No. 672,740.

Patented Apr. 23, 1901.

L. MAYHEW.

AMALGAMATOR.

(Application filed Apr. 16, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

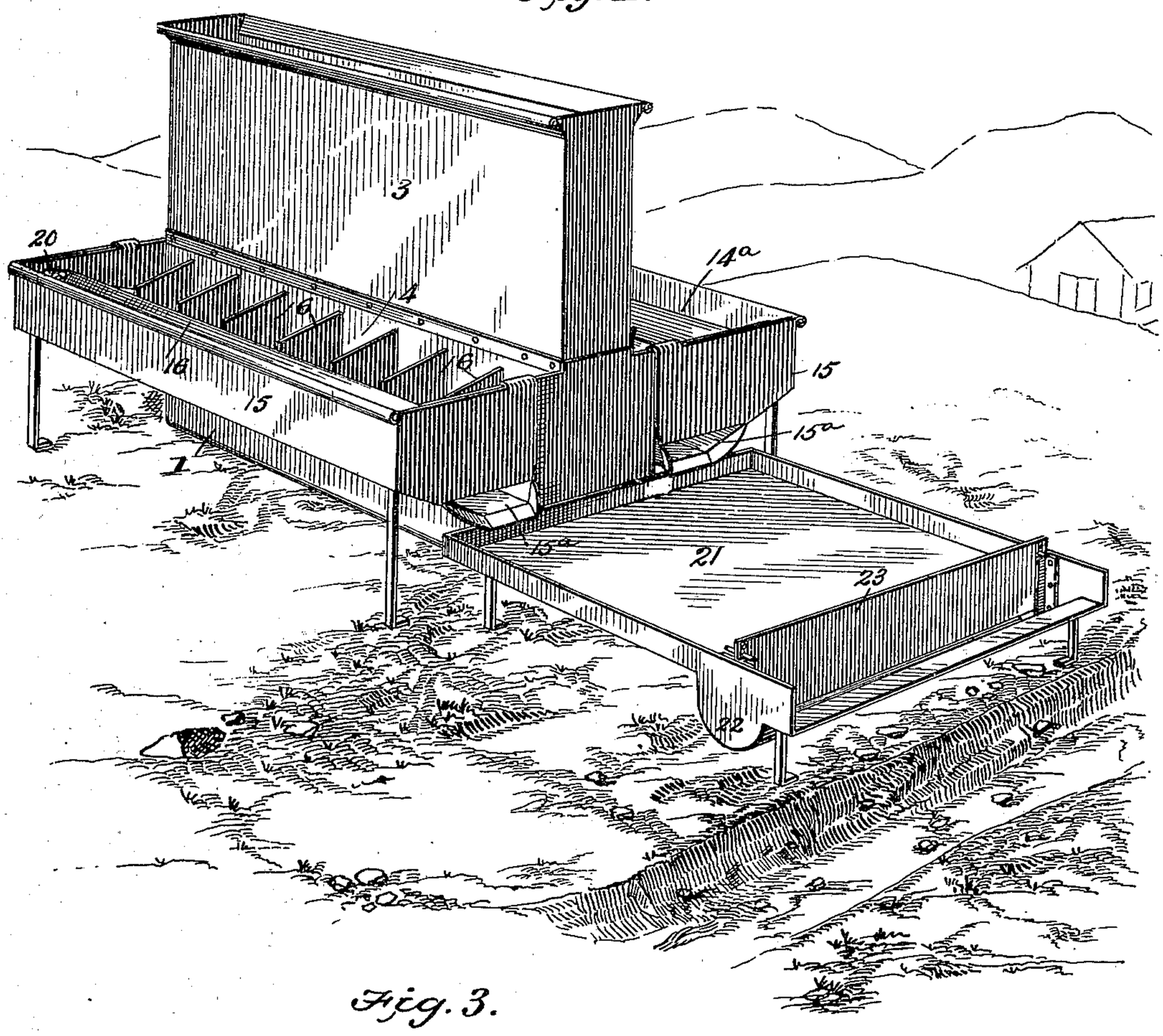
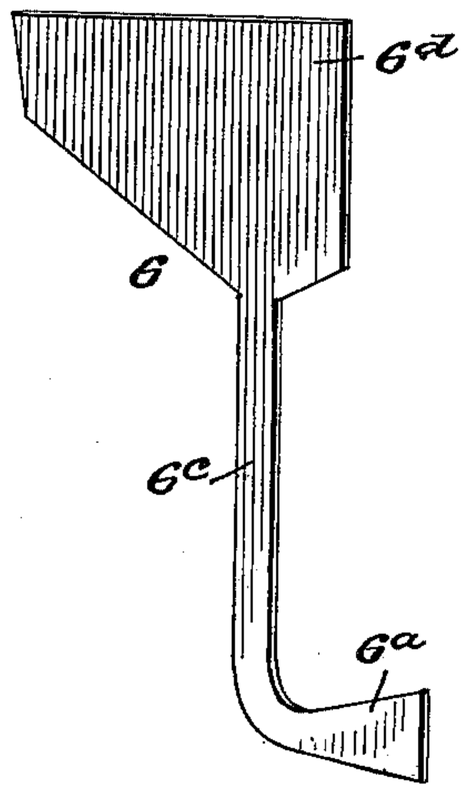


Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

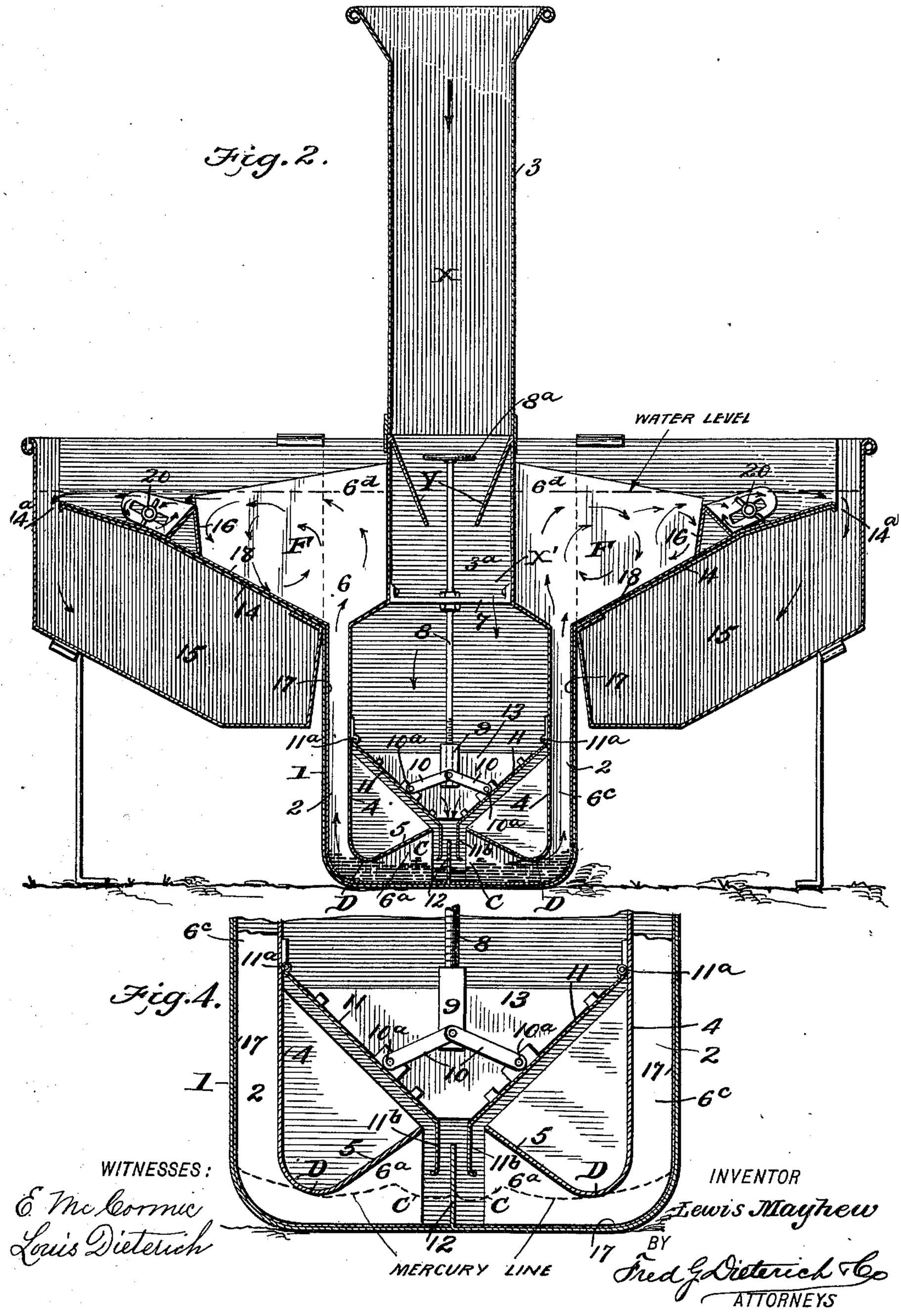

Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

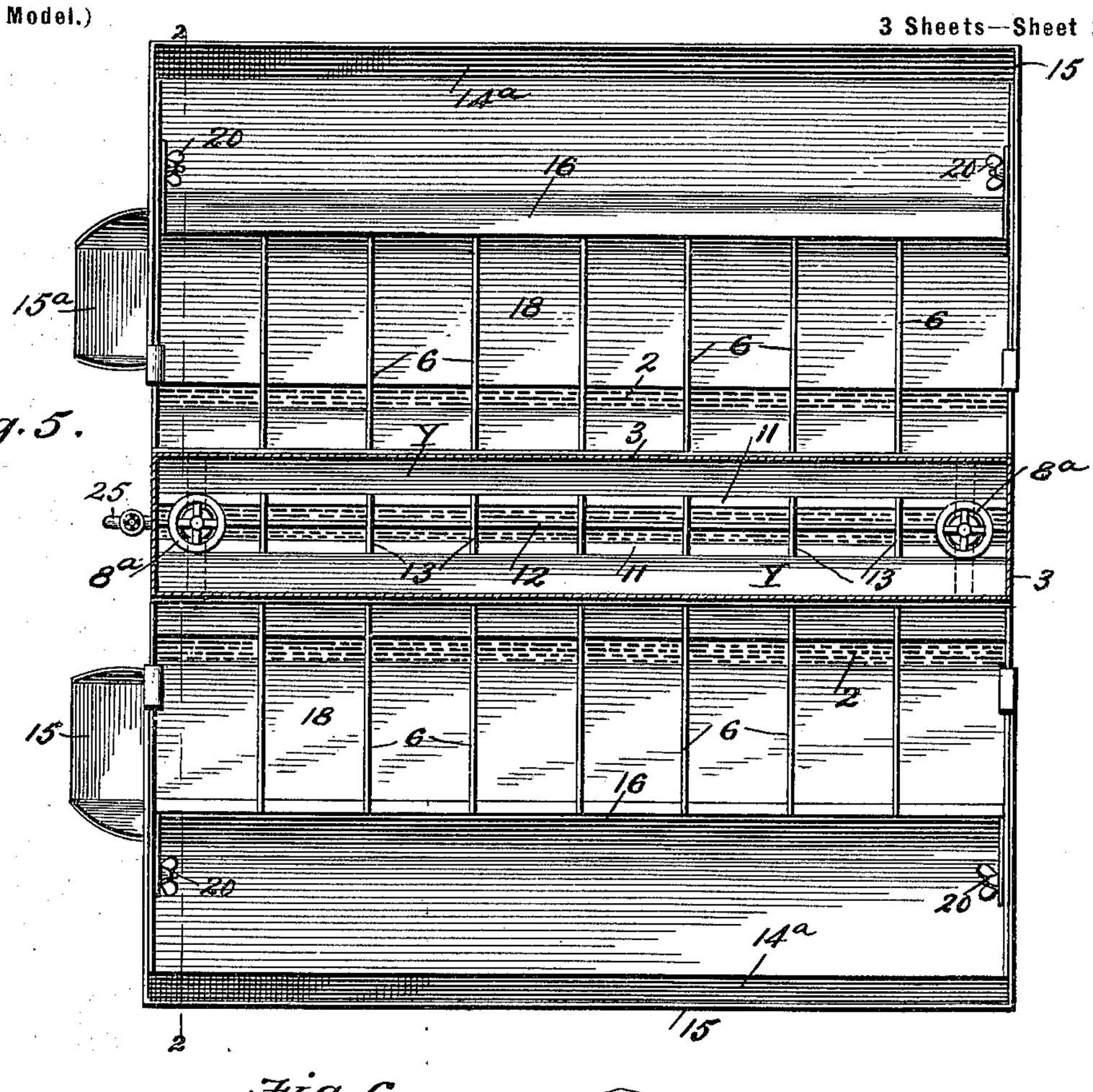


Fig. 6.

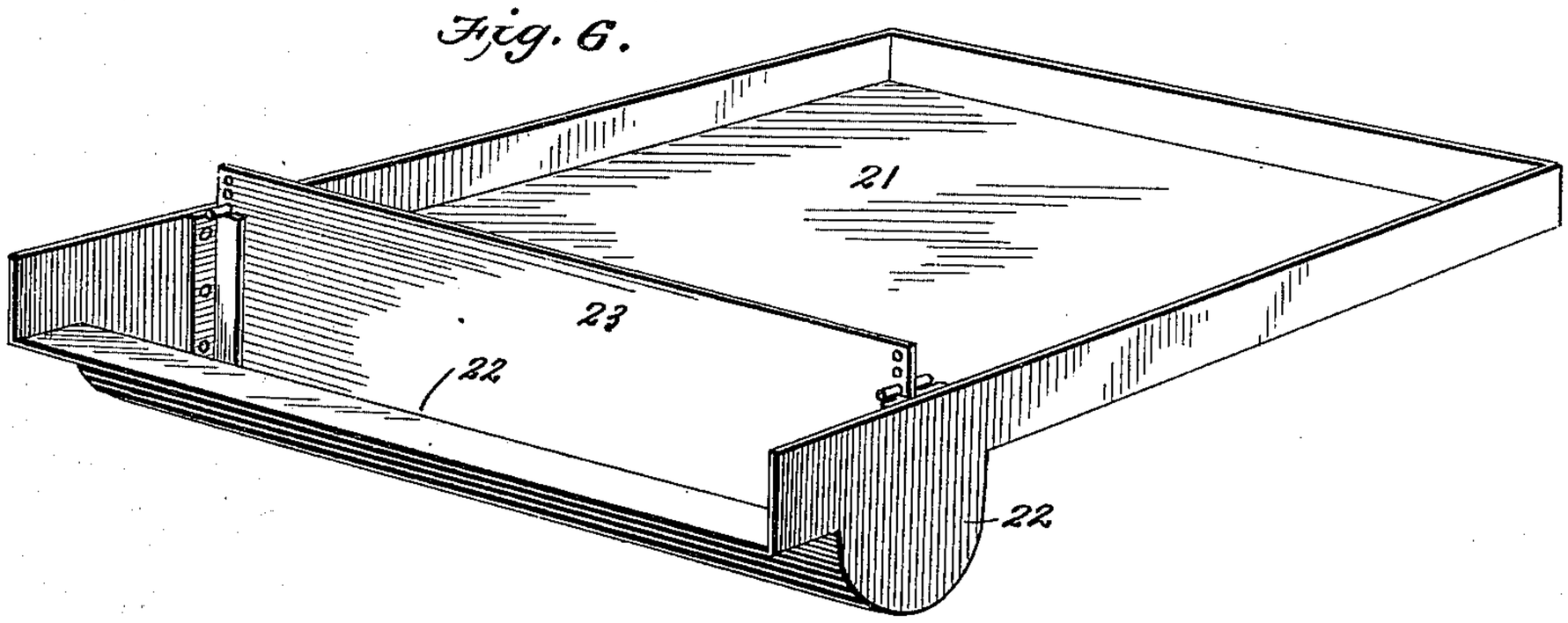
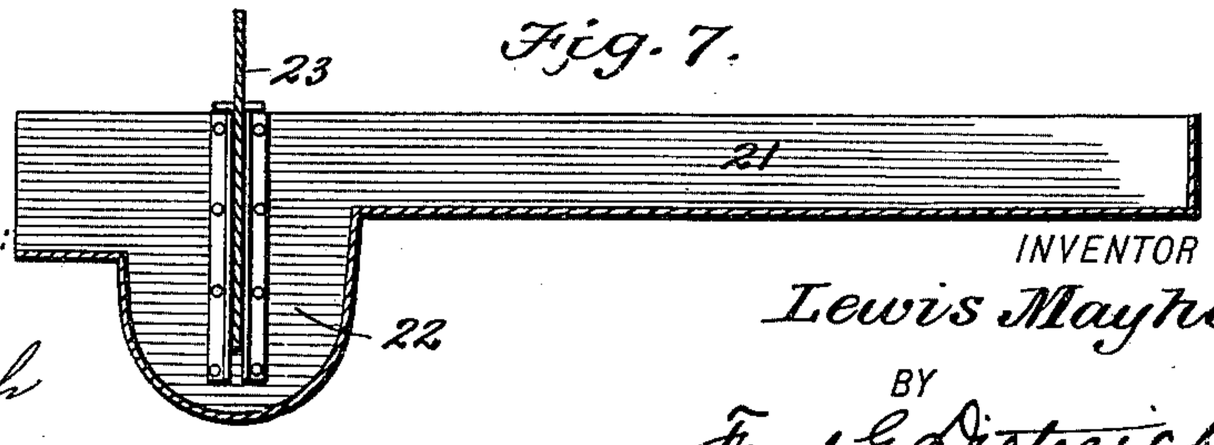


Fig. 7.



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UNITED STATES PATENT OFFICE.

LEWIS MAYHEW, OF NEW WHATCOM, WASHINGTON, ASSIGNOR TO SANFORD B. MAYHEW, OF SAME PLACE.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 672,740, dated April 23, 1901.

Application filed April 16, 1900. Serial No. 13,152. (No model.)

To all whom it may concern:

Be it known that I, LEWIS MAYHEW, residing at New Whatcom, in the county of Whatcom and State of Washington, have invented a new and Improved Amalgamator, of which the following is a specification.

My invention is in the nature of a new and useful amalgamator or gold-saving machine adapted for ready attachment to any sluice-box or stamp-mill without employing any special connecting devices therefor; and it more particularly relates to that class of amalgamators designed for saving "float-gold" or precious metal from sand and gravel deposits, no matter how fine, and including the separation of the precious metal from that kind of ore called "black sand."

Primarily my invention seeks to provide a machine for the purposes stated which is entirely automatic in its action and which also embodies among its characteristic features a novel adjusting means whereby the feed can be set to suit the specific gravity of the sand in different localities, simplicity in its complete construction, effectiveness in use, and including the no-less-desired quality of lightness and compactness, whereby the machine may be readily assembled and made easy to transport.

In its general construction my machine is made of sheet-steel and comprises a quicksilver tub or well, a detachable nozzle or hopper, preferably formed of sections to facilitate its transportation, adjusting devices for regulating the discharge of the nozzle end of the hopper, and panning-compartments into which the sand that passes from the mercury receives a whirling action, and riffled surfaces over which the heaviest black sand is carried through the whirling or panning spaces to the discharge.

This invention also comprehends a novel construction of mercury-well, a feed for discharging the auriferous material into the mercury-passages for the said material arranged to cause such material to have a plurality of dips through the mercury, whirling or panning chambers, and a novel arrangement of passage-ways joining the mercury-spaces and the panning-chambers, adapted to produce an effective precipitation of the heavy or precious particles as they are carried up by the current from the mercury-spaces to the panning-spaces.

Again, this invention includes among its essential features a novel arrangement of amalgamator-plates adapted to be detachably fitted upon the surfaces over which the sand, gravel, and other auriferous material are carried during the process of separating the gold.

In its subordinate features this invention consists in certain details of construction and peculiar combination of parts, all of which will hereinafter be first noted, and then specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of my improved gold-saving machine. Fig. 2 is a vertical section of the same, taken practically on the line 2 2 of Fig. 1. Fig. 3 is a detail view of one of the partition-plates hereinafter referred to. Fig. 4 is a sectional view, on an enlarged scale, of the lower end of the nozzle and the well-bottom. Fig. 5 is a top plan view of the machine. Fig. 6 is a perspective of the discharge-apron. Fig. 7 is a longitudinal section thereof.

Referring now to the accompanying drawings, in which like characters indicate like parts in all the figures, 1 designates a tub or well for holding the mercury, which is of an elongated shape and extends the full length of the machine. Within the well 1 is fitted the lower part of the hopper, which also extends the entire length of the machine, said lower hopper being, however, of less width than the well 1, whereby intervening vertical side spaces or passages 2 2 are provided, the lower or nozzle end of the hopper being also held from contact with the bottom of the well, the purpose of which will presently appear. The hopper comprises an upper or receiver part 3, that extends above the top of the supporting portion of the machine proper and is made of a height which can be conveniently disposed under the discharge end of the sluice-box or stamp-mill. The lower part 3^a of the hopper terminates in what I term a "nozzle," the discharge or mouth of which also extends the full length of the machine and is made adjustable to provide for the

proper feed of auriferous material of different specific gravity. The bottom of the part 3 of the hopper extends below the nozzle or mouth proper, as indicated at 4, and terminates in an inverted dished bottom, the converging upwardly-extending sides 5 of which when the machine is complete and set up for use rest upon the inwardly-extending shoe or base portions 6[a] of the partition-plates 6, which plates in connection with their coöperating parts form an essential feature of this invention and will presently be fully described. The hopper is made of two sections, the lower one of which has its upper portion (indicated by X) reduced transversely, the purpose of which will presently appear, and it has its upper end terminating just above the tops of the partition-plates 6. The upper part of the hopper has the side walls of its bottom flared inward, as at Y, to facilitate the auriferous material discharging directly over the discharge or nozzle end of the hopper, and the flared bottom of the upper section is fitted into the upper end X of the lower hopper-section and made fast in any suitable manner to admit of its being readily slipped up off the bottom hopper-section, which bottom section is also detachably held within the mercury-well, such arrangement of parts providing for a quick detaching or assembling of the parts, which renders the entire machine capable of being compactly assembled for transportation. At the neck portion X′ the lower hopper-section has a cross-brace 7 at each end, which braces 7 have apertures to receive and guide the spindles 8, that carry adjusting-wheels 8[a], one of such spindles being at each end of the machine. The lower ends of the spindles 8 are threaded and each engages a socket-plate 9, to each of which is pivotally joined one end of a pair of toggle-links 10 10, the outer ends of which are pivotally joined, as at 10[a], to the oppositely-disposed plates 11. The plates 11 are hinged at 11[a] to the side walls of the lower hopper-section, and such plates form, as it were, the nozzle end of the hopper, and the lower ends of the said plates 11 terminate in pendent vertical extensions 11[b], that project down at each side of a separate plate 12, that extends the full length of the well and serves as a means for dividing the current as it passes out of the nozzle.

It will be noticed, particularly by reference to Fig. 3, that the inward extensions 6[a] of the division-plate 6, as also the bottom of the lower hopper-section, extend up to a plane above the nozzle ends 11[b], the purpose of which is to provide ample bubbling or circulating spaces above the discharge end of the nozzle, whereby to create an effectual parting of the current and also cause the said current and precious materials to again dip through the mercury after they shall have received their initial dip after they pass down through the nozzle-mouth.

So far as described it will be readily seen that to adapt the nozzle for materials of different specific gravity it is only necessary to turn the hand-wheels 8[a] to separate or close the plates 11, which operation not alone regulates the size of the throat or discharge of the nozzle, but also the spaces to each side of the division-plate 12. To create a more perfect feed of the material through the nozzle, a set of V-shaped partition-plates 13 are loosely dropped into the bottom of the nozzle part of the hopper, said partitions serving to keep the auriferous material from banking or forming a solid bulk, it being obvious that as they are loosely held in place they will rise and fall with the adjustment of the sides 11, said partitions being of a less width than the hopper in which they rest to admit of their moving, as stated. By making the bottom of the hopper dished and of hinged plates, as described, it is also manifest that should for any reason the said hopper become clogged up the material therein can be readily agitated by simply adjusting the feed mechanism that controls the width of the nozzle-discharge.

In practice sufficient mercury is placed within the well to cover the bottom portion thereof, as indicated in Fig. 3.

In operation the sand and other auriferous material passing into the hopper are caused to gravitate toward the nozzle with considerable force and are discharged into the mercury contained in the bottom of the tub, it being understood that the water and material as they pass out of the pending portions of the nozzle are divided by the plate 12. As it passes to each side of the plate 12 the material dips into the quicksilver and partially frees itself at C C, and is then again forced through the quicksilver at D D, thereby receiving a second dip before it is caused to pass up between the hopper and the walls of the well.

The walls of the well portion of the machine extend up and terminate in outwardly and upwardly inclined pan-sections 14 14, the outer ends of which terminate in discharges 14[a], that empty into the collecting-troughs 15, one trough being employed for each pan 14, and upon each pan is mounted one or more shaped riffle-plates 16, the upper edges of which, however, do not extend quite to the plane of the discharge end 14[a], so as to provide for a free passage of the material thereover and through the panning-spaces F F. The panning-spaces F F cover the area between the riffles, the sides between the ends F of the pan-sections, and above the passages at the sides of the well, said area of the panning-spaces being increased by reducing the transverse width of the hopper, as hereinbefore stated.

17 indicates amalgamator-plates that are fitted over the sides and bottom of the well, and 18 18 are similar plates placed upon the bottom of the pan portions 14, said plates being detachably held in place by any suitable

means whereby they can be quickly removed when desired for cleaning.

Now by reason of the construction of the parts aforesaid the sand or other gold-bearing material as it passes through the quicksilver has the smaller or light particles separate from the main body or precious portions that contain gold, and said light or non-precious material is carried up by the swift water through the vertical passages and whirled into the panning-spaces F F, and when it reaches the said spaces F F there is just sufficient current to take the heaviest black sand out over the riffles to the discharge. By thus carrying off the ore it is obvious that as the amalgamator-plates 17 18 are at all times free from the sand banking or resting thereon the finest particles of quicksilver that contain gold which engage said plates adhere or amalgamate thereon.

Reducing the area of the hopper at the pan 14 gives further room for the whirling or panning process and prevents forcing the concentrates out of the machine too quickly.

The riffle-plates are made "shaped" and are independently held on the pan 14, so they can be adjusted (slid up or down) as the heft of the sand requires, said riffle members having overhanging ends that engage the upper edges of the ends of the machine and are held in place by thumb-screws 20, as clearly shown in Fig. 5.

In the practical application of a machine involving the construction described, with the omission of the wings 6 6 before mentioned, while the results in the main when working certain grades of auriferous material have been satisfactory, yet in general use—that is, with any grade of sand or other gold-bearing material—I have found the results not all that is desired, for the reason that sometimes the sand stirs up in the vertical spaces between the hopper and the wall of the well in such manner that it concentrates its force in one or two places, and in consequence wastes the quicksilver. Again, when such results took place I found the sand would leave the center of the water and expand sidewise, bank very heavily on the rest of the quicksilver, and cause great trouble. These objectionable features I have entirely overcome by providing a series of equispaced partition-plates 6, which in practice are placed about three inches apart. These plates 6 are all alike and each consists of a vertical or shank portion 6^c, that snugly fits the passage-way between the hopper and the well, and an inturned or shoe portion at the bottom which rests upon the bottom of the well and which also forms a support for the lower end of the hopper, said partition also including an upper portion 6^d, which has the shape and size like that of the transverse area of the panning-spaces F. All of the plates 6 are made fast to the lower hopper-section and are removable from the well. By providing a series of partition-plates as described banking of the sand is entirely overcome, as the current with the flowing material is cut up into small sections, which causes the water to come up in all parts of the vertical spaces alike, the boiling or whirling action then taking place only in the panning-spaces F, as explained, and where it is desired.

A machine involving a construction as described may be made of different lengths to suit the main supplying means, as the division-plates and the plates 13 serve to completely divide the main or full volume that is fed into the hopper into a series of equally-divided small portions, each of which portions passes through a like process as it passes from the machine.

While the plates 6 are illustrated in this application, and their structure and combination with its specific form of coacting parts form a feature of this invention, I deem it proper to say that the broad idea of applying the different plates for the purposes stated forms the subject-matter of a separate application filed by me on even date with this application, Serial No. 13,152.

The collecting-hoppers 16 are suitably inclined toward their discharges 16^a, from which the water-flow passes into a supplemental collecting-trough 21, which is made up of sheet-copper and silver-plated on the inner side. This trough is intended to catch any amalgam that may become separated from the machine, and to provide for positively collecting any surplus amalgam the said trough has a transverse well 22, provided with an adjustable gate 23, as clearly shown in Fig. 4.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the advantages and complete operation of my invention will be readily understood by those skilled in the art to which it appertains.

The concentrates as they travel down the hopper are passed through the mercury, too, thereby giving the same the best possible contant. The upper spaces F provide for a complete separation of all particles of quicksilver from the same, no matter how fine. In making the riffles adjustable they can be readily set closer to the discharge in case heavy or black sand is being worked to give the water sufficient force and to prevent the sand from banking on the amalgamator-plates. The auriferous surfaces being arranged vertically in the passages from the well to the spaces F permits the surplus quicksilver running back upon the plates down into the well, and thereby such surplus quicksilver cannot be affected by the force of the water covering up the said vertical passages. The quicksilver-well is provided with a drawing-off cock 25, as shown in Fig. 5.

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

1. The combination with an amalgamating-

pan having a central pendent well, and portions inclined toward the well; of the hopper fitted above the well, having its outer walls parallel with the well-walls, whereby to form passages from the well to the inclined pan portions, said hopper having its bottom dished upward from its outer edges, whereby an enlarged circulating-space is provided under the hopper, and having a central discharge-nozzle projected below the dished bottom of the hopper, said enlarged circulating-space communicating with the side passages of the well through a contracted opening between the extreme lower edge of the hopper and the bottom of the well.

2. In an amalgamator as described; the combination with the stationary amalgam-pan having a central well; a stationary hopper fitted therein to form discharges between it and the well for the outflow, the bottom of the hopper having an external inverted-dish shape and having a discharge-nozzle projected centrally through the dished-shape bottom; and a longitudinally-extending vertical ridge-plate secured upon the bottom of the well projected up into the discharge-nozzle, for the purposes described.

3. In an ore-treating machine as described, the combination with a hopper having a dished bottom, said bottom being projected within the amalgamator bath or well, and having a central discharge extending its full length; of the division-plates 13, removably supported upon the dished bottom, substantially as shown and for the purposes described.

4. In an ore-treating machine as described; the combination with the hopper fitted within the amalgamating-bath, said hopper having its bottom made of an inverted-dish shape and having a discharge extending centrally thereof, its full length, the bottom of the well having a vertically-projecting ridge-plate extending its full length; the hinged plates 11, said plates having pendent portions extending down at each side of the aforesaid ridge-plate, and means substantially as shown for adjusting the plates 11, as specified.

5. In an ore-treating machine as described; the combination with the amalgamating-pan having a mercury-well; of the hopper fitted within the well to form outflow-passages between it and the well-walls, said hopper having its bottom made of an inverted-dish shape, the apex of which terminates at a discharge extending the full length of the hopper; and a series of partition-plates, said plates having portions fitting the outflow-passages, and integral inwardly-extending foot members fitting the spaces between the dished bottom of the hopper and the bottom of the well and terminating at the discharge-opening of the hopper, substantially as shown and described.

6. In an ore-treating machine as described; the combination with the amalgamating-pan having a mercury-well; of the hopper fitted within the well to form outflow-passages between it and the well-walls, said hopper having its bottom made of an inverted-dish shape, the apex of which terminates at a discharge extending the full length of the hopper; and a series of partition-plates, said plates having portions fitting the outflow-passages, and integral inwardly-extending foot members fitting the spaces between the dished bottom of the hopper and the bottom of the well and terminating at the discharge-opening of the hopper; and a longitudinal ridge-plate projected up from the bottom of the well, centrally of the discharge-opening of the hopper, substantially as described.

7. An improved amalgamating apparatus, comprising in combination with the pan having inclined sides, and a pendent well into which the said inclined sides discharge, said well extending the full length of the pan, said inclined sides each having a riffle-plate extending its full length; an overflow, and a collecting-trough having a discharge for each overflow of the pan; the supplemental collecting-trough adapted to receive the outflow from the discharge end of the machine, said supplemental trough having a well provided with an adjustable gate; and a hopper fitted into the well of the pan so as to form vertical side passages for the outflow and having a central discharge extending its full length, all being arranged substantially as shown and for the purposes described.

8. The combination in an amalgamator apparatus as described; with the pan having the inclined bottom portions 14, and a well extending its full length into which the said bottom portions discharge; the riffle member 16, adjustably mounted upon the bottom 14; a hopper fitted within the well to form vertical side passages for the outflow between it and the sides of the well, said bottom having a central discharge its full length and having its upper portion of a reduced area at a point above the top of the well portion of the pan; and a series of partition-plates detachably fitted within the outflow-passages, said plates having upper portions of the size and shape equal the transverse area of the space formed between the top of the pan, the bottom 14, the riffle-plates, and the sides of the hopper, substantially as shown and for the purposes described.

9. An improved amalgamating apparatus, comprising a pan having dished portions 14; a riffle-plate 16, adjustably mounted upon each bottom 14; a well extending the full length of the pan; a hopper having its lower portion fitted within the well to form side passages for the outflow between it and the well-walls, the bottom of the hopper being made of an inverted-dish shape, said hopper having a discharge extending its full length; and a series of partition-plates fixedly connected to the hopper, said plates having portions forming transverse partitions extending the full

transverse area of the panning-spaces above the pan portions 14, having pendent members adapted to fit the outflow-spaces and having foot portions extending inwardly under the dished bottom of the hopper, said foot portions forming means for supporting the hopper within the well, said hopper and partitions being detachably mounted within the well, all being arranged substantially as shown and described.

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