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J. B. ROSSMAN.

AMALGAMATOR.

APPLICATION FILED SEPT. 8, 1898. RENEWED JUNE 25, 1904.

Fig. 5.

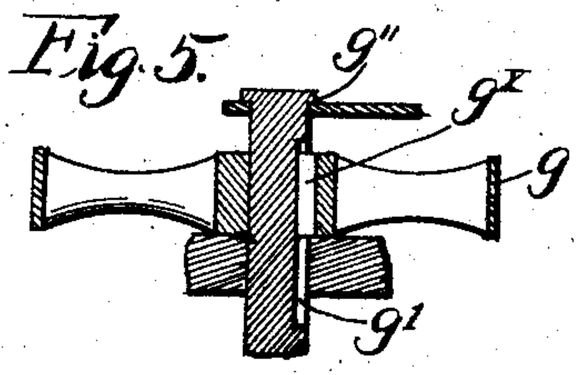


Fig. 2.

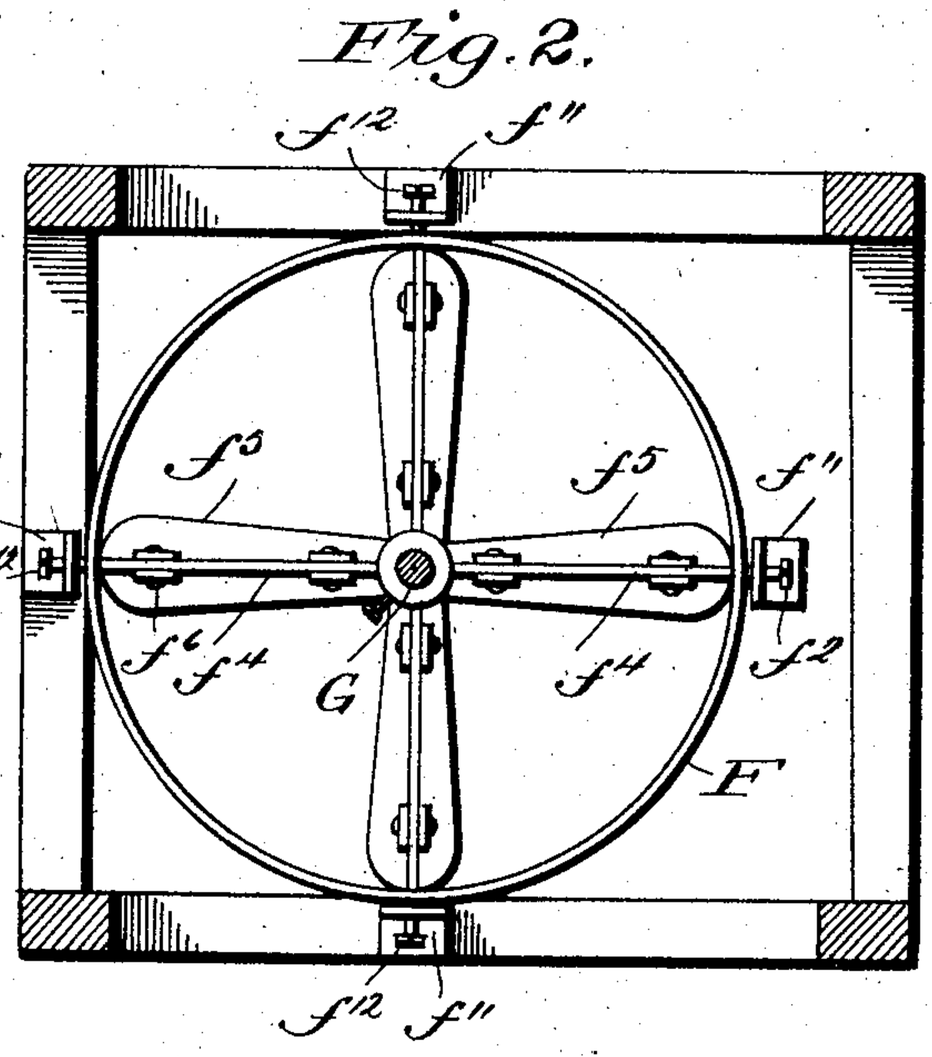


Fig. 1.

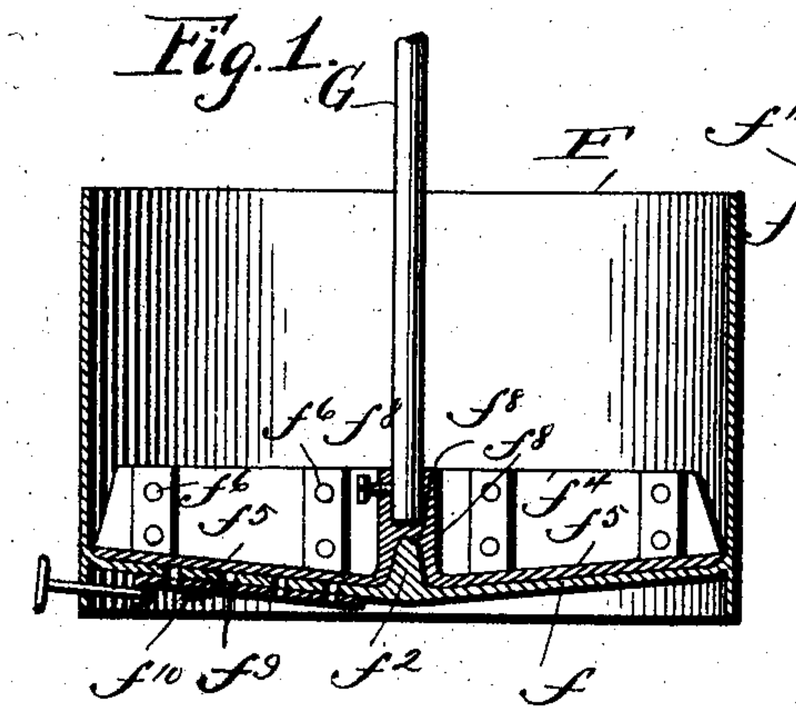


Fig. 4.

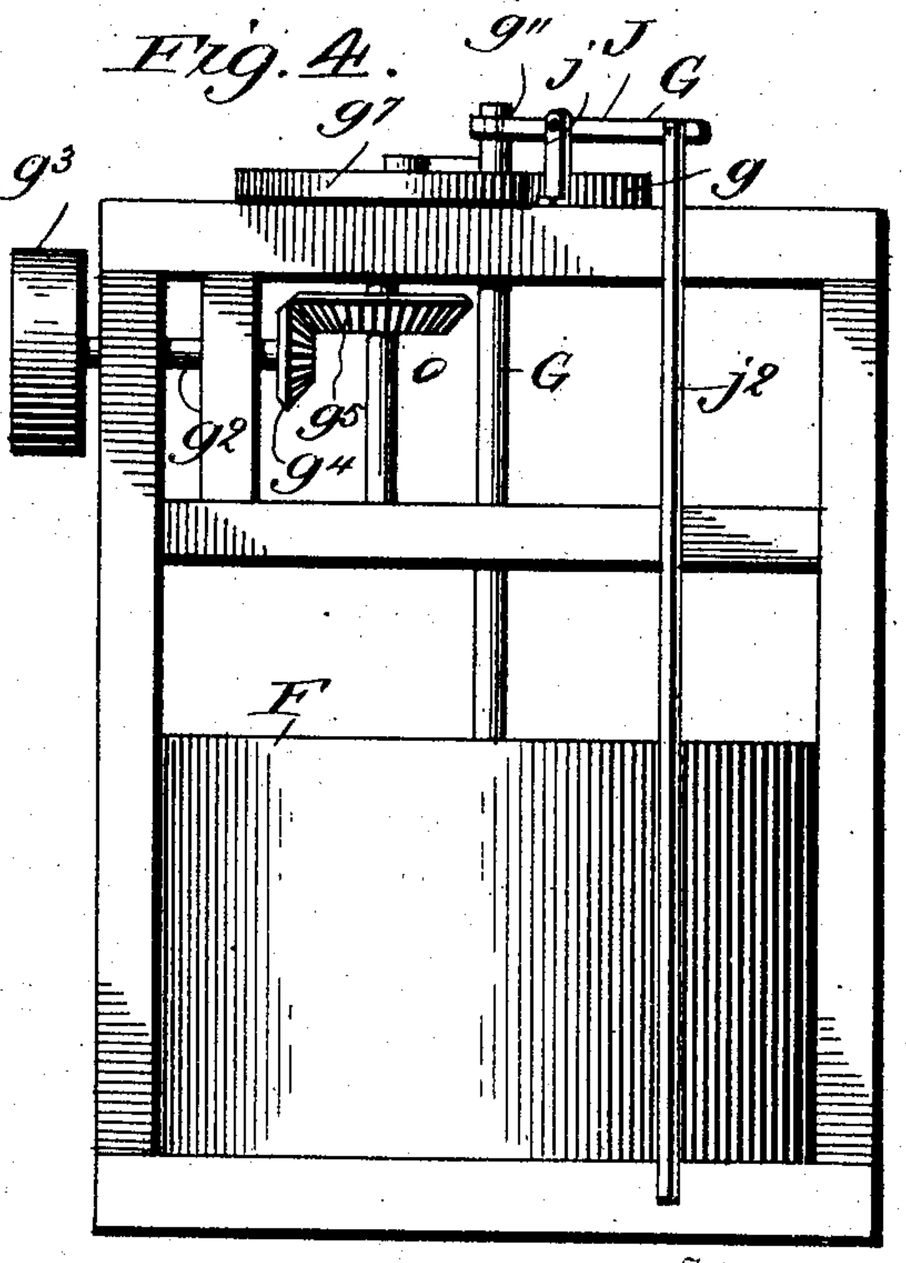
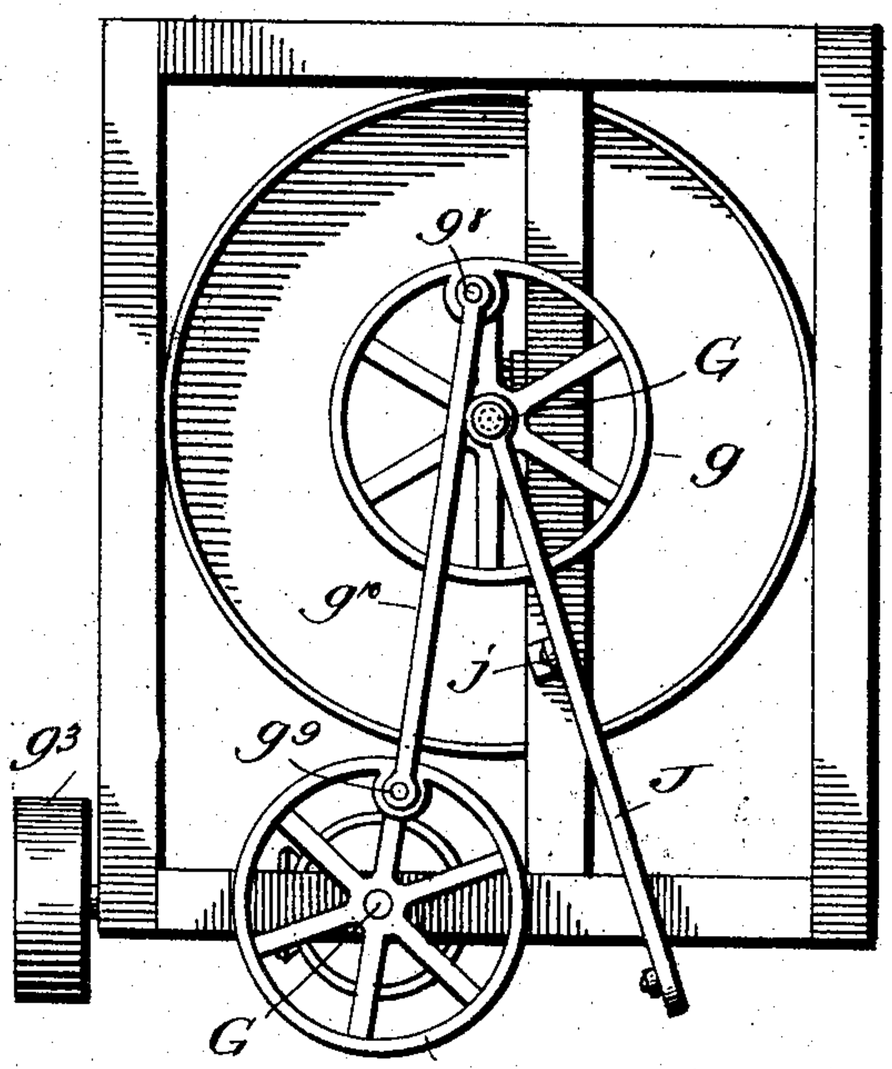


Fig. 3.



Witnesses:

L. C. Mills.

R. M. Elliott.

Inventor:

John B. Rossman,

by R. G. Dyer & Son, his attorneys.

No. 780,529. Patented January 24, 1905.

UNITED STATES PATENT OFFICE.

JOHN B. ROSSMAN, OF ST. PAUL, MINNESOTA.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 780,529, dated January 24, 1905.

Application filed September 8, 1898. Renewed June 25, 1904. Serial No. 214,128.

To all whom it may concern:

Be it known that I, JOHN B. ROSSMAN, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Amalgamators; and I do hereby 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.

The invention relates to improvements in amalgamators.

The object is in a ready, efficient, and comparatively inexpensive manner to effect the separation and saving of gold, silver, platinum, copper, lead, and other minerals and metals held in a finely-divided state in the ore or gangue, and, if desired, to separate these metals and minerals into separate divisions—that is to say, to collect gold, silver, platinum, &c., at one point, copper and lead at another point, and so on.

With these objects in view the invention consists in the novel construction and combination of parts of an amalgamator, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of the specification, and in which like letters of reference indicate corresponding parts, I have illustrated a form of embodiment of my invention, it being understood that the same may be otherwise embodied without departing from the spirit of the invention. In the drawings, Figure 1 is a view in sectional elevation of the rotary amalgamator. Fig. 2 is a view in plan of the same. Fig. 3 is a view in plan, showing more particularly the mechanism for revolving the amalgamator; and Fig. 4 is a view in elevation of the amalgamator. Fig. 5 is a sectional detail view showing the construction at the top of the shaft G.

Referring to the drawings, the amalgamator consists of a tank or cylinder F, having its bottom suitably concaved or sloping toward the center, as shown at f. At the center of the bottom is arranged a pin or bearing f^2, upon which the rubbers revolve, the rubbers consisting of a strong center stub-shaft f^3, to which are attached arms or beaters f^4. These arms not only support the shoes or rubbers f^5, (which are held in their places by screws f^6,) but by their motion keep the material agitated and in a perfect state of suspension. The stub-shaft is secured upon an actuating-shaft G by set-screws f^8 and is provided with a socket f^7, positioned upon the center pin f^2. In the bottom of the cylinder F are openings f^9, under which is arranged a metal slide f^{10}, having openings to correspond with those in the bottom of the cylinder, the slide being engaged by a screw $f^\times$, carrying a hand-wheel, whereby upon turning the screw the slide may be moved so as to bring its openings into or out of register with those in the bottom of the cylinder. The amalgamator-tank is secured in a suitable frame and may be moved and kept in position by brackets f^{11} and set-screws f^{12}. The rubbers are operated by the shaft G, which is actuated through a wheel g. The wheel g is shown provided with a spline $g^\times$, arranged to slide in a keyway g' formed in the shaft G, thus leaving the shaft free to be raised and lowered by suitable mechanism, hereinafter to be described. Mounted in suitable bearings above the cylinder is a horizontal shaft g^2, carrying at one end a pulley g^3 and at the opposite end a beveled gear g^4. The bevel-gear g^4 imparts motion to a similar gear g^5, carried by a perpendicular shaft g^6, the upper end of which latter shaft carries a wheel g^7, connected with the wheel g by pitman-pins g^8 g^9 and a pitman-rod g^{10}. The wheel g^7 is made enough smaller than the wheel g so that one half-revolution of the wheel g^7 will effect a one-third revolution of the wheel g and the second half-revolution of the wheel g^7 returns the wheel g to its starting-point. This gives a vibratory motion to the rubbers in lieu of a rotary motion, which would be objectionable for the reason that it would create a current within the amalgamator, whereas by the vibratory motion only a violent agitation of the liquid within the amalgamator is caused, resulting in effecting separation and precipitation of the material within the amalgamator and its propulsion toward the center thereof,

where the precious metals are caused to settle to the dead-water and then come at once into contact with the quicksilver, which is placed in the bottom of the amalgamator.

At the top of the shaft G is a shoulder g^{11}, (see especially Fig. 5,) in which is fitted one end of a lever J, the same being fulcrumed on a standard j, the lever being raised and lowered by a rod j^2. When the lever is raised, the rubbers are lifted a sufficient height to clear the material in the amalgamator, thus allowing the machine easily to be started, even when loaded.

In practice several amalgamators may be used in a single plant, and in connection with the amalgamators I may employ any of the chemicals well known in the art for cleaning the particles of the gold in order to cause them to amalgamate readily, such chemicals including solutions of various alkalies, salts, and acids, one or all either separately or mixed in proper proportions.

As a specific illustration of solutions adapted for use with my amalgamator two will be described, one designated as solution No. 1 and the other as solution No. 2.

As an example of solution No. 1 I may employ a saturated solution of cyanid of potassium and water and a saturated solution of caustic soda and water mixed in about the following proportions: one pint of cyanid of potassium to six pints of caustic soda mixed with sixty gallons of water, either cold or hot, but generally hot. In lieu of the caustic soda carbonate of soda or any of the alkalies may be used.

As an example of solution No. 2 I may employ one pint of sulfuric acid mixed with sixty gallons of water. Where the gold is very pure, zinc plates are to be used in the solution during amalgamation. When the ore contains zinc, antimony, arsenic, and tellurium, I may use in connection with solution No. 2, but not mixed therewith, a mixture of one pint of hydrochloric acid to thirty gallons of water. This latter solution may be used in connection with the rubbing process or the pulp may remain in it a suitable time before being subjected to the scrubbing process. Under all conditions the pulp must be washed with pure water between the use of the different solutions. While the above are the proportions of the different chemicals generally employed, it is to be understood that inasmuch as the different ores require different strengths of the chemicals to effect proper treatment the proportions of the chemicals may be changed without departing from the spirit of my invention. Generally stated, the best results are secured by employing one part of the saturated solution of cyanid of potassium and six parts of a saturated solution of caustic soda with the required amount of water to each.

The manner of treating and amalgamating the concentrates is as follows: A suitable quantity of the concentrates is supplied to the first amalgamator with sufficient quicksilver to take up the gold and silver and also enough of water and chemical solution No. 1 to cause the mixture to be thin enough to allow the precious metals to settle easily to the bottom of the amalgamator. The machine is then run a sufficient time to cause the chemical solution, together with the rubbing to which the precious metals are subjected, to cleanse them from all oxid of iron, oils, or grease, arsenic, sulfur, antimony, &c. This solution, in connection with the rubbing action of the amalgamator, not only cleans the gold, but effects purification of the quicksilver and keeps it in a state to take up the gold and silver coming in contact with it. Where there is a large amount of sulfur or sulfids, antimony, or arsenic present in the concentrates, these are passed to the second amalgamator and are subjected to the action of solution No. 2, the operation being the same as that in the first amalgamator. The second step amalgamates all the gold and silver and gathers together all the floured quicksilver. The amalgam may then be separated from the quicksilver and be retorted in the usual manner.

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

1. An amalgamator-bowl having a circular concaved bottom, rubbers pivotally mounted within said bowl and means for imparting to the rubbers an oscillatory motion about its center and over a segment of the bottom thereof, whereby successive areas of agitated and dead water are produced within the bowl when in operation, substantially as described.

2. The combination with an amalgamator provided with a concaved bottom, of oscillatory rubbers fitting within the said bottom and adapted to traverse the arc of a horizontal circle, means for raising and lowering the rubbers, thereby to accommodate the device to different bulks of material to be treated, and valved discharge-openings in the bowl-bottom, substantially as described.

3. In an amalgamator, a tank or body portion provided with a bottom concaved or sloping toward its center, a pin or projection upon said bottom extending into the body portion, rubbers mounted upon said pin as an axle and fitting the bottom, means to impart a circular vibratory motion to said rubbers, discharge-openings in the bowl-bottom and a slide-valve controlling said openings, substantially as described.

4. In an amalgamator, a tank or body portion provided with a bottom concaved or sloping toward its center, rubbers fitting said bottom and pivotally mounted near the center thereof, a shaft to transmit motion to the rubbers, a crank mounted upon the upper por-

tion of said shaft, a similar crank, but shorter, mounted upon the frame of the machine and connected with a source of power, and a connection between said cranks whereby, when the shorter crank is revolved about its axis, a circular vibratory motion is imparted to the rubbers, substantially as described.

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

JOHN B. ROSSMAN.

Witnesses:
FLOY A. ROSSMAN,
JOHN C. HILL.