(No Model.)

H. BAUDOUIN & J. SOUTHERN.

CONCENTRATOR AND AMALGAMATOR FOR PRECIOUS METALS.

No. 534,777. Patented Feb. 26, 1895.

Fig. 1.

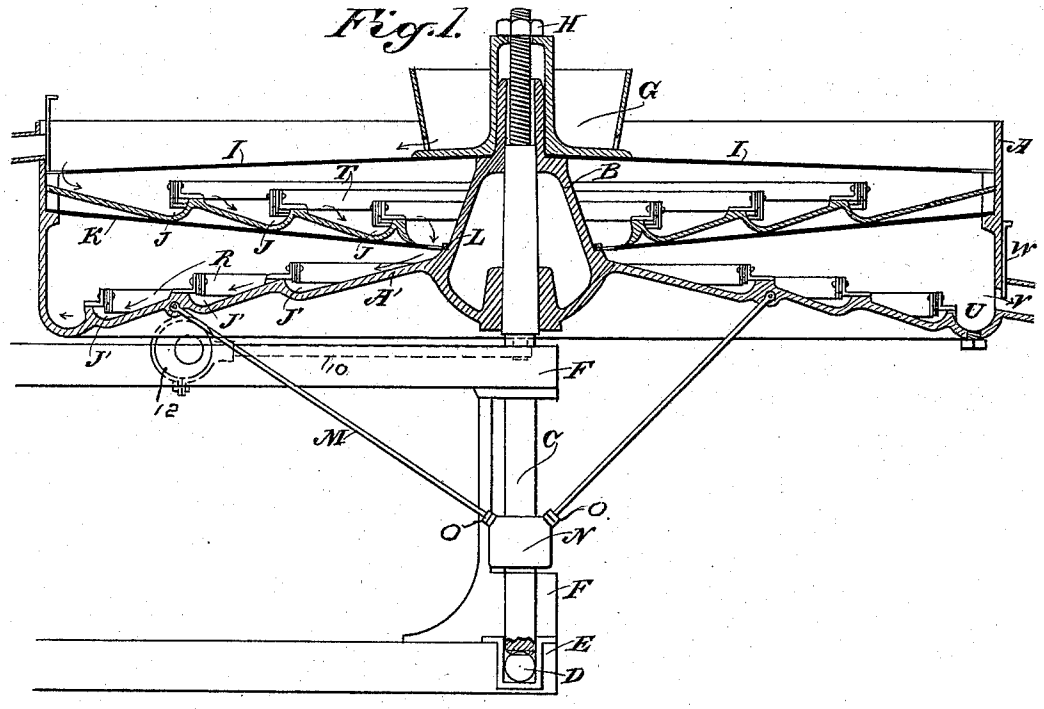


Fig. 2.

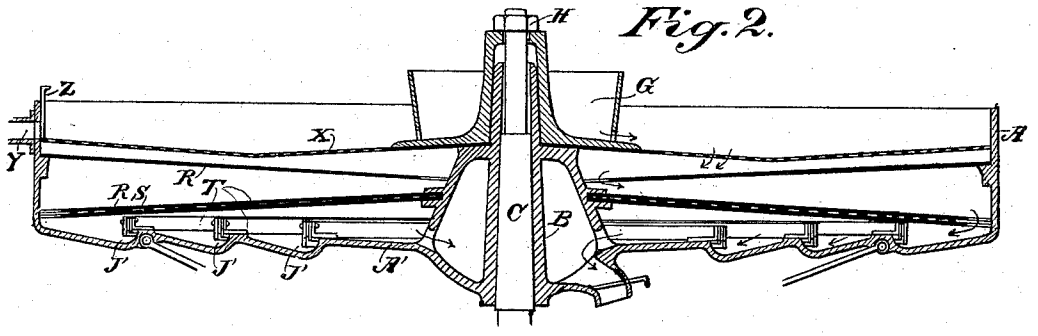
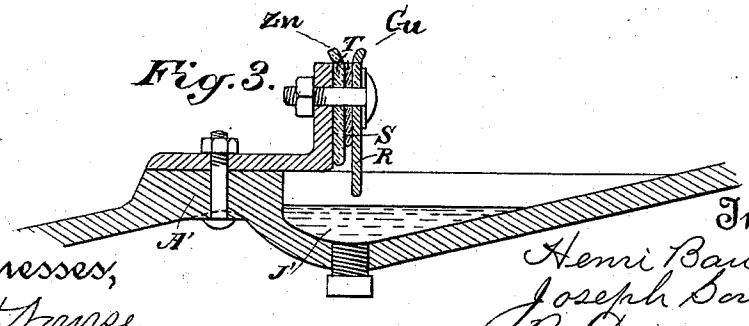


Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRI BAUDOUIN AND JOSEPH SOUTHERN, OF GRASS VALLEY, CALIFORNIA.

CONCENTRATOR AND AMALGAMATOR FOR PRECIOUS METALS.

SPECIFICATION forming part of Letters Patent No. 534,777, dated February 26, 1895.

Application filed June 14, 1894. Serial No. 514,544. (No model.)

To all whom it may concern:

Be it known that we, HENRI BAUDOUIN and JOSEPH SOUTHERN, citizens of the United States, residing at Grass Valley, Nevada county, State of California, have invented an Improvement in Concentrators and Amalgamators for Precious Metals; and we hereby declare the following to be a full, clear, and exact description of the same.

Our invention relates to an apparatus to save amalgam, to collect a large percentage of float gold and floured quicksilver, and to thoroughly and effectively separate them from the pulp before running into concentrators.

It consists in certain details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a vertical sectional view of the apparatus. Fig. 2 is a similar view showing it when used to clean up. Fig. 3 is an enlarged view of one of the quicksilver troughs and its attachments.

The object of our invention is to provide an apparatus for the more effectually saving all precious metals, such as float gold, and floured quicksilver, which are apt to go to waste by being carried off in suspension with the slimes after the process of crushing, amalgamating in the battery and passing over copper or silver plates. In the ordinary methods used for treating such tailings, these metals are mixed up with concentrates or sulphurets which it is also desired to save. Consequently, when these sulphurets are sent to the chlorination works and roasted, the quicksilver that may be contained with them, is lost by evaporation in the furnace, and part of the gold which may be in the shape of small solid balls, does not remain long enough in the chlorinating vats for the chlorine gas to dissolve it and turn it into chloride of gold. Consequently, a large percentage of this metal is also lost in the tailings.

Our invention consists of a pan adapted to be placed some distance from the battery so as to be out of the way and allow free access to the front of the battery for changing and repairing screens, renewing shoes and dies, cleaning up the mortar, and such other work as requires free access to the front of the battery.

The pan is given a rapid oscillating motion around its vertical axis, and is constructed upon the principle that the infinitesimal particles of floured quicksilver and float gold, as well as other precious or valuable metal, are readily precipitated and deposited upon a metallic surface by the aid of a galvanic current.

A is a circular pan having either a convex or a concave bottom, and a cone D in the center through which passes a vertical shaft C. This shaft rests upon a ball bearing D in a step E, suitably fixed to the frame-work which carries the apparatus. The shaft is held to the frame by means of two bearings, as shown at F, so that all the parts to be oiled are below the pan, and there is no danger of oil or other greasy lubricating substance getting upon the plates to interfere with the operation.

The upper end of the shaft is screw-threaded, and the hopper into which the material is to be fed, fits around the upper end of the cone, as shown at G, and is securely held in place by means of a nut H, screwing down upon the upper end of the shaft. The bottom of the hopper rests upon a circular sieve or distributing plate, or upon the copper amalgamating plate, the center of which is adapted to rest upon a suitable ledge upon the cone, while the outer periphery rests upon the periphery of the pan or a shoulder suitably arranged to support it. This distributing plate I may be made in a single piece or in segments bolted or screwed to an apron and spider arms, and it has an inclination either descending from the center toward the periphery, or the reverse so that pulp fed into the hopper G will pass through holes or channels around the bottom of the hopper and be delivered upon this copper plate.

The pan is caused to oscillate rapidly about its center by means of a pitman 10 having one end connected with the pan at some suitable point, preferably the periphery and the other end with a crank or eccentric 12 which is rotated by a shaft to which it is fixed and any suitable source of power. The rotation

should be such as to produce about one hundred and ninety or two hundred vibrations of the pan per minute, and the extent of the oscillation may be about four inches. This serves to keep the quicksilver, which is used as hereinafter described, in a lively condition. From the periphery of the copper plate I, the pulp flows down into the quicksilver chambers J which are formed in independent annular channels from the exterior to the center of the pan on a plane which descends toward the center.

K is a spider composed of arms radiating from the central ring L, which ring is adapted to rest upon a circular flange or step on the exterior of the cone B. The outer ends of the arms of the spider are securely bolted or fixed to a supporting flange around the inner periphery of the pan, and this spider serves to support the quicksilver channels J, previously described.

Openings as made through the inner periphery of the plate forming the channels, or grooves, may be made in the side of the cone allowing the material which has flowed down to this point, to escape and fall upon the convex bottom of the pan, shown at A′, and this bottom has formed in it, a set of annular quicksilver grooves or channels J′, similar to those previously described, but descending from the center toward the periphery.

The bottom of the pan is preferably supported by a number of radial braces M which extend upwardly and outwardly from the collar N fixed to the vertical shaft, and having adjusting nuts O by which the tension may be regulated. The outer ends of these braces are suitably connected with the bottom of the pan as shown. This pan may be of any suitable diameter, from three to six or more feet, and the annular quicksilver channels J or J′ may be as many in number as desired. Each of these channels has a mechanism connected with it designed to produce a galvanic current. It consists of copper and zinc hoops of such diameter that the lower edge of the copper hoops will dip into the respective channels as shown in the enlarged view, the zinc ring forming contact with the copper upon one side and being of less depth so that it cannot come in contact with the quicksilver, and a suitable porous material is connected with the two so as to form the elements of a battery in each case. This material may be of blanket, india rubber, or other suitable material. These rings forming the battery elements, are supported either by means of an iron hoop which is in turn supported from the spider K, or they may be directly supported from the bottom. The copper plate is shown at R, the zinc plate at T and the porous material at S with the supporting arms and clamping bolts. The copper plate extends down into the pulp to a point just above the level of the quicksilver in each of the annular channels, leaving a sufficient space for the pulp to pass beneath the plate and thence flow over the edge of the channel and into the next and so on until it reaches the last of the series of channels. The zinc plate is made of considerably less depth than the copper plate so as to prevent any quicksilver from coming in contact with the zinc. It will be seen from this construction that the pulp, after flowing out over the distributer, then returns toward the center through the upper series of annular quicksilver channels J, in each case coming in contact with the copper element of the battery thus formed, and as the porous material S is moistened with saline or acidulated solution in the usual manner for exciting an electrical action in a voltaic pile, the galvanic action produced will cause the fine floured quicksilver or float gold to be deposited upon and adhere to the lower edge of the copper plate from which, as it accumulates, it will drop from time to time into the channel or trough beneath it. If more than one series of these circular channels are employed, it will be seen that the pulp will flow from the lower edges of the first series into the upper one of the next series, and will thence proceed in the same manner to the lowest edge of this series. In the present case we have shown two series of these troughs as previously described.

Around the outer periphery of the bottom A′ of the pan, is a channel U in which any quicksilver or valuable material which passes over the lowermost of the channels will be collected.

V is a discharge passage having a slide gate W which is open for the discharge of sulphurets and other material concentrated at this lowest point in the pan. If the pan is made with a concave bottom the movement of the pulp is reversed and the discharge thus takes place from the center as shown in Fig. 2.

In some cases we employ flat plates of copper and zinc, over which the pulp flows, in which case the copper plates will be placed above the zinc ones, and will project some distance beyond the peripheries of the latter, so as to prevent any contact of the quicksilver with the zinc, as the latter will be rapidly destroyed by such contact. These plates may be stationary or movable, the galvanic action being the important effect produced in either case. The galvanic action can be produced in the same manner by these inclined zinc and copper plates as with those which have been previously described as standing upon edge, the pulp simply flowing over the uppermost copper plate in that case.

If the pan is used in mills where electricity is generated for lighting, motive power, or other purposes, the zinc plates may be dispensed with, and the copper plates or hoops connected by wires with the generators of electricity.

When the pan is to be used as a clean up pan or gravel washer, we employ a sheet iron sieve X upon which the material from the central hopper is first discharged, and over

which it passes, the fine material falling through upon the distributer I beneath the sieve. Gravel and coarse material will pass out through a discharge outlet Y having a controlling gate as shown at Z. In this case the upper series of annular quicksilver troughs may be dispensed with, and copper plates employed in place thereof. A supplemental rim is bolted upon the main rim to raise it, and the central cone is also extended. The bottom of the pan may be concave or convex as desired. The operation will then be as follows: The pulp being introduced into the hopper, flows through openings and is evenly distributed over the upper copper plate, by reason of the oscillations of the pan, and upon this plate most of the amalgam will collect and adhere, while by reason of centrifugal force and gravitation, as well as the current of water, the pulp will run to the periphery, passing thence to the first quicksilver trough where its outflow is checked by the galvanic hoop previously described, and every particle of material is compelled to come into contact with the electrically excited copper plate, thence passing over the quicksilver in the channel, it flows into the next channel where the operation is repeated, and so on until it reaches the discharge gate at the periphery of the pan. At this point the quicksilver and amalgam will have been entirely separated from the sulphurets and other concentrates, and the latter may be taken to any of the usual concentrators.

The charge of quicksilver for each pan varies according to its size and to the loss from the battery. For a five foot pan about thirty pounds may be used divided as follows: Ten pounds in the uppermost trough or channel, seven in the next, three in the next. The remaining ten pounds will be divided in the lower series of channels in the proportion of seven in the uppermost and three in the second.

When the machine is to be used as a clean up pan, after the sieve, plates, &c., have been properly adjusted, the slide at the discharge gate is so regulated as to allow a free passage for the sand, but it is adapted to keep the level of the water above the sieve. The upper slide gate will be kept closed until all the material fine enough to pass through the meshes of the sieve has been thoroughly washed and disintegrated, and it is then opened to allow the coarse sand and gravel to run out.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. An apparatus for working the ores of precious metals, consisting of a vertically journaled oscillating pan having copper and zinc plates disposed therein with relation to each other so as to produce a galvanic action, the zinc plates being covered and protected from contact with the mercury by the copper plates.

2. An apparatus for working the ores of precious metals, consisting of a vertically journaled oscillating pan having one or more concentric overflow channels between the center and periphery, adapted to contain quicksilver, plates of copper and zinc disposed with relation to each other so as to produce a galvanic current, the copper plates extending over and protecting the zinc plate, and so disposed that the passing material flows against or over them, so that the metal carried by the current will be brought into contact with the copper plates.

3. An apparatus for working the ores of precious metals consisting of a vertically journaled oscillating pan having an inclined inner bottom with one or more annular overflow channels between the center and periphery adapted to contain quicksilver, battery elements consisting of circular hoops of copper and zinc and porous fabric whereby an electrical current is induced, said hoops being so fixed that the lower edge of the copper hoop dips into the moving current of pulp just above the surface of the quicksilver in each of the channels while the zinc hoop is made shorter and protected from contact with the current by the overlying copper plate.

4. An apparatus for working the ores of precious metals, consisting of a vertically journaled oscillating pan having an inclined bottom with annular overflow channels adapted to contain quicksilver, a correspondingly channeled disk supported above the bottom having its inner side inclined with relation to the bottom of the pan and a horizontal plane, hoops of copper and zinc overlying each other and adapted to produce an electrical current, said hoops being fixed above the quicksilver containing channels with the lower edge of the copper hoop descending into the pulp just above the surface of the quicksilver, a copper distributing disk with an inclined upper surface, a hopper surrounding the central cone of the pan into which the pulp or material to be treated is received, openings whereby it is delivered upon a distributing plate, and openings whereby it passes upon the exterior of the uppermost channeled disk, and thence upon the channeled bottom of the pan, and a discharge opening and gate at the lower part of the pan.

5. An apparatus for working the ores of precious metals, consisting of the vertically journaled oscillating pan having an inclined bottom with annular quicksilver channels and copper and zinc elements forming a galvanic battery disposed with relation to said channels, a superposed inclined disk having similar channels and battery elements so that pulp delivered upon the disk flows over its channels from one edge to the other, and thence over the channels in the bottom, and a spider consisting of a ring supported upon the central cone of the pan and arms secured to the periphery thereof whereby the upper disk and the hoops composing the battery elements are supported.

6. An apparatus for working ores, pulp or gravel containing valuable precious metals consisting of a pan having an inclined bottom with annular overflow, quicksilver channels and copper plates disposed with relation thereto so that the pulp flows over and against them, and means for producing an electric current through said plates, a discharge gate at the lower periphery of the pan for the escape of sulphurets, a sieve or screen extending over the top of the pan, a central hopper from which material is delivered to pass over said screen, and a discharge opening and gate in line with the surface of the screen whereby the finer material is separated by the oscillations of the pan to pass through the screen and the coarser material is discharged through the gate above the screen.

In witness whereof we have hereunto set our hands.

HENRI BAUDOUIN.
JOSEPH SOUTHERN.

Witnesses:
JOHN MULROY,
P. A. MURPHY.