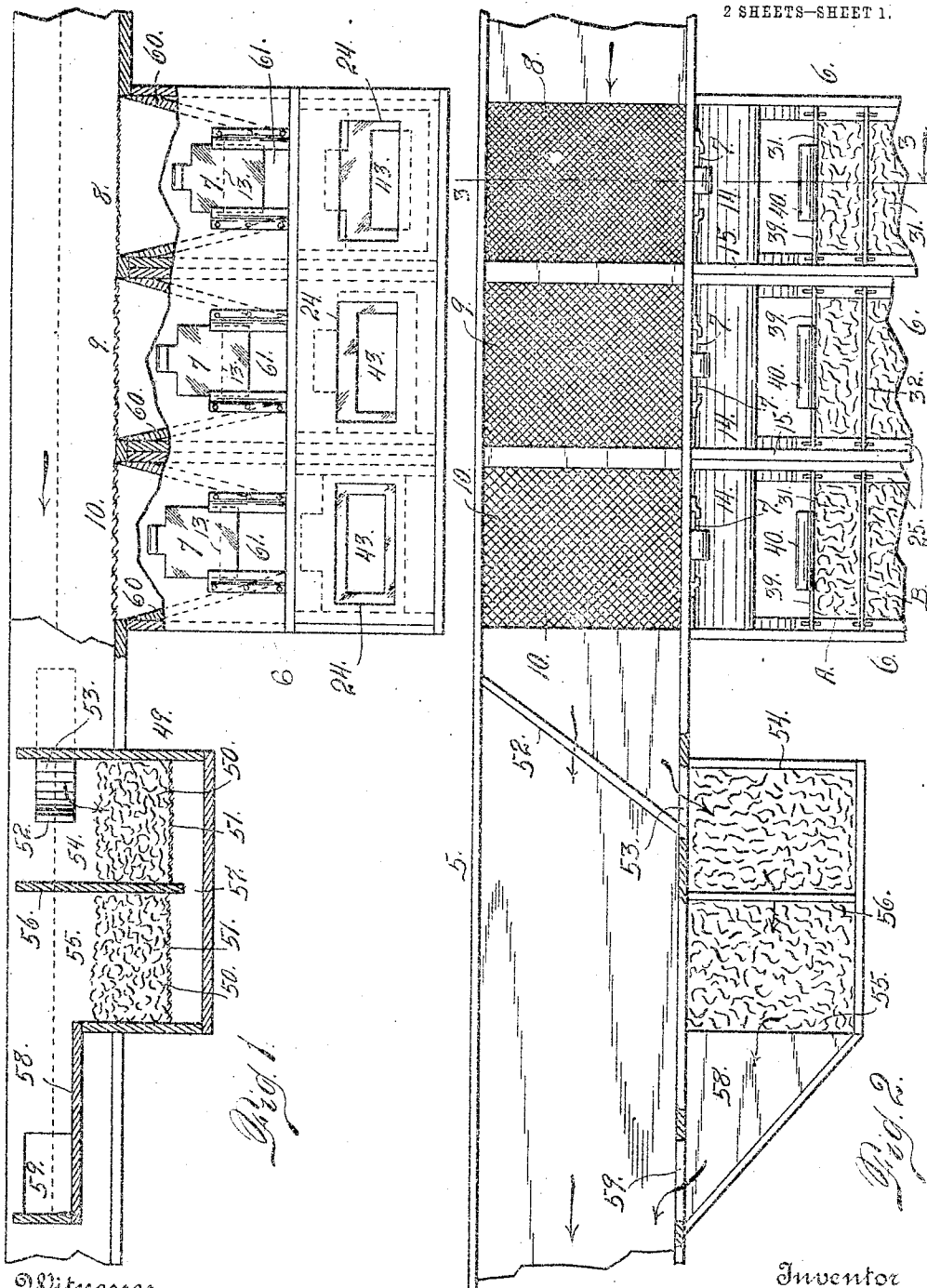


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MACHINE FOR SEPARATING METAL FROM ORES.
APPLICATION FILED FEB. 12, 1912.

1,045,083.

Patented Nov. 19, 1912.

2 SHEETS—SHEET 1.



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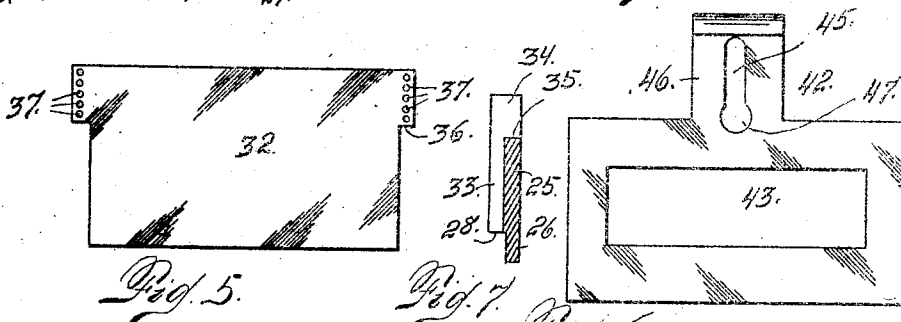
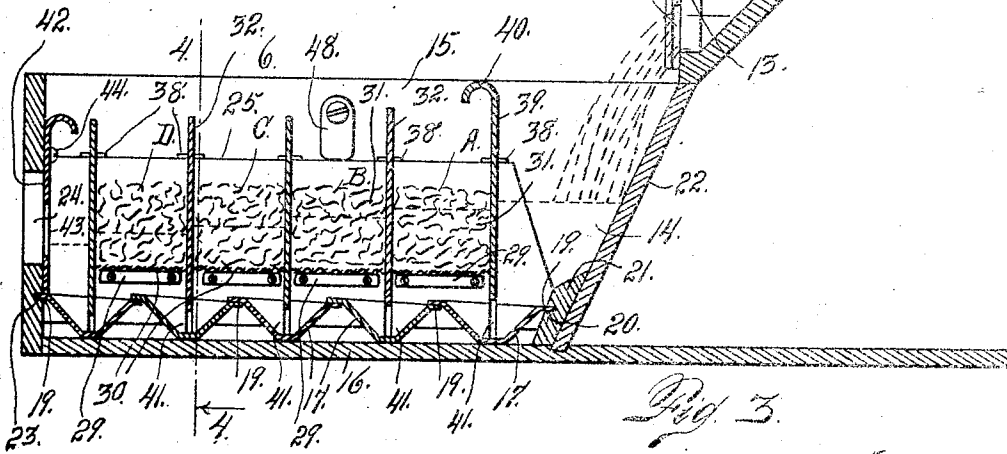
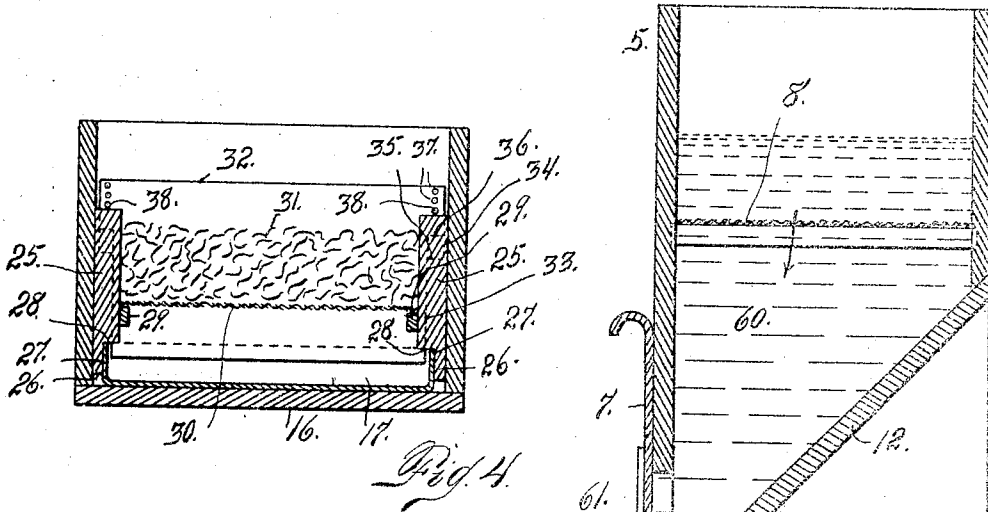


Fig. 6.
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UNITED STATES PATENT OFFICE.

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MACHINE FOR SEPARATING METAL FROM ORES.

1,045,083.

Specification of Letters Patent.

Patented Nov. 19, 1912.

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To all whom it may concern:

Be it known that I, CHARLES ROSS, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Machines for Separating Metal from Ores; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in machines more specially adapted for use in separating the precious metal values from their ores, or other material with which they are found mingled in the natural state.

The machine may be employed in the saving of the values from pulverized quartz or rock, or it may be employed in the saving of free precious metal values from placer dirt, or loose material with which the gold and silver, or other values, are found in a free state.

The machine is well adapted for use as an amalgamator, and liquid mercury may be placed in the pans forming a part of the machine and arranged in compartments separated by adjustable partitions for controlling the flow of pulp therethrough. At the front and rear ends of each unit are respectively located gates, one for controlling the entrance of the material to the unit, while the other regulates its escape therefrom. In each unit I may employ copper shavings, coated with mercury, the said shavings being arranged above the pans and adapted to catch particularly light precious metal values which remain in suspension in the water, not being heavy enough to settle, and which might not be brought in contact with the mercury of the pans, either in its free state, or as a coating upon the pans. The pans in each unit are arranged in a series, each pan being approximately V shaped, and the pans being arranged to overlap each other and held in place by removable side pieces, which normally hold the pans in the proper position for saving the metallic values. When, however, it is necessary to clean up, the side pieces, together with the adjustable partitions, and gates, may be

first removed, after which the pans may be taken out, cleaned of their values and replaced in the reverse order.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing, in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a side elevation of my improved apparatus, the same being shown partly in section. Fig. 2 is a top plan view of the same partly broken away. Fig. 3 is a section taken on the line 3—3, Fig. 2. Fig. 4 is a cross section taken through one of the units on the line 4—4, Fig. 3. Fig. 5 is a detail view of one of the adjustable partitions employed in each unit of the apparatus. Fig. 6 is a detail view of a gate located at the discharge extremity of each unit. Fig. 7 is a detail sectional view of the removable side pieces.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a sluice adapted to receive the material to be treated as placer dirt, the said sluice being constructed and arranged to remove the coarser material, as the rock and larger pieces of gangue, to prevent them from encumbering and clogging the units of the apparatus.

The units, each of which in its entirety, I will designate by the numeral 6, are arranged along one side of the sluice, to receive material from the latter which is provided with gates 7 for regulating the escape of the material into the several units. Between the water level and the bottom of the sluice are located mesh diaphragms 8, 9 and 10, which are of different mesh and arranged to screen the material which passes to the respective units 6, arranged alongside the sluice opposite the said diaphragms. The diaphragm 8 is of the finest mesh, the diaphragm 9 somewhat coarser, and the diaphragm 10 of still coarser mesh. There are three units 6 arranged to receive the material which passes through the respective diaphragms. By virtue of this variation in the mesh of the diaphragms, all the material containing any precious metal values, it is believed may be removed from the mass under treatment. It is evident, however, that the mesh, as well as the number of the diaphragms, together with the corresponding separating units, may be reg-

ulated as circumstances may require, or as the character of the material under treatment may dictate.

As illustrated in the drawing, the bottom of the sluice below the diaphragms is downwardly inclined from the rear side, as shown at 12, whereby the material passing through the diaphragms is directed downwardly and forwardly through an opening 13, controlled by the gates 7, into a forwardly located receptacle 14, arranged in front of each separating unit 6. Each of these units is provided with two parallel vertically disposed side walls 15, which if desired, may be arranged to form in connection with the sluice, a substantially, stationary and reasonably permanent structure. Within these side walls, and resting on the bottom 16 of each unit, are pans 17 approximately V-shaped and having longitudinally disposed flanges 19, which intermedicate the extremities of the unit overlap each other, the flanges of any particular pan being arranged one above, and the other below the flanges of adjacent pans in order to facilitate the securing of the pans in place, and at the same time permit their ready removability. The foremost pan, or that located at the forward extremity of the unit, and extending into the receptacle or compartment 14, has its flange 19 inserted in a recess 20 formed in a reinforcement 21 of the front wall 22 of the unit, while the rearmost pan has its outermost flange 19 in engagement with a recess 23 formed in the rear end wall of the unit below the discharge opening 24 in said wall.

Located within the side walls 15 of each unit, and engaging the opposite ends of the pans, whereby the latter are held securely in place, are removable side pieces 25. These pieces have parts 26 at their lower edges reduced in thickness and adapted to pass outside the opposite ends 27 of the pans (see Fig. 4). These side pieces also have shoulders 28, which rest upon the upper edges of the ends of the pans. Secured to the side pieces on their inner surfaces, and disposed longitudinally thereof, are cleats, or strips 29, of wood or other suitable material adapted to form a support for wire mesh members 30, the latter in turn forming a support for metal shavings 31, preferably composed of copper and coated with mercury to facilitate the saving of the precious metal values passing through the units with the pulp, and in suspension.

Each unit is divided into a number of compartments by means of transverse partitions 32, whose outer edges engage grooves 33, formed in the side pieces 25 and extending the entire width of the said pieces on their inner surfaces. Above the grooves 33 are slots 34, which extend entirely through the side pieces. Hence, the grooves and slots

at their junction form a shoulder 35, upon which a shoulder 36 of each partition is adapted to rest in order to positively limit its downward movement. Above each shoulder of each partition 32, is a series of perforations 37, adapted to receive pins 38, for limiting the downward movement of the partition before their shoulders 36 come in contact with the shoulders 35 of the side pieces 15.

The width of the partitions 32 is such that they may extend downwardly into the pans 17, the partitions being respectively arranged directly above the centers of the respective pans. By arranging the partitions so that they shall extend below the tops of the pans, the material in passing through each unit is compelled to take a zig-zag or undulating course, which is well adapted for carrying the pulp upwardly through the mesh members 30, whereby any fine free metallic values held in suspension by the water and which otherwise might escape, are caught by the mercury coated copper shavings 31.

In case the pans 17 contain free mercury, the free metal values will be saved therein to the extent that these values in a comparatively clean form are brought into contact with the mercury by virtue of the well known affinity of these metals for mercury; relatively large particles or nuggets of gold or silver will settle in the pans by virtue of their specific gravity. In this respect the structure may be termed a "concentrator," since the units are well adapted for stratifying the heavier metallic particles in the bottoms of the units, namely, in the pans.

By virtue of this construction and arrangement, my improved apparatus is well adapted for saving all classes of precious metal values, regardless of the form in which they may exist in the material under treatment.

As illustrated in the drawing, (see Fig. 3), there is located at the forward extremity of each unit a member 39, which occupies a position parallel with the partitions 32, and performs a similar function, except that it is located at the forward end of the unit, being equipped with a bent upper extremity 40 for convenience as a hand hold. This gate is of the same general construction as the partitions 32. In the arrangement disclosed in Fig. 3, the gate 39 is raised relatively high, or so that its lower end occupies a position approximately on a level with the top of the adjacent pan 17, while the partitions 32 from front to rear are gradually lowered, leaving spaces 41 between the lower ends of the partitions and the bottoms of the pans of diminishing height, whereby, theoretically, the pulp may be said to assume different level in the shav-

ings 31 in the various compartments as indicated at A, B, C and D, respectively. This showing is intended to indicate approximately the manner in which the pulp will arrange itself in the shavings of the various compartments of the different units.

If it is desired to raise the height to which the pulp will rise in the copper shavings, the rear gate 42 is raised, and by virtue of the fact that this gate is provided with a discharge opening 43 formed intermediate its extremities, the raising of the gate will necessarily elevate the lower edge of the gate bounding the gate opening, and consequently, compel the pulp to remain in the unit at a depth slightly greater than the height of the lower edge of the gate opening 43 and the bottom of the unit.

From this explanation it will be understood that a very satisfactory adjustment of the gates and partitions of each unit, is practicable in handling material in my improved apparatus.

The gate 42 is located in front of the opening 24 in the rear wall of the unit, and may be held in any desired position of adjustment by means of a fastening screw 44 passed through a vertically disposed slot 45 formed in the centrally located upward projection 46 of the gate. The lower extremity of this slot is relatively large, as shown at 47, so that the head of the fastening screw may pass through the slot at its lower extremity while at all positions above the lower end of the slot the screw head will over-lap the gate on opposite sides of the slot, and maintain the latter in place.

In order to lock the removable parts of each unit securely in place, the side pieces 15 are provided with pivoted buttons, or fastening devices, 48, which when thrown to the position shown in Fig. 3, press upon the upper edges of the side pieces 25 and lock the latter in their lowest position, whereby the pans are also held tightly in place.

As illustrated in the drawing, it is assumed that all the valuable portions of the material which under ordinary conditions is sufficiently heavy to settle in the bottom of the sluice, will pass through the diaphragms 8, 9 and 10, and thus be delivered to the units for treatment. However, should it happen that there are float values in the form of slime, which either rest on top of the pulp or are suspended near the top thereof, provision is made in the sluice beyond the separating units for diverting this float material and causing it to pass outwardly through cells of a receptacle 49 containing copper shavings 50, preferably coated with mercury, the said shavings being supported on screens 51 of suitable mesh positioned above the bottom of the latter. In order to divert the float material from the

sluice into the receptacle, the latter being located out side of the wall of the sluice, I employ an inclined deflector 52, whose rear extremity, or the down stream end, is located farther rearwardly than its forward extremity. This deflector consists of a piece of suitable material set edge-wise in a diagonal position between the side walls of the sluice, the same being of sufficient width to dip somewhat below the top or level of the pulp in the sluice. The rear extremity of this deflector terminates at one side of the sluice just beyond an opening 53 in the side wall, whereby the float material is directed into the shavings of the receptacle 49, the water being compelled to pass downwardly through the shavings of a compartment 54 and up through the shavings of the compartment 55, by virtue of a centrally located partition 56, whose lower extremity is located a short distance above the bottom of the receptacle, leaving a space 57, for the water to pass from one compartment to the other, and thence upwardly and over a platform 58 and through an opening 59 back into the sluice beyond the float deflector 52.

The compartments of the sluice below the mesh diaphragms, are hopper shaped, since their side walls 60, are inclined inwardly as they extend downwardly, thus making it practicable to discharge from the sluice into the various units through openings 13, and through mouths 61 below the gate 7, of relatively small width.

From the foregoing description, the use and operation of my improved construction will be readily understood. The material to be treated may be fed to the various units of the apparatus through the instrumentality of the sluice, as heretofore explained, or any other suitable manner as may be desired. In any event, the pulp is caused to travel through the various units, the said pulp being of the same, or different grades, as may be desired, the operation being continued until the pans, together with the copper shavings above the pans, are sufficiently laden with precious metal values to require a clean up. In this event, it only becomes necessary to loosen the securing buttons 48 from the side pieces 25 of the units, after which the said side pieces may be removed.

Previous to the removal of the side pieces, the partitions and gates may be lifted out, the shavings and their supporting screens removed, and finally, the copper pans. The shavings may be retorted in any suitable manner for the purpose of saving the values contained therein, while the pans, together with the partitions and gates, which may also be composed of copper and coated with mercury if desired, may be subjected to the usual treatment for the purpose of removing the amalgam therefrom.

Having thus described my invention, what I claim is:

1. In apparatus of the class described, the combination of a sluice having in communication therewith means for separating out the heavier concentrates, a float collector arranged alongside the sluice beyond the said means, a deflector arranged diagonally across the sluice above the bottom thereof, said sluice having openings in the side thereof above and below the lower end of the deflector and communicating with the float collector.

2. The combination of a receptacle of greater length than width, amalgamable pans arranged in the bottom of the receptacle to form a continuous undulating bottom from front to rear, transversely arranged partitions vertically adjustable and suitably spaced within the receptacle, the said partitions being located approximately directly above the lower parts of the pans, means for controlling the escape of material at the rear end of the receptacle, metal shavings coated with mercury supported above the pans and adapted to be flooded by pulp passing through the receptacle in the form of an undulating stream, and suitable means for determining the height to which the pulp will rise in the metal shavings, substantially as described.

3. The combination with an elongated receptacle and means for discharging therefrom material to be treated in the form of pulp, or in combination with water, of pans arranged in the bottom of the receptacle to form an undulating structure from front to rear, said pans being readily detachable, means for securing the pans in place when the machine is in operation, transversely arranged partitions vertically adjustable and suitably spaced within the portion of the receptacle equipped with the said pans, mesh members arranged between the partitions above the pans, metal shavings coated with mercury supported within the com-

partments upon the said screens and suitable means located at the front and rear of the body of the receptacle for regulating the depth to which pulp passing through the receptacle will rise within the metal shavings, substantially as described.

4. In apparatus of the class described, the combination of a receptacle, means located in the bottom thereof for causing pulp passing therethrough to assume the form of an undulating body, transversely arranged partitions suitably spaced within the body of the receptacle and arranged to cooperate with the undulating bottom, means arranged at the front and rear ends of the receptacle for regulating the passage of material through the body of the latter, mercury-coated metal shavings located within the receptacle between the partitions thereof, a mesh bottom upon which the said shavings are supported at a suitable distance above the bottom of the receptacle, and suitable means located above the receptacle for discharging material into the front part of the latter, to give the material passing through the receptacle the desired pressure head, for the purpose set forth.

5. The combination with a receptacle of amalgamable pans arranged in the bottom of the receptacle to form a continuous undulating surface from front to rear, the transverse partitions arranged approximately above the lowest points of said pans, mesh material mounted between said partitions, metallic shavings, mercury coated, supported upon said mesh material, means for controlling the entrance of pulp at one end of the receptacle and the exit of gangue at the other end thereof.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES ROSS.

Witnesses:

F. E. BOWEN,
A. ESBERT O'BRIEN.