

(No Model.)

2 Sheets—Sheet 1.

J. H. JORY.
AMALGAMATING AND REDUCING SLUICE.

No. 509,912.

Patented Dec. 5, 1893.

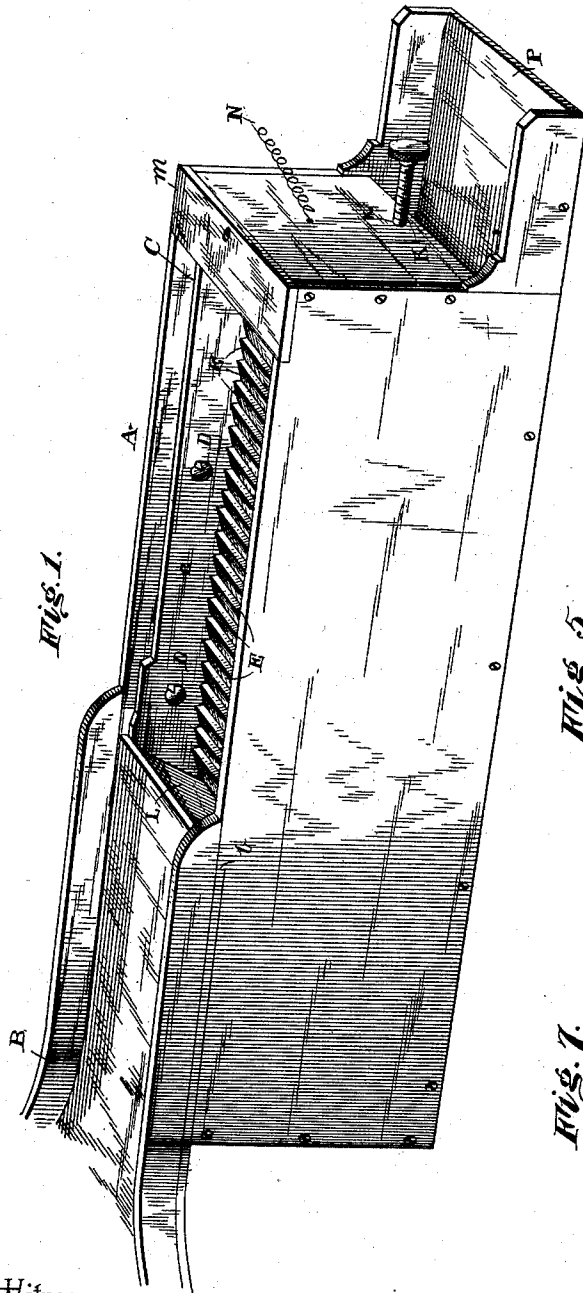


Fig. 1.

Fig. 5.

Fig. 7.

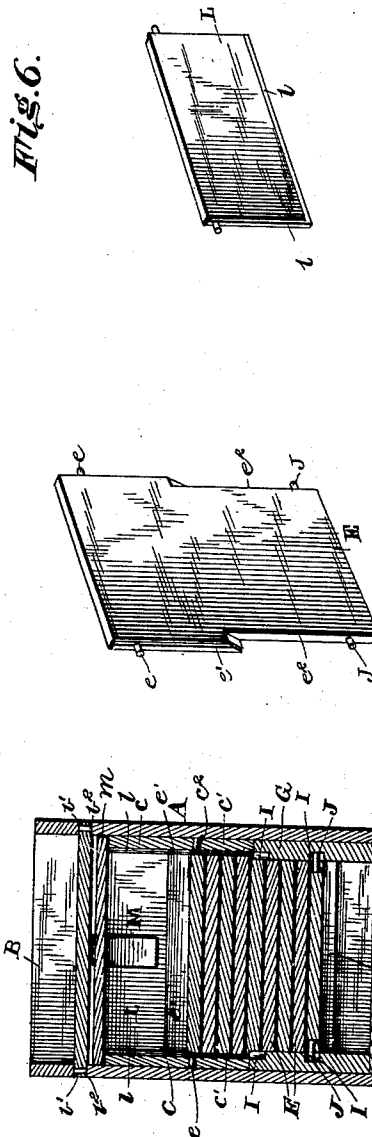


Fig. 6.

Witnesses

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Fig. 2.

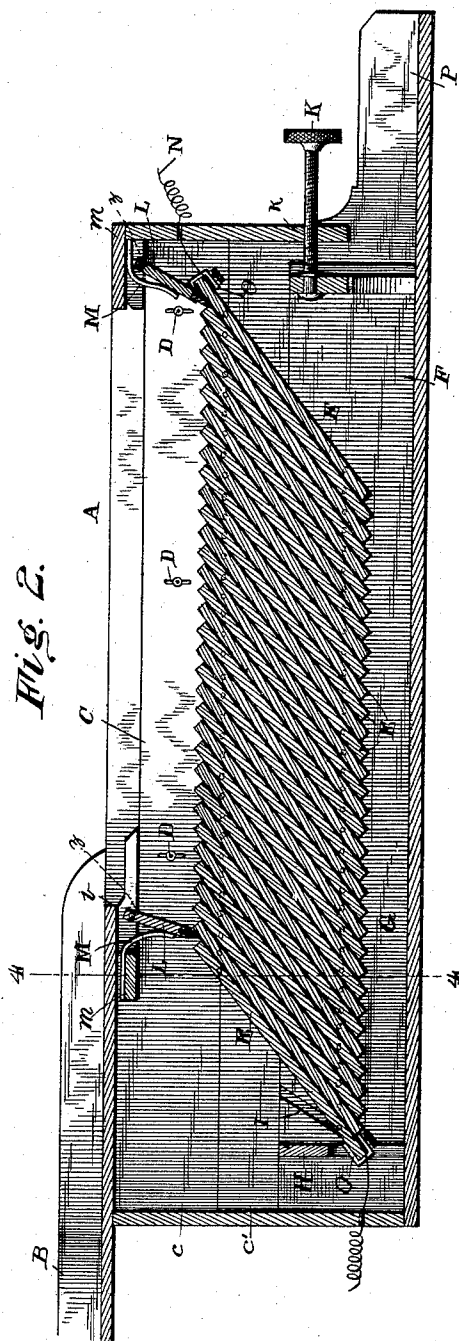
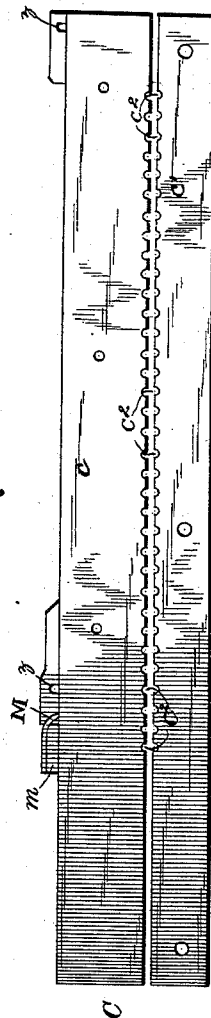


Fig. 3.



Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH H. JORY, OF SAN FRANCISCO, CALIFORNIA.

AMALGAMATING AND REDUCING SLUICE.

SPECIFICATION forming part of Letters Patent No. 509,912, dated December 5, 1893.

Application filed January 23, 1893. Serial No. 459,319. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. JORY, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Amalgamating and Reducing Sluice, of which the following is a specification.

This invention relates to amalgamating and reducing sluices; and it has for its object to provide an improved apparatus of this character which is particularly adapted for use in connection with the discharge from stamp batteries, pulp from amalgamating pans, chlorides from vats, &c., so as to collect and save the fine particles of gold and silver which are usually lost in the slime or pulp from such machines.

To this end the invention primarily contemplates certain improvements in amalgamating and reducing sluice boxes whereby the finely divided precious metals from the stamp mills and amalgamating pans can be effectually and positively collected, and also means whereby the said sluice box can be adapted for reducing the metals into a metallic state from the solutions in which they are contained and recovering the same by the method involved when the sluice box is used for amalgamating.

With these and other objects in view which will readily appear as the nature of the invention is better understood the same consists in the novel construction, combination and arrangement of parts, hereinafter more fully described, illustrated and claimed.

In the accompanying drawings:—Figure 1 is a perspective view of a sluice box constructed in accordance with this invention. Fig. 2 is a central vertical longitudinal sectional view of the same. Fig. 3 is a detail in section of the sliding slotted adjusting frame. Fig. 4 is a detail elevation of one of the side sectional hanger plates. Fig. 5 is a detail in perspective of one of the amalgamating plates. Fig. 6 is a similar view of one of the end flood gates. Fig. 7 is a vertical sectional view on the line 4—4 of Fig. 2.

Referring to the accompanying drawings, A represents an elongated rectangular sluice box constructed of a suitable length and depth so as to accommodate the slime discharge from a stamp battery, pulp from amal-

gamating pans, or chlorides from vats. At one end of the sluice box A is removably attached the feeding trough B. The feeding trough B, is seated in the cutaway edges b , of the opposite sides of the sluice box and is provided with the bottom perforations b' , which receive the pins b^2 , projecting from the top edges of the sluice box, and thus providing means for the removable attachment of the feeding trough to one end of the sluice box.

At opposite inner sides of the sluice box A, are arranged the opposite sectional hanger plates C, comprising the upper and lower sections c and c' , at the meeting edges of which is formed a series of regularly spaced bearing openings c^2 . The uppermost sections c , are removable, and are held in position on the other stationary sections c' , by means of the thumb screws D, passing therethrough and into the sides of the sluice box. By removing the screws D, the upper sections of the hanger plates can be removed for the purpose of allowing the amalgamating plates E, to be also removed in order to clean the deposits therefrom. The amalgamating plates E, are preferably of copper and are amalgamated on both sides thereof. The said plates are arranged longitudinally in the sluice box from the inner edge of the trough B, to the opposite end of said sluice box, and the same are provided at opposite edges thereof above their centers with the opposite projecting pivot pins e , which engage the bearing openings of the hanger plates and serve to support the plates E, so that they can be easily adjusted by the means to be presently described. The opposite edges of the plates E, above and below their pivot pins are grooved to receive the packing strips e' , which contact with the faces of the hanger plates to prevent the fluids from finding escape at such points, and below the pivots e , the opposite edges of the plates E, are cut away at e^2 , so as to work inside of the opposite sides of the sliding adjusting frame F. The sliding adjusting frame F, slides between the bottom of the sluice box A, and the bottom edges of the lower stationary section of the opposite hanger plates, and said sliding frame comprises the opposite adjusting plates G, connected at one or both ends by the end bars H, and the inner sides of said opposite plates G, are provided

with a parallel series of angle grooves or slots I, leading from a point near the lower edges of said plates to the top edges of the same, at which the upper ends of said grooves or slots are open so as not to interfere with the removal and replacement of the plates E. At opposite edges of the plates E, near their extreme lower edges are arranged the adjusting pins J, which loosely take into the parallel angle or oblique grooves I, so that as the said sliding adjusting frame is moved in either direction, the whole series of amalgamating plates are simultaneously and regularly adjusted, so that the parallel arrangement is still preserved, and the width of the spaces between the several plates remains uniform. Loosely connected or swiveled to one of the end bars H of the frame F, is the adjusting screw K, working through a threaded bearing *k*, at one end of the sluice box, and having a thumb plate at its outer end, so that the said screw can be readily turned in order to adjust the spaces between the several plates. Now noting the oblique disposition of the several parallel amalgamating plates and the means for adjusting the same, it would be well at this point to also note, that the said plates, which are amalgamated on both sides, are arranged so as to regularly overlap each other, so that at the upper ends of the plates are formed riffles or pockets which lead into the capillary passages between the plates. The capillary passages between the plates are usually between one-fiftieth to one one-hundredth of an inch in width, so that no particle of metal whatever can escape through said passages without being brought into direct contact with the amalgamating surfaces of said plates. The discharge from the stamp mill, or pans, &c., is run over the trough onto said amalgamating plates, and the said plates are so adjusted that a sufficient depth of the fluid matter will stand on top of said plates, so that the pressure will be sufficient to maintain a flow of the slime, or pulp through the capillary passages, equaling the amount fed over the trough B. This can be readily adjusted by the operator.

Arranged at each end of the series of amalgamating plates are the end flood gates L. The end flood gates L, are removably hinged at their upper edges, at *z*, to the top of the removable sections of the hanger plates, so that said flood gates can be moved out of position either separately or with such hanger plate sections, and the lower edges of said gates are held in contact with the end plates of the series of amalgamating plates by means of the springs M, bearing against one side of the same and secured at their upper ends to suitable supports *m*, also secured to the hanger plates or to the top of the sluice boxes. These end flood gates are amalgamated upon their exposed faces and serve to confine the fluid matter on top of the series of amalgamating plates, so as to force such liquid matter, con-

taining the metallic ores in suspension or in solution, through the capillary passages between such amalgamating plates. The end flood gates are also provided with edge packing *l*, contacting with the sides of the hanger plates and the top of the amalgamating plates, with which they contact so as to make a fluid-tight joint. Now in certain cases the capillary action between the overlapping amalgamating plates, must be reinforced, and in order to provide for such reinforcement of the capillary action, I send an electric current through the entire series of amalgamating plates, which are necessarily in the circuit with each other, through the medium of the fluid matter therebetween, which contains amalgamated matter, which has escaped from the stamp batteries or the amalgamating pans, &c. The series of amalgamating plates are connected in a suitable electric circuit, by means of the electric circuit wires N, passing through opposite ends of the sluice box and connected to the metallic clamps O, removably clamped to the end plates of the series, as clearly shown in the drawings. The exhausted slimes, pulps or sands, are discharged through the tailing opening or sluice P, at one end of the sluice box.

In operation, as before stated, the plates E, are separated sufficiently so as to allow the slimes, pulp or sands to pass through the capillary channels therebetween, the depth of such matter being sufficient on top of said plates to aid the capillary action. During the passage of such ore-containing matter through the capillary channels or passages, the amalgams of the metals are formed on the amalgamating plates, and as such plates become covered by amalgam it will of course be necessary to separate the same farther apart from time to time by means of the screw K. This operation is followed both in gold and silver amalgamation. Silver amalgamation is ordinarily done in pans, but the work may be greatly simplified and cheapened by stamping the ore fine as in gold batteries, and amalgamating by the means herein described. As the capillary passages between the plates are but a very small fraction of an inch, it will be seen that no particle of metal can escape without being brought into intimate contact with such plates, and formed into an amalgam. In cases where the metals are covered by a film of sulphides of metals, iron or manganese oxide and other non-amalgamating surfaces, the electric charge passing through the amalgamating plates necessarily facilitates the union of the metals with the amalgam of said plates by its decomposing or reducing action. As before stated, the gold or silver amalgam may of course be removed from the plates at convenient periods.

Some ores contain the precious metal in such a chemical combination as to necessitate a reduction before the metals can be recovered. The old processes of solution, filtering, &c., are greatly simplified by the use

of the herein described apparatus, by using the same as a filtering and reducing agent, supplemented by the capillary amalgamator. In this case, the amalgamating plates are replaced by iron, copper, carbon, or other reducing plates, through which a current of electricity is passed so that the metals can be recovered or reduced from their combinations into the metallic state and recovered by amalgamation as herein described.

The many advantages of the capillary process involved in the herein described apparatus will be readily apparent to those skilled in the art, and I will have it understood that changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention, and it is to be observed an important factor in the present machine, is that the separations effected are greatly assisted by capillary attraction between the plates E.

The herein described capillary amalgamating sluice is particularly adapted for use in saving the fine gold now lost in hydraulic mining, ground sluicing and beach mining, and in such use the sluice being protected by ordinary screens from the coarse sands and gravel and being designed to be of sufficient capacity in number and size of plates to control the flow therethrough.

It may be well to observe at this point that the successful operation, of the herein described apparatus, is not dependent in any particular on any specific chemical reaction, but the reducing, extracting, and amalgamating functions are greatly aided by the molecular force of capillary action, which is itself assisted and intensified by the influence of an electric current so as to cause a more positive adhesion of the particles of metals to the plates. It will of course be apparent to those skilled in the art that the plates which form the capillary channels may be of carbon, silver, copper, iron or any other suitable metal, which may be desirable for the particular process being carried out by the apparatus, according as it may be for the extraction of gold, silver, copper, aluminium or other metals. The plates may also be arranged in a series of the same metal consecutively, or of different metals alternately, as the particular case may demand, and the electricity employed as an auxiliary factor, may be applied either as a direct or an alternating current, according to whether the metal to be extracted is to be precipitated or caused to adhere to the plates.

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

1. In an amalgamating and reducing sluice, the combination with an elongated sluice box; of a series of obliquely arranged amalgamating plates arranged within said box and having capillary channels or passages therebetween, and means for adjusting the channels or pas-

sages between said plates, substantially as set forth.

2. In an apparatus of the class described, the inclosing sluice box, a series of parallel plates arranged within the box, means for adjusting said plates simultaneously, to regulate the capillary channels or passages therebetween, and electrical connections for said plates, substantially as set forth.

3. In an apparatus of the class described, an elongated sluice box, a series of obliquely arranged plates removably hung within the sluice box and having capillary passages therebetween, means for uniformly adjusting the width of said passages, substantially as set forth.

4. In an apparatus of the class described, an elongated sluice box, removable hangers at opposite inner sides of said box, a series of parallel overlapping plates pivotally supported in the removable hangers, and a sliding adjusting frame connected with the lower ends of said plates to uniformly adjust the capillary passages between said plates, substantially as set forth.

5. The combination of an elongated sluice box, removable hangers at opposite inner sides of said box, a series of parallel overlapping amalgamated plates pivotally supported in the removable hangers, said plates being arranged obliquely or at an angle, a sliding adjusting frame loosely connected to the lower ends of said plates to regulate the capillary passages therebetween, spring-actuated flood gates arranged within the sluice box and held against the end plates of the parallel series, and electrical connections for the plates, substantially as set forth.

6. The combination of a sluice box having a removable feed trough at one end and a tailing opening at the opposite end, opposite sectional hanger plates arranged at opposite inner sides of the sluice box and having a regularly spaced series of bearing openings, the upper section of said hanger plates being removable, a parallel series of obliquely arranged overlapping amalgamated plates having opposite pivot pins removably engaging the bearing openings of the hanger plates, a sliding adjusting frame connected to the lower ends of said amalgamated plates to adjust the capillary passages, and the spring actuated flood gates, substantially as set forth.

7. The combination of an elongated sluice box open at the top, a removable feed trough at one end of said sluice box, a series of parallel obliquely arranged amalgamating plates having opposite pivot pins, and opposite adjusting pins below the pivot pins, opposite removable hangers receiving the pivot pins of said plates, a sliding adjusting frame arranged within the sluice box below the hangers, and having opposite adjusting plates overlapped by the opposite edges of the amalgamating plates and provided with a parallel series of angle or oblique grooves which receive the adjusting pins of said plates, an ad-

justing screw connected with one end of said frame, and electrical connections, substantially as set forth.

8. The combination of an elongated sluice
5 box open at the top, a series of parallel amalgamating plates arranged at an angle removably within the box and having capillary passages there-between, spring-actuated removable flood gates supported within the
10 sluice box and provided with packing in their edges contacting with the opposite sides of the box and the end plates of the series, an adjusting frame mounted to slide within the bottom of the sluice box and comprising opposite connected plates having a parallel series of angle or oblique grooves, adjusting
15 pins projecting from opposite lower edges of the amalgamating plates and taking into the grooves of the frame plates, an adjusting
20 screw connected to one end of the sliding

frame, connecting clamps removably attached to the end plates of the series, and electric circuit wires connected to said clamps, substantially as set forth.

9. The herein described method of amal- 25 gamating and reducing ores which consists in forcing the ore slimes, pulp &c., through separated capillary passages between metallic plates, under the pressure due to the body of the liquid above the plates and maintaining 30 an electric circuit through said plates, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOSEPH H. JORY.

Witnesses:

W. E. BLAKE,
LILLIAN H. BLAKE.