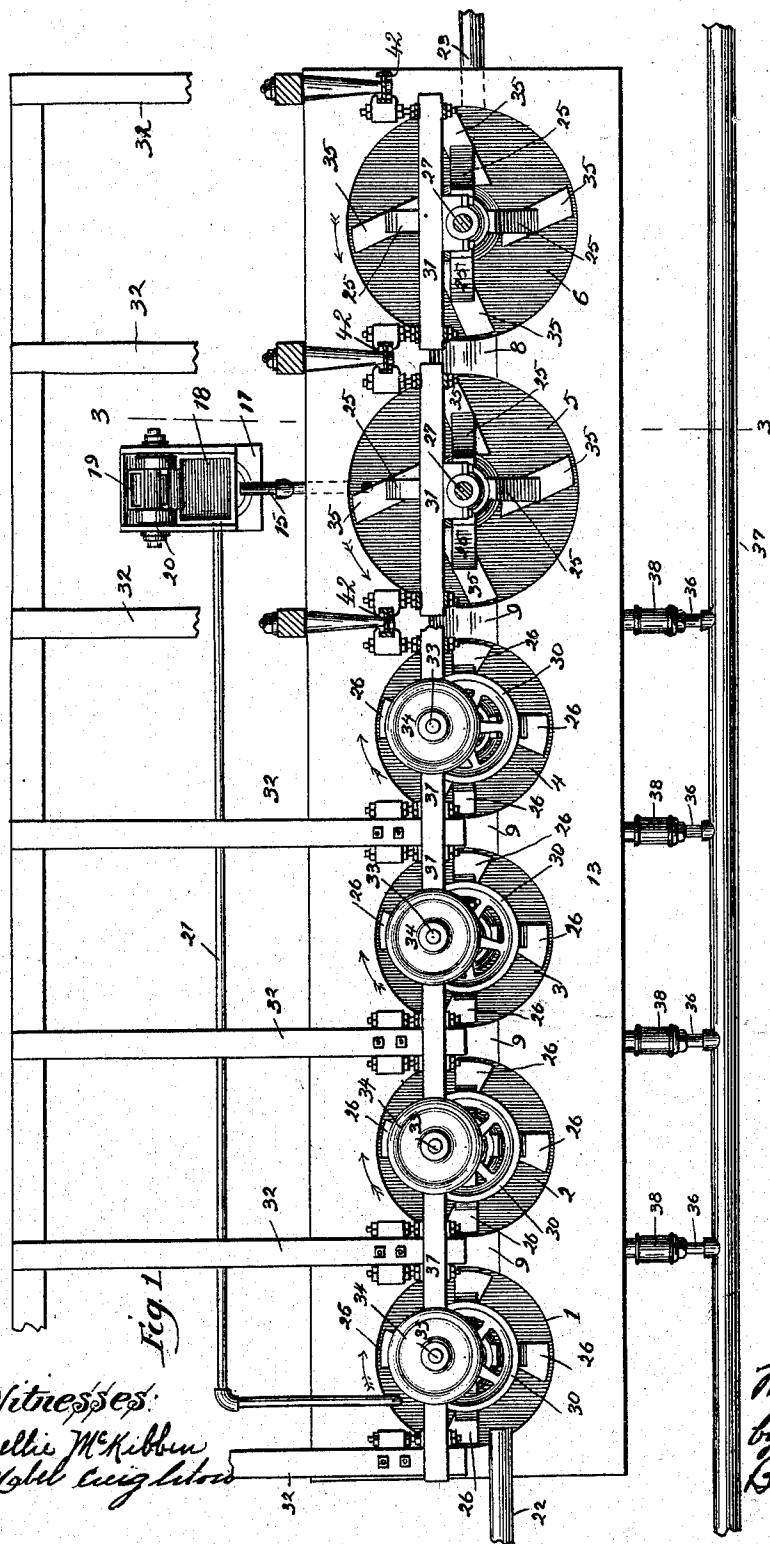
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3 Sheets—Sheet 1.

M. P. BOSS.
AMALGAMATING PAN.

No. 504,859.

Patented Sept. 12, 1893.



Witnesses:
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Mabel Craigston

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(No Model.)

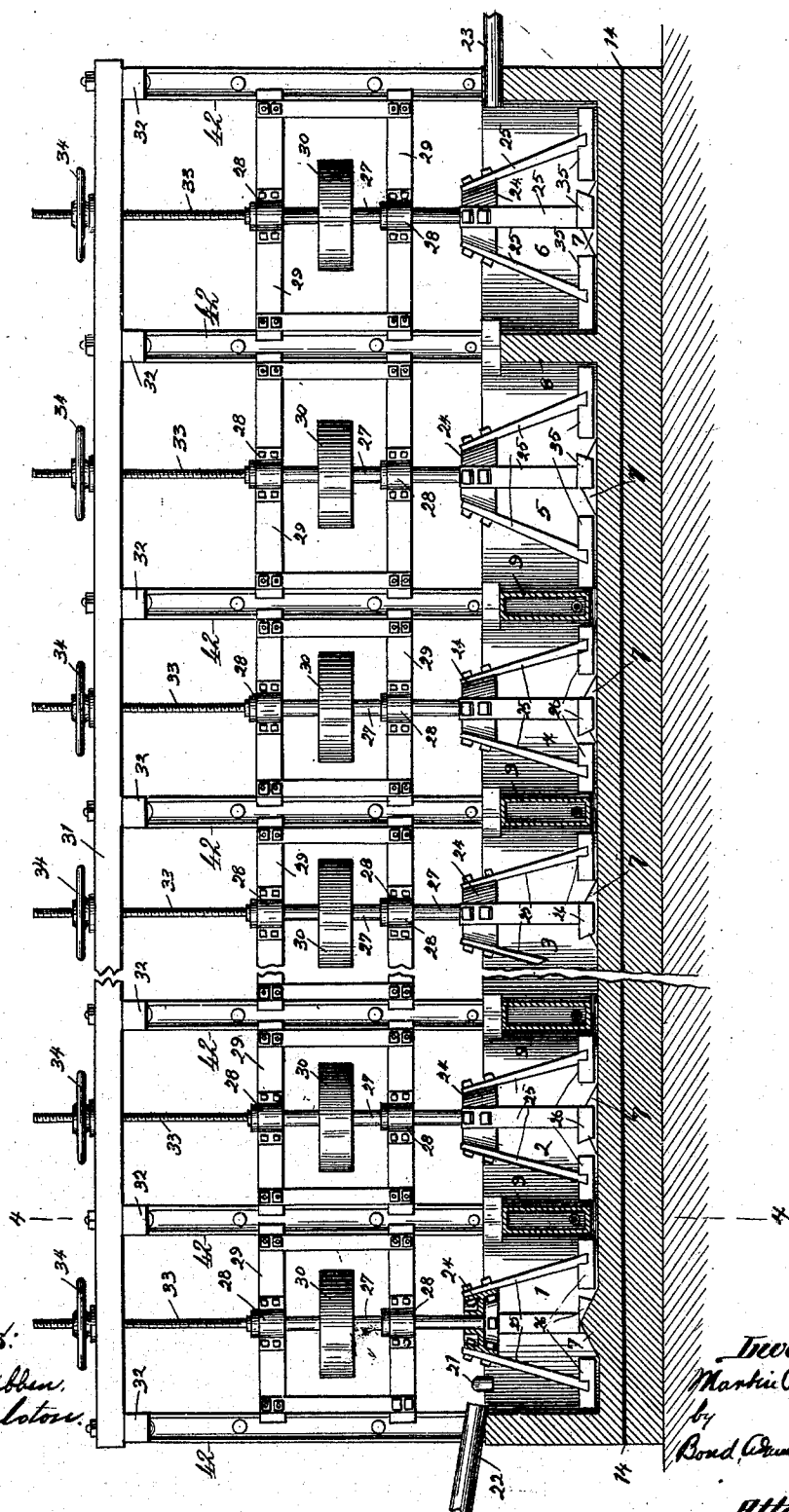
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Fig. 2.



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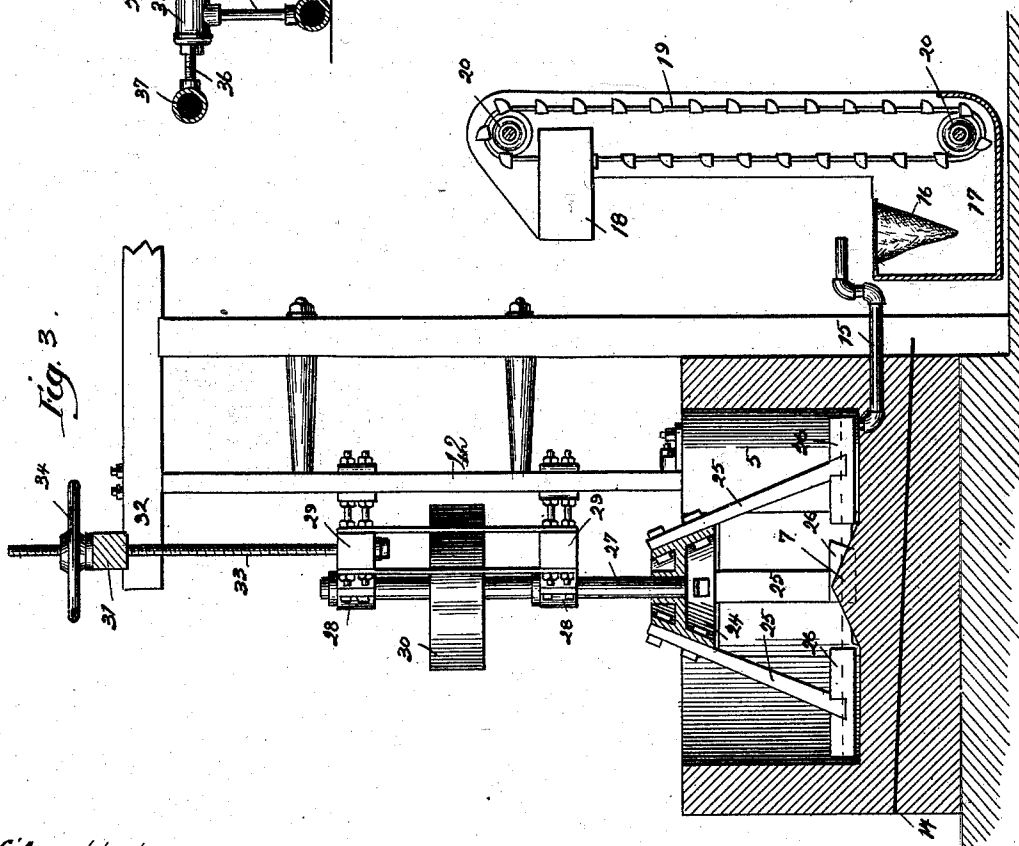
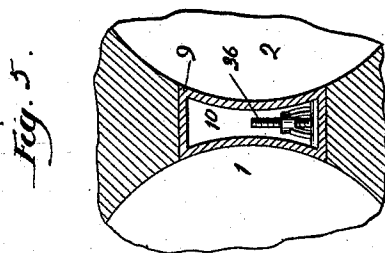
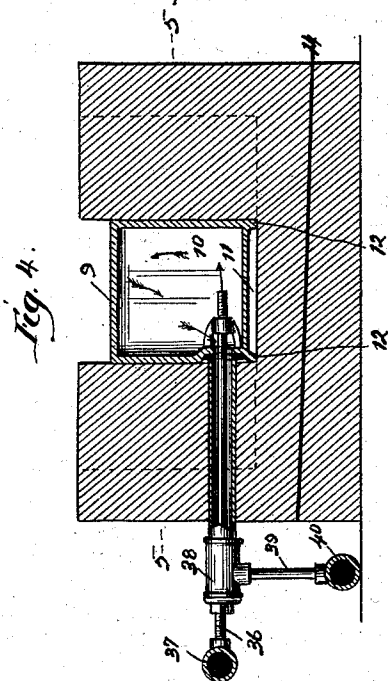
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3 Sheets—Sheet 3.

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UNITED STATES PATENT OFFICE.

MARTIN P. BOSS, OF SAN FRANCISCO, CALIFORNIA.

AMALGAMATING-PAN.

SPECIFICATION forming part of Letters Patent No. 504,859, dated September 12, 1893.

Application filed January 19, 1892. Serial No. 418,606. (No model.)

To all whom it may concern:

Be it known that I, MARTIN P. BOSS, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Amalgamating-Pans, of which the following is a specification, reference being had to the accompanying drawings, in which—

10 Figure 1 is a top or plan view. Fig. 2 is a longitudinal vertical section. Fig. 3 is an enlarged detail, being a vertical cross section on line 3—3 of Fig. 1. Fig. 4 is a detail, being a vertical cross section on line 4—4 of Fig. 2; and Fig. 5 is a detail, being a horizontal section on line 5—5 of Fig. 4.

My invention relates to amalgamating pans used in the separation of gold and silver from ore. It is customary, in separating gold and silver from ore, to thoroughly wet the ore and then reduce it to a finely powdered condition, so that it will flow readily. The powdered ore, commonly called pulp, is then passed into pans, where it is agitated thoroughly in the presence of mercury, where the gold and silver unite with the mercury to form an amalgam, leaving the crushed stone free from gold and silver.

10 The process of "pan amalgamation" consists, first, of a series of receptacles for liquid pulp, which have a revolving disk at the bottom running at a speed that will generate by centrifugal force an outward current of pulp and quicksilver, sufficient to carry them intermingled upward at the periphery and then inward to the center, at the surface, in a constantly repeating rotation; and, second, of another series of receptacles for separating the quicksilver from the pulp, having in them revolving stirrers giving motion sufficient to keep the particles of sand in suspension, but moderate enough to allow the quicksilver to settle. The first mentioned are known in the business as pans, and the last mentioned as settlers. It has been customary to make these pans and settlers cylindrical, and constructed individually distinct and connected by pipes near the top to permit of a continuous flow from one end of the series to the other, and out; the quicksilver being introduced into and taken from each pan separately. I propose to make my series of pans

and settlers of one long vat or reservoir of masonry, wood, or other suitable material, providing partitions that will admit of the pulp flowing over the top and of the quicksilver passing under said partitions. The quicksilver I introduce in a constant stream at the end in which the pulp is introduced, and it flows through the series of pans and at the first settler through a pipe to a strainer, through which it is passed to take out the amalgam, and then the strained quicksilver is elevated to flow back to the beginning of the series again.

The object of my invention is to provide a new and improved system of amalgamating pans, by the use of which the process of separating gold and silver from the ore will be greatly simplified and cheapened, and in which the amount of gold, silver and mercury wasted will be reduced to the minimum. I accomplish this object as hereinafter specified and as illustrated in the drawings. That which I regard as new will be pointed out in the claims.

In the drawings, 1, 2, 3, 4, indicate a series of pans, which are preferably formed of masonry, and are arranged in succession, as shown in Figs. 1 and 2, being preferably all on the same level and of the same depth. The pans 1, 2, 3, 4, are cylindrical in shape, and an opening is left between each successive pan. In the drawings I have shown the pans as four in number, but any desired number may be used.

5, 6, indicate the settlers, which are preferably larger than the pans 1, 2, 3, 4, and are arranged in a series after them. The center of the bottom of each of the pans and settlers is preferably conical in shape, as best shown at 7 in Fig. 3. An opening is provided between the pan 4 and settler 5, but the settlers 5 and 6 are preferably entirely separated from each other by a wall 8, as best shown in Fig. 2.

9, 9, indicate partitions which are adapted to fit into the openings between the successive pans to tightly close such openings except at the bottom, where a narrow passage 11 is provided by supporting the partitions 9 upon lugs 12, as best shown in Fig. 4. The partitions are preferably formed of pottery, but they may be made of any other suitable material which will not amalgamate with mer-

cury, and they are preferably double concave, to form a continuously curved surface with the remainder of the pans, as best shown in Fig. 1. In each partition 9 is an inclosed chamber 10, as best shown in Figs. 4 and 5, for purposes which will be hereinafter set forth. The height of the partitions is such that they terminate a short distance below the upper edge of the pans, as shown in Fig. 4, the object of which construction will be set forth more fully hereinafter. The partition 8 is of the same height as the partitions 9, and is made of similar material; but as hereinbefore stated, it is preferably a solid wall, and tightly separates the settlers 5 and 6 from each other at the bottom. I prefer to build the pans and settlers in a solid piece of masonry 13, as shown in Figs. 1, 2 and 3, as that construction is cheaper and more satisfactory, but I do not wish to limit myself to that particular construction, as they may be made of wood or any other suitable material.

14, indicates a plate which extends continuously under all the pans and settlers, and is preferably inclined, as shown in Fig. 3. The plate 14 may be formed of prepared canvas, or it may consist of a piece of sheet metal, and serves to collect and drain off any mercury which may filter through the bottom of the pans and settlers.

15, indicates a pipe, which extends from the bottom of the settler 5 to the outside of the settler, and terminates over a strainer 16, as best shown in Fig. 3. The strainer 16 consists of a canvas bag hung in a receptacle 17, which is adapted to contain mercury.

18, indicates a receptacle adapted to contain mercury, which is supported above the receptacle 17 at some distance higher than the top of the pans and settlers.

19, indicates an elevator, consisting of a belt and buckets running on pulleys 20 and 21, the buckets of which elevator pass into the receptacle 17 and are adapted to carry mercury therefrom and empty it into the receptacle 18, as best shown in Figs. 1 and 3.

21, indicates a pipe for conducting mercury from the receptacle 18 to the pan 1, as best shown in Fig. 1. The elevator 19 may be driven by any suitable driving mechanism.

22, indicates a pipe for conducting pulp into the pan 1.

23, indicates a pipe for conducting the waste pulp from the settler 6.

24, indicates stirrers, one of which is mounted in each of the pans and settlers, which stirrers are composed of diverging arms 25, from the lower ends of which are carried shoes 26 and 35, as best shown in Figs. 2 and 3. The stirrers are mounted upon vertical shafts 27, which are mounted in suitable bearings 28 upon a vertically sliding frame 29, as best shown in Fig. 2. The ends of the frames 29 are fitted to slide upon I-beams 42, which are arranged in a vertical position at each side and back of the frames 29, as best shown in Fig. 2.

30, indicates a band wheel mounted upon and keyed to each shaft 27, as best shown in Fig. 3.

31, indicates a bar which extends longitudinally of the pans and settlers and a short distance above the frames 29, as best shown in Fig. 2. The bar 31 is supported upon suitable supporting bars 32, as best shown in Fig. 3.

33, indicates vertical rods which are connected at their lower ends to the frames 29, and pass through the bar 31, as best shown in Fig. 3. The rods 33 are screw-threaded, and are adapted to receive hand-wheels which are screwed upon the rods 33 above the bar 31, as best shown in Fig. 2. By this construction, by operating the hand-wheels 34 the rods 33 and the frames 29 may be raised or lowered at pleasure. The band wheels 30 and shafts 27 are rotated from drive wheels, or any other suitable mechanism, by means of bands. I prefer to use bands somewhat narrower than the band wheels 30, so that the band wheels may be vertically adjusted to some extent without removing the bands; but bands of any desired width may be used.

The shoes 26 are mounted upon the stirrers which are in the pans 1, 2, 3, 4, and the shoes 35 upon the stirrers in the settlers 5 and 6, as best shown in Fig. 1. The stirrers are designed to revolve in the direction indicated by the arrows in Fig. 1, and the forward edge of each of the shoes 26 is forwardly inclined and beveled, as shown. By this construction, when the stirrers are operated, the action of the shoes 26 will be such as to cause an outward current of pulp and mercury, which will be sufficient to carry them intermingled upward at the periphery, and then inward at the surface to the center, in a constantly repeating rotation. The shoes 35 carried by the stirrers in the settlers 5 and 6, are forwardly inclined, as shown, for throwing the sand outward toward the periphery, in order to facilitate the passing off of the sand, while permitting the mercury to settle.

36, indicates steam pipes, one of which extends into each chamber 10, as best shown in Fig. 4. The pipes 36 each connect with a header 37, which is connected to a suitable source of supply. The pipes 36 pass through larger exterior pipes 38, which also extend into the chamber 10, as shown in Fig. 4.

39, indicates connecting pipes, which connect each pipe 38 with a header 40. The outer end of each pipe 38 is tightly fitted around the pipe 36, in order to prevent steam from escaping from the pipe 38. The construction is such that steam may be admitted to the different chambers 10 through the pipes 36, when it will circulate through said chambers, as indicated by the arrows in Fig. 4, and will then escape through the pipes 38, 39 and 40.

The operation of separating gold from the ore by the use of my improved apparatus, is as follows: The ore having first been reduced to the form of liquid pulp in the usual man-

ner, it is introduced into the pan 1 through the pipe 22. The stirrers 24 are then set in operation, and a supply of mercury is introduced into the pan 1 through the pipe 21.

5 The pulp and mercury will be thoroughly agitated together by the shoes 26, and a portion of the mercury will be taken up by the pulp by reason of the vigorous whirling movement of the latter, and when the pail 1, is sufficiently filled the pulp together with the portion of mercury which has been taken up thereby will overflow the partition 9 into the pan 2. The surplus mercury, or that which is not taken up by the pulp, flows unrestrictedly under the partition 9 into the pan 2. A current of steam will be kept circulating through the chamber 10 in the partition 9 to facilitate amalgamation of the mercury with the gold and silver. A similar operation will take place in each of the successive pans 2, 3, 4, until the pulp mixed with quicksilver and the surplus quicksilver reach the first settler 5. In this settler the movement of the pulp and the quicksilver carried thereby is slower than in the pans 1, 2, 3 and 4, and the quicksilver will be precipitated or allowed to settle at the bottom of the receptacle, and will flow together with the surplus mercury which has passed freely under the different partitions 9, into the strainer 16 by way of the pipe 15, where the amalgam will be separated from the surplus mercury, which will flow through the canvas into the receptacle 17. It will then be carried by the elevator 19 into the receptacle 18, and will then flow back through the pipe 21 into the pan 1, for re-use. The amalgam may be removed from the strainer 16 for further treatment. The separated sand, which will be kept in a suspended condition in the water which is added to it before it is introduced into the pan 1, will overflow the partition 8 into the settler 6, where any amalgam and quicksilver which may be contained will be permitted to settle from it, and the waste pulp or sand will then pass out through the pipe 23. When it is desired to clean the pans or settlers, the stirrers may be raised by operating the hand wheels 34, as above described.

50 That which I claim as my invention, and desire to secure by Letters Patent, is—

1. In an amalgamating apparatus, the combination with a series of pans, of a series of vertically movable frames above said pans, shafts journaled in said frames, stirrers carried by said shafts and located in said pans, and devices connected with said movable frames for adjusting said frames, shafts and stirrers vertically, substantially as described.

60 2. The combination with two or more pans arranged adjacent to each other, of one or more partitions separating each pan from the others, upper and lower means of communication between the successive pans, and means for agitating the contents of the pans, substantially as described.

3. The combination with a series of pans,

and a settler, of partitions separating each pan from the others and from the settler, means of communication above and below 70 each partition between successive pans and the settler, and means for agitating the contents of the pans and the settler, substantially as described.

4. The combination with a series of pans, 75 and a settler, of partitions separating the pans from each other and from the settler, said partitions terminating a short distance below the upper edges of the pans and settler, a passage at the lower portion of the pans to afford communication between adjoining pans and to the settler, and means for agitating the contents of the pans and settler, substantially as described.

5. The combination with a plurality of pans, 85 of partitions separating said pans, passages affording communication between said pans, and devices for heating said partitions, substantially as described.

6. The combination with a series of pans, 90 and a settler, in communication successively with each other, of partitions separating the pans from each other and from the settler, means for heating said partitions, and devices for agitating the contents of the pans and the 95 settler, substantially as described.

7. The combination with a series of pans, and a settler, partitions separating each of said pans and the settler, said partitions terminating a short distance below the upper 100 edges of the pans and settler, and passages at the lower portions of said partitions, of a chamber in each of said partitions, and means for passing a current of steam through each of said chambers, substantially as described. 105

8. The combination with a series of receptacles, as 1, 2, 3, 4, of partitions 9 separating said receptacles, said partitions terminating a short distance below the upper edges of the receptacles 1, 2, 3, 4, an opening under each 110 of said partitions to afford communication between successive receptacles near the bottom, and means for agitating the contents of said receptacles, substantially as described.

9. The combination with a series of receptacles, as 1, 2, 3, 4, of partitions 9 separating said receptacles, said partitions terminating a short distance below the upper edges of the receptacles 1, 2, 3, 4, an opening under each of said partitions to afford communication between successive receptacles near the bottom, means for agitating the contents of said receptacles, a chamber 10 in each of said partitions, and means for passing a current of steam through each of said chambers, substantially as described. 125

10. The combination with a series of receptacles, as 1, 2, 3, 4, of partitions 9 separating said receptacles, said partitions terminating a short distance below the upper edges of the 130 receptacles 1, 2, 3, 4, an opening under each of said partitions to afford communication between successive receptacles near the bottom, means for agitating the contents of said re-

ceptacles, a chamber 10 in each of said partitions, steam pipes 36 extending into each of said chambers, means for supplying steam to said pipes, and pipes 38 inclosing said pipes
5 36 and opening into said chambers, substantially as described.

11. The combination with an amalgamating pan, of a plate 14 under said pan, adapted to intercept any mercury which may filter
10 through the bottom of said pan, substantially as described.

12. The combination with a series of pans in communication successively with each other, and a settler communicating with said
15 pans, each of said pans and settlers being cy-

lindrical in shape, of partitions 9 separating said pans and the settler, said partitions being somewhat lower than the edges of the pans and settler, passages under said partitions, stirrers in said pans and settler adapted to agitate their contents, means for rotating said stirrers, a pipe 15 leading from said settler, a strainer 16, and means for conducting mercury from said strainer back to said pans, substantially as described.

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