J. M. CALLOW.

PNEUMATIC FLOTATION CELL AND METHOD.

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1,366,766. Patented Jan. 25, 1921.

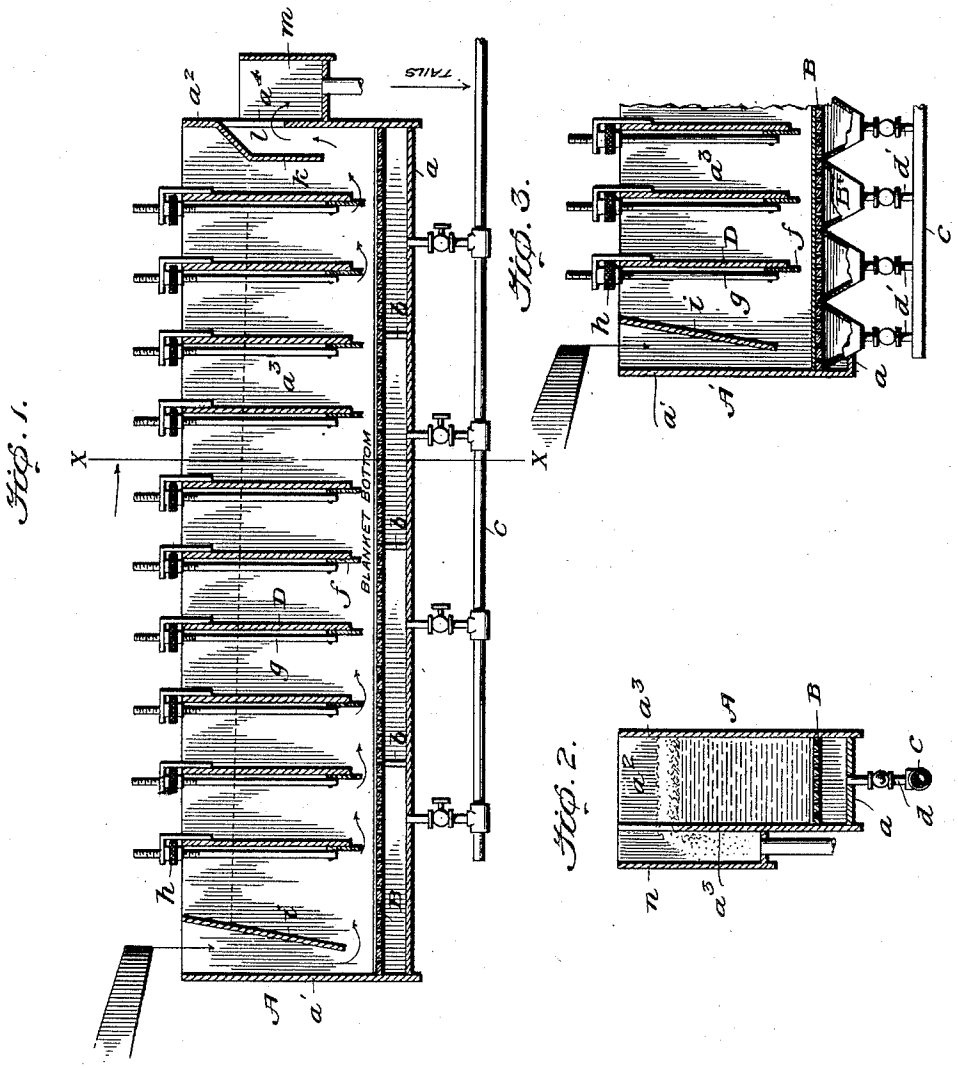


Fig. 1.

Fig. 3.

Fig. 2.

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PNEUMATIC FLOTATION CELL AND METHOD.

1,366,766. Specification of Letters Patent. Patented Jan. 25, 1921.

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To all whom it may concern:

Be it known that I, JOHN M. CALLOW, a subject of the King of Great Britain, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Pneumatic Flotation Cells and Methods, of which the following is a specification.

My invention relates to a method of and an apparatus for concentrating metallic ores by separating the metallic particles from the barren or rocky constituents thereof, and the invention consists of the method and the parts and the constructions, arrangements and combinations of parts which I will hereinafter describe and claim.

In the accompanying drawing forming part of this specification and in which similar letters of reference indicate like parts in the several views:—

Figure 1 is a longitudinal sectional view of a flotation cell embodying my invention.

Fig. 2 is a cross sectional view on the line X—X of Fig. 1.

Fig. 3 is a longitudinal sectional view of a portion of a flotation cell of modified form.

The present invention is distinctly related to the art commonly known as buoyant processes and which is distinguished from the usual amalgamation processes in which the ore forms an amalgam, in that in the buoyant process a certain percentage of oil, or of two dissimilar oils or an oil and acid, or an oil and an alkali, or some other suitable substance, is mixed with finely ground ore pulp and the mixture is then subjected to aeration for the purpose of producing a froth composed of bubbles of air and oil to which the mineral particles attach, said froth having the appearance of an aggregation or mass of soap bubbles, which when collected and the froth discharged or broken down by natural settlement or by the addition of cold water, or other means, displaces the mineral particles that have been caught.

In the accompanying drawings embodying my aforesaid invention, A, represents a tank of suitable material and which is herein shown as of substantially rectangular form and comprising a bottom, a, front and rear ends, a', a^2 and sides a^3, the bottom in the present instance being shown substantially level and there being supported a suitable distance thereabove, a false bottom, B, of some suitable porous or pervious material, which should have the function of permitting the passage through it of a gaseous medium, but not the water or pulp.

The space between the permanent and false bottom of the tank constitutes an air chamber. This chamber may run continuously from one end of the tank to the other, and it may be subdivided by means of partitions, b, and into this chamber or chambers air or other gaseous fluid may be delivered under pressure through a supply pipe, c, and valve-controlled branches, d.

The tank is also provided with a series of more or less closely related permanent partitions, D, which are fixedly secured between the sides of the tank so as to form a series of compartments one succeeding the other from the front to the rear end of the machine, said partitions having their lower ends terminating a short distance above the false bottom, B, as shown in Fig. 1.

Each of the partitions, D, is provided with a gate, f, which is slidably mounted on the lower portion of the partition and is provided with a stem, g, which extends upwardly through a hand-wheel, h, at the upper portion of the tank, whereby the gate may be adjusted relatively to the partitions to regulate the height of the passage between the bottom of the gate and the false bottom through which passage the pulp is permitted to flow from the head end to the tail end of the tank.

At the head end of the tank there is also an inclined partition, i, the lower end of which terminates above the false bottom, said partition, i, forming between itself and the head end of the tank, a chamber into which pulp with its addition of a froth-producing agent is delivered and permitted to escape under the partition, and into the first of the compartments with which the tank is supplied.

At the tail end of the tank, the end, a^2, is constructed with an outlet opening, a^4, which

forms a weir, the height of which determines and also serves to maintain the liquid level within the tank, said weir or opening being overlapped by a plate, *k*, which forms between itself and the end wall of the tank, a passage, *l*, through which the tailings pass to the weir, and into a suitable receiver, *m*.

The tank is also provided with a concentrates launder, *n*, extending along one or both sides of the upper portion of the tank and into which launder the froth generated in the tank during the admission of the gaseous fluid into the pulp overflows in the manner well known in this art. The overflow edge in the present instance is slightly inclined toward the tail end of the tank, but obviously this edge could be level, instead of set down a trifle at each of the partitions, as shown, without in any manner departing from the spirit of my invention.

In the construction shown in Fig. 3, the bottom of the tank, A′, is shown as provided with a series of cells, B′, of substantially funnel-shape and into each of which one of the valve-controlled branch pipes, *d*′, conducts the air or gaseous medium to the cell so that it may be delivered through the porous bottom and into the fluid contents of the tank, for aerating said contents and causing the generation of a foam or froth, which rises through the liquid contents and accumulates on the surface thereof and gradually accumulates until it passes over the overflow edge of the tank and into the launder, before mentioned.

The construction of Fig. 3 will prove of convenience in operation in case some of the sections of the porous material, if made of sections, are damaged by accident or otherwise, and have to be removed. In this case the damaged section could be cut out and the tank still continue to run with but little sacrifice in efficiency.

The general operation of the device will be understood by those skilled in the art, it being sufficient to say that the pulp with its addition of a froth producing agent is fed into the head end of the machine and flows toward the tail end and gradually rises in the several compartments between the fixed partitions until the proper level of the fluid is reached and which level is determined by the position of the weir at the tail end of the machine. By providing each of the station partitions, D, with an adjustable gate and employing substantially a large number of partitions, the gates may be so adjusted relatively to the porous false bottom of the tank as to create an eddy, or movement of the pulp, at the gate sufficient to keep the sands in the pulp in suspension. This is the essential object in using a large number of partitions and in disposing these partitions only a short distance apart, because the sands which have been agitated in suspension by the first constricted opening formed beneath the gate of the first partition, will be caught in the eddy created by the next succeeding opening, which operation extends throughout the length of the machine. Thus, the heavy sands or tailings are caused to travel along the false bottom and beneath the successive gates and to be finally delivered through the weir at the tail end of the machine, while the foam or froth generated in the tank rises through the spaces between the partitions and accumulates on the surface of the liquid contents and gradually builds up thereon and overflows the top edge of the tank and into the launder before mentioned.

From what has been heretofore said it will be apparent that I prevent the blanketing of a permeable septum which forms the bottom of a bubble flotation ore concentrator, by subdividing the pulp body longitudinally of the separator, into a series of bodies having closely restricted communication substantially only in the plane of the permeable bottom, and create in each body in proximity to each point of communication, an eddy or eddies adapted to scour the surface of said bottom and transport material having a tendency to settle on said bottom through the separator.

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

1. The process of preventing the blanketing of a permeable septum forming the bottom of a bubble flotation ore separator consisting in subdividing the pulp body longitudinally of the separator into a series of bodies having closely restricted communication only in the plane immediately above the permeable bottom, and creating in each body in proximity to the points of communication, eddies adapted to scour the surface of said bottom and transport material having a tendency to settle on said bottom through the separator.

2. In apparatus of the character described, a tank having a bottom forming a permeable bed through which a gaseous medium is delivered for the purpose of aerating the liquid contents of the tank, means for delivering the gaseous medium through the bed, said tank having a series of spaced partitions whose lower edges terminate above said permeable bed, said partitions being movable toward and from said bed and adapted to constrict the openings beneath the partitions and create eddies in proximity to the partitions whereby sands agitated into suspension by passing under one partition will be caught in the eddy created by the next succeeding partition.

3. In apparatus of the character described, the combination of a tank having a bottom forming a permeable bed for sup-

plying a gaseous medium into the fluid contents of the tank, means for delivering the gaseous medium through the bed, and vertical partitions in the tank adjustable toward and from said bottom and adapted to constrict the passages beneath the partitions and to form eddies in the flowing pulp in the vicinity of the partitions whereby sands agitated into suspension by passing under one partition will be caught in an eddy created by the next succeeding partition.

In testimony whereof I affix my signature.

JOHN M. CALLOW.