(No Model.)

S. L. TRIPPE.

AMALGAMATOR.

No. 308,642. Patented Dec. 2, 1884.

Fig 1

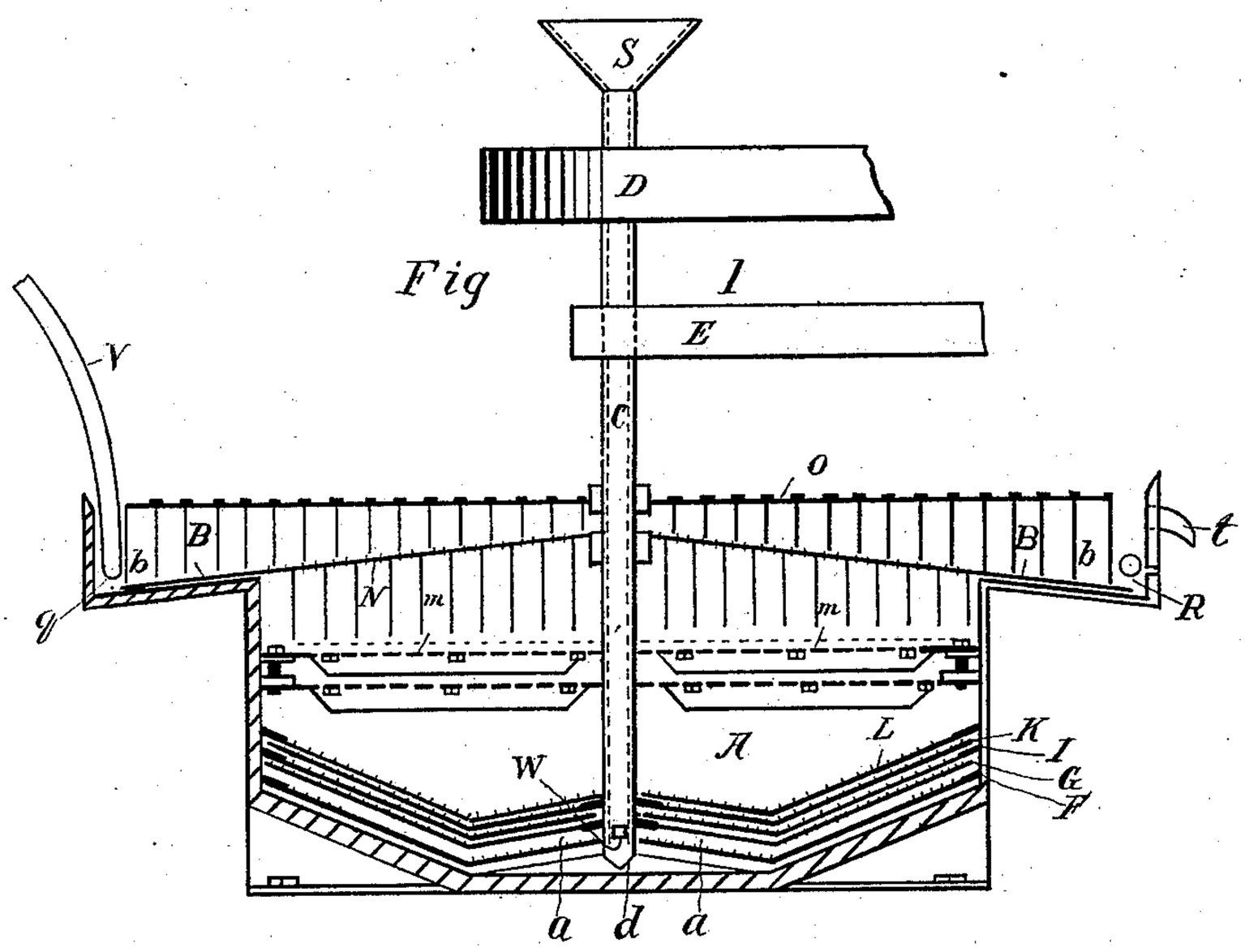


Fig 2

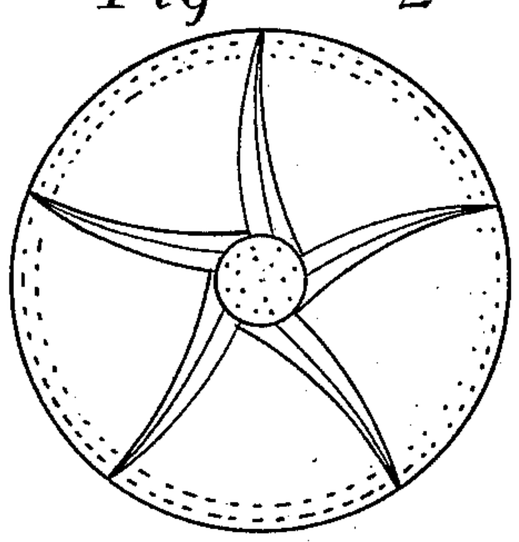
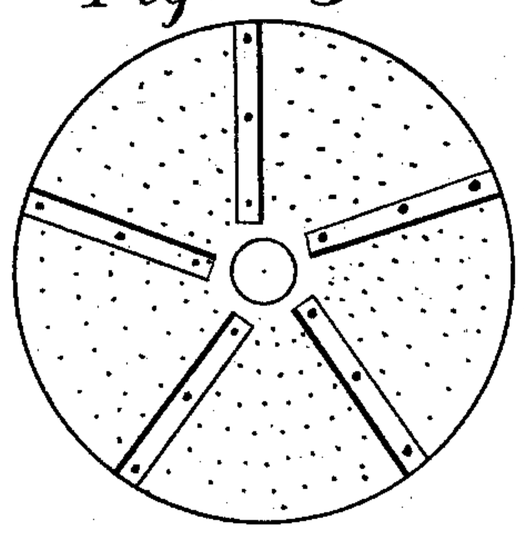


Fig 3



Attest

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SYLVANUS L. TRIPPE, OF DENVER, COLORADO.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 308,642, dated December 2, 1884.

Application filed October 9, 1884. (No model.)

To all whom it may concern:

Be it known that I, SYLVANUS L. TRIPPE, a citizen of the United States, residing in the city of Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful improvements in amalgamators for amalgamating and separating gold and other metals from their ores by means of mercury, and for concentrating and separating the mineralized portion of certain ores from the gangue by means of the difference in the specific gravity thereof; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to ores containing metallic silver and gold, and refers to those processes particularly which consist in part in forcing pulverized ore beneath the surface of a body of mercury. None of these processes, so far as I can learn, overcome the effects caused by the fact that gold and silver, and possibly mercury, are hygrometric, and in the presence of moisture attract and hold upon the surface thereof a film or thin coating of water, which not only causes finely-divided particles of these minerals to rise easily through a body of mercury in a very slight current of water, but also forms a barrier to an actual contact between the finely-divided mineral particles through which chemical affinity does not extend.

I have found by experiment that, no matter how long pulverized ore remains beneath mercury or what distance it may be forced through it, amalgamation takes place only when the gold or silver particle comes in actual contact with mercury; that owing to the density of that fluid it tends to make room for the passage of ore by capillary openings, and to give way bodily to pressure, thereby forcing the ore to the surface in the water-currents without regard to the specific gravity of some of its particles when free of moisture. In consequence of this much valuable mineral is carried off in the tailings, as it is not amalgamated by reason of not coming into actual contact with, although passing through a body of mercury. This is particularly the case when the metallic particles are very minute. To overcome this difficulty and to insure an actual contact between the valuable mineral and the mercury is the object of the series of muller-plates described farther on.

In working or milling gold and silver ores, whether for amalgamation or separation by gravity, it is found that a pulverization which will free all the mineral particles from their attachment to rock is impractical, and that while some of them are freed others remain attached to particles of the rock, or are inclosed therein, so that neither amalgamation nor separation by gravity are fully effective, and in milling such ores much loss is incurred, unless the tailings are concentrated by further treatment, which is usually effected by means of expensive machinery, such as jigs, buddles, vanners, and similar appliances.

It is well known that the passage of pulverized ore, whether wet or dry, through mercury is attended by a mechanical division or flouring of more or less of the mercury, which occasions a loss thereof, and, if it be charged therewith, of valuable mineral also. None of the processes, so far as I can learn, where ore is passed through mercury provide any adequate means for preventing such loss.

I have mentioned some of the defects in the usual processes for separating gold and silver from their ores, and have designed an apparatus which I find by experiment will overcome these difficulties, and in the same process concentrate the valuable portion of the ore, after first separating therefrom all the particles of free gold and metallic silver.

My invention is based in part on the theory that gold and metallic silver will amalgamate if brought into actual contact with mercury, though I also seek to make available the superior specific gravity of gold over that of mercury and the superior gravity of the mineralized portion of the ore over the gangue.

The method by which I seek to accomplish these results will be best understood by reference to the accompanying drawings.

Figure 1 is a sectional view of my apparatus, and Figs. 2 and 3 are detail views.

A is a vessel for containing mercury, cylindrical in form, having an enlarged cylindrical section, B, preferably made of cast-iron, both sections made with sloping base, substantially as shown.

C is a pipe standing in a seat, *d*, stayed by

the bearing E, having a pulley, D, by which it is rotated, a hopper, S, at its upper end, and openings W at or near its lower end.

Near the bottom of the vessel A is a distributing and mixing device composed of a series of perforated plates, preferably made of steel and arranged as follows:

A short distance above the bottom of the vessel A is the plate F, the upper surface of which is shown in Fig. 2, which is held in position by means of set-screws. It is perforated from the seat *d* outwardly for a short distance, where it extends under the space *a a*, and also near the side of the cylinder, in order that the mercury may freely pass through it. There are grooves extending along a part of the upper surface of the plate, through which the pulp mixed with mercury can pass outwardly.

Affixed to the pipe C by means of a collar is the plate G, which is so adjusted on the pipe as to bring a part of its under surface into almost immediate contact with part of the upper surface of the plate F. A portion of the under surface of the plate G is grooved in a similar manner to the plate F, and for the same reason. The plate G is perforated throughout, except near the pipe C, where the plate extends above the space *a a*, where it is without any perforations, so that the pulp discharged from the openings *w* in the pipe C is forced outwardly and between the plates F and G and into the grooves therein.

In almost immediate contact with the plate G is a stationary perforated plate, I, held in place by set-screws.

Above the plate I is the plate K, affixed to the pipe C by a collar, and which plate rotates with the pipe. The perforated stationary plate L is also held in place by set-screws immediately above the revolving plate K. The plates I, K, and L are so adjusted in the vessel that their surfaces are in almost an immediate contact, so as to operate as a compound muller.

In working the apparatus, the vessel A being filled with mercury to about the height of the dotted line shown in Fig. 1, the pipe C is made to rotate, the pulverized ore wet to a pulp is fed into the hopper S, and by hydrostatic pressure carried out of the openings W and between the plates F and G along the grooves therein, and in consequence of the pressure and the rotation of the plates G and K the ore is ground or rubbed through the perforations in the series of plates and passes into the mercury above them in the vessel A. In passing between and through the series of plates the pulp is thoroughly mixed with mercury, and it is believed that no particle of mineral, however minute, will escape amalgamation if in condition to amalgamate.

The plates F, G, I, K, and L are preferably made of steel, having perforations only a little larger than is necessary for the passage of the particles of pulverized ore.

At a suitable distance above the series of muller-plates above described are one or more stationary plates, *m m*, made of copper, perforated and having amalgamating-surfaces.

On the under side of the plates *m m* are angular projections or flanges extending downward, as shown in Fig. 3, which are designed to collect the floured mercury and to arrest the circulatory motion therein, which is communicated thereto by the rotation of the plates G and K, thereby securing a quiet stratum of mercury, through which the ore must pass, and where there is no interference with the law of gravity in separating the metal from the gangue.

At the top of the vessel A, and extending nearly to the side of the enlarged cylinder B, is placed the plate N, which plate is affixed to the pipe C and rotates with it. This plate is perforated from the pipe outwardly over the space above the vessel A, and is without any perforations where it extends within the enlarged cylinder B. The plate N is made of copper, and has an amalgamating under surface from which project a series of points or stirrers of unequal length. The object of this construction of the plate N is to gather the fine or floured mercury, which must come in contact therewith if carried thereby, the water-currents passing out of the vessel A. The finely-divided particles of mercury, as they are accumulated on the under amalgamating-surface of the plate N, form globules, and when of sufficient size become detached, in consequence of their own weight, and fall down and become incorporated with the body of mercury in the vessel A. The projecting stirrers, extending beneath the plate N, prevent the packing of the pulp on the surface of the body of mercury and enable the globules to descend through the pulp. It is expected that all loss of mercury will be prevented by this device. The plate N performs another office as well in its connection with the concentrating-cylinder, B, of which it forms a revolving bottom through which the pulp and water-currents pass, and by its rotation tends to carry the heavier and mineralized portion of the ore, as it becomes divested of the gangue, into the space *b b* in the upper cylinder.

To assist in the separation of the worthless material from the heavier and mineralized portion of the ore, in the enlarged cylindrical section B is a perforated water-pipe, R, extending entirely around the outside of the cylinder, with openings inwardly, or toward the pipe C, through which water-pipe, by means of a supply-pipe, V, water is forced through the pulp in the cylinder B and over the surface of the imperforated part of the plate N, the rotation of which plate, assisted by the gravity of the mineralized ore in opposition to the water-currents from the pipe R, serves to completely divest the concentrate material from all the light and worthless gangue before it has worked its way beyond the plate N into the space *b b*, from where it is discharged by the openings in the cylinder B (shown in Fig. 1)

below the spout *t*. In case any free gold should be carried above the plate N by the force of the water-currents having failed to amalgamate in the vessel A, it is expected that it would not be lost, but would be retained with the concentrate in the upper cylinder.

While it is not claimed that the concentrating device arranged in this apparatus is by itself alone adapted to working very finely pulverized ore or slimes, it is expected that material of that character, in passing through the vessel A, will be divested of nearly or quite all its value, and that only the coarser particles will carry value which it is desirable to save, and which this device, it is believed, will do to such extent that further treatment will be wholly unnecessary.

The stirrer O is constructed of two or more iron rods inserted at one end into a collar around the pipe C, by which they are rotated with the pipe. These rods extend nearly to the side of the cylinder B, and have on the under side thereof branches or projections extending downward, and which are of unequal length, so that the ends thereof may be equally distant from the surface of the convex plate N, as shown in Fig. 1.

The object of the stirrer is to prevent the heavy material from packing on the plate N, and also to assist the water-currents in washing away the light material or gangue.

I am aware that devices are in use in which pulverized ore is forced beneath the surface of a body of mercury and through perforated plates; that stirrers and additional water-currents are used to assist in washing away the tailings from the surface of the mercury, and that there are devices for concentrating ore by means of upward currents of water; but

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the vessel A for containing mercury, the hollow pipe C, standing in a seat, *d*, within the vessel, having a hopper, S, at its upper end, means by which it is rotated, openings W at its lower end, means by which the pulp is mixed with mercury and distributed beneath a body thereof, perforated plates *m m* above the distributing device, and the enlarged cylindrical section B, containing water-pipe, stirrers, convex revolving plate N, and openings for the discharge of the concentrate, substantially as described.

2. The combination of the vessel A, feed-pipe C, means for distributing and mixing the pulp beneath a body of mercury, enlarged cylinder B, with water-pipe R, supply-pipe V, convex amalgamating-plate N, and the stationary amalgamating-plates *m m*, having projecting flanges on the under side thereof, substantially as described.

3. The combination of the vessel A, pipe C, enlarged cylindrical section B, containing water-pipe R, supply-pipe V, convex amalgamating-plate N, stirrers O, stationary amalgamating-plates *m m*, and the series of perforated revolving and stationary plates F, G, I, K, and L, adjusted as distributing and mixing mullers, substantially as described.

SYLVANUS L. TRIPPE.

In presence of—
ALLEN M. GHOST,
W. C. GHOST.