C. J. B. ARMSTRONG.

PROCESS OF AND APPARATUS FOR CONCENTRATING ORES.

APPLICATION FILED MAR. 15, 1917.

1,269,150. Patented June 11, 1918.

Fig. 1.

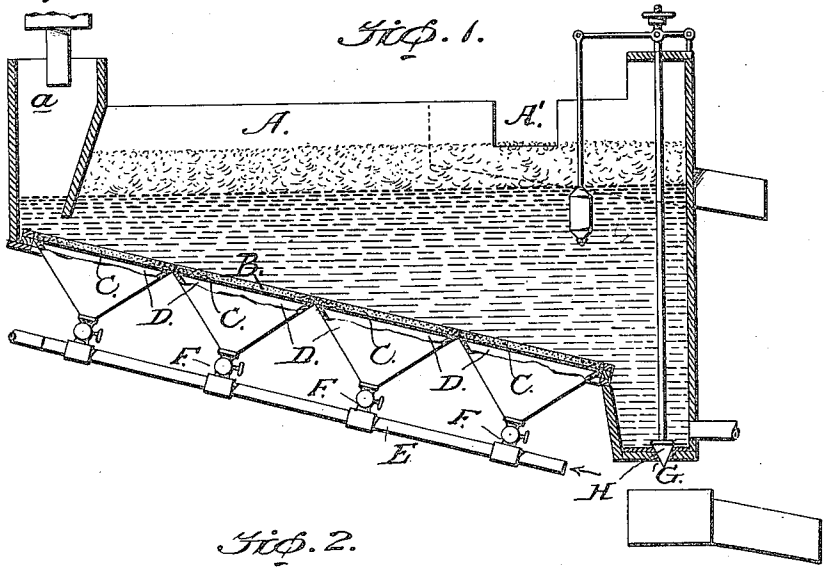


Fig. 2.

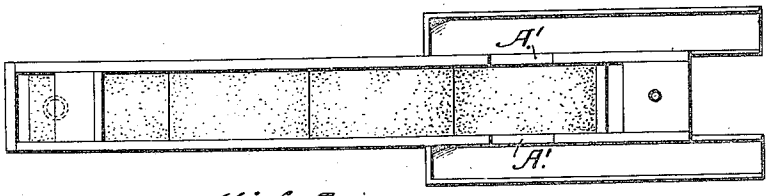


Fig. 3.

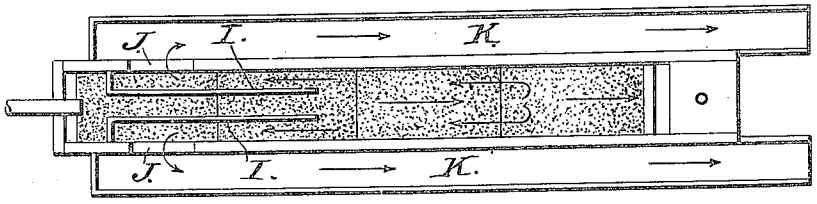


Fig. 4.

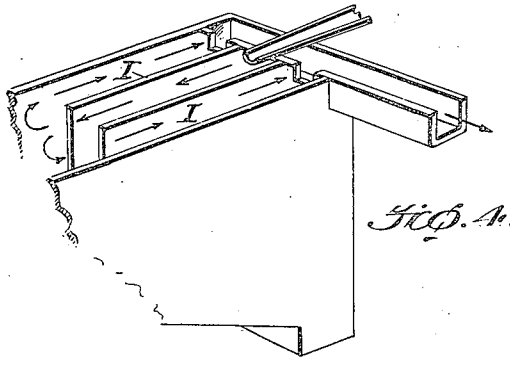
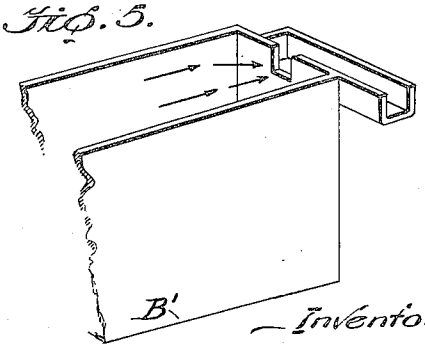


Fig. 5.



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PROCESS OF AND APPARATUS FOR CONCENTRATING ORES.

1,269,150. Specification of Letters Patent. Patented June 11, 1918.

Application filed March 15, 1917. Serial No. 155,056.

To all whom it may concern:

Be it known that I, CEDRIC JUDSON BEATTY ARMSTRONG, a British subject, residing at Cobalt, Ont., Canada, in the district of Timiskaming and Province of Ontario, Canada, have invented certain new and useful Improvements in Processes of and Apparatus for Concentrating Ores, of which the following is a specification.

My invention relates to certain new and useful improvements in process of and apparatus for concentrating ores and the same consists of the parts and the constructions, arrangements and combinations of parts which I will hereinafter describe and claim.

In the accompanying drawings forming part of the specification and in which similar reference characters indicate like parts in the several views:

Figure 1 represents a longitudinal sectional view of an ore flotation tank embodying my invention.

Fig. 2 is a top plan view.

Fig. 3 is a view similar to Fig. 2 showing a tank of slightly modified construction.

Figs. 4 and 5 illustrate other modified forms of tanks.

The present invention has particular relation to the construction of the tanks which are now more or less employed in flotation processes for separating the metalliferous constituents of an ore mass from the gangue or nonmetalliferous constituents, by an agent or agents, as an oil, or an oil and an acid, or an oil and an alkali or some substance which acts selectively upon the metallic or metalliferous constituents of the mass, and which mass usually consists of powdered ore and water and a frothing agent.

In carrying out my invention I construct a tank A, of any desired material, size and capacity, and this tank may have either an inclined bottom B, as shown in Fig. 1, or the bottom may be substantially horizontal, as shown at B', in Fig. 5. Any other suitable and well known form or design of tank may be employed, and hence the tanks illustrated in the present drawings are but representative of any tank capable of use in the art hereinbefore referred to. Whatever the form of tank adopted, the same should be supplied with a feed supply *a* and with means for admitting air in more or less large volume into the fluid contents thereof in order to produce that effective aeration of the mass that seems to be so necessary or desirable to generate gaseous bubbles, which become the active agent for floating the mineral particles of the mass to the surface of the liquid contents of the tank. For the purpose mentioned, namely, for aerating the ore pulp as described, I prefer to employ some suitable porous substance, for instance a plate or plates of porous earthenware, or porous brick, or felt, canvas or other fibrous material, suitably supported, such porous material being illustrated generally at C in the drawing, and overlying and forming a top covering of an air chamber or chambers, D, which may be supplied with air or other gaseous medium, under pressure, through the medium of a supply pipe E, having valve-controlled branches F, whereby the gaseous medium admitted into the aforesaid chamber or chambers D, will be forced through the porous bottom of the tank in innumerable fine streams and will enter the pulp mass throughout substantially the entire area thereof and will so act upon the frothing-agent constituent of said pulp as to produce bubbles which rise through the body of pulp, and in doing so the sulfids or metalliferous particles thereof seem to have an affinity therefor as they tend to attach themselves to the rising bubbles and are elevated thereby, while the gangue or non-metalliferous particles of the ore pulp tend to precipitate or fall downwardly between the stream of ascending bubbles to the bottom of the tank, and which tank is usually supplied with an appropriate outlet G for the tailings or rejected matter. If desired, this outlet may be automatically controlled and the liquid level of the tank maintained, by the employment of a float actuated valve H, or any other well known arrangement, automatic or otherwise in its operation, may be employed if suitable for the above purpose.

A leading object of the present invention is to provide the tank with a more or less

constricted area for the discharge of the bubbles which accumulate on the surface of the liquid contents of the tank. Ordinarily, the discharge of the bubbles, or the froth, foam or suds, as the bubble mass is sometimes called, is laterally over an extended or long surface formed by the top edge, or edges of the tank, but I have found in my practical research in this art that if a constricted area only is provided for the outlet or discharge of the bubbles, I obtain certain desirable results due to the concentration of the bubbles. For example, in the well known and so-called "Callow cell," the usual discharge of the bubbles is over two edges of the tank, each about eight (8) feet long, and when using such a tank with ore of a very high ratio of cencentrates, the amount of overflow over the sixteeen (16) feet represented by the long edges before mentioned, is, comparatively small, but by concentrating all of this flow into a constricted outlet, and which outlet is shown in the form of notches or small recesses A′ cut in the top edges of the tank, or made in the side or sides of the tank at some suitable point above the liquid level thereof the overflow is obviously many times deeper than in the instance above noted. Two notches or openings, each say about six (6) inches wide, one in each of opposite sides of the tank, may be considered as a desirable size as with the combined one foot area thus provided as an outlet, the depth of the froth then overflowing will be obviously about sixteen (16) times as deep and can be more easily controlled.

By the constriction of the bubble outlet, substantially as above explained, the bubbles instead of overflowing immediately they appear or form upon the surface of the pulp and being allowed to travel only a short distance before discharging, are retained in the tank for a much longer period than usual, say for a time sufficient to enable the bubbles to travel substantially the entire length of the tank, (usually about eight (8) feet in the type of tank herein mentioned) if the aforesaid constricted outlet, or notches, recesses or openings is at or near the discharge end of the tank, and to travel a distance of approximately sixteen (16) feet, in the tank mentioned, if the constricted bubble outlet is at the feed end of the tank and protected against a short circuiting of the bubbles by appropriate baffles I, or the like, as shown in Figs. 3 and 4. When using these baffles, and which baffles may extend any desired distance from the feed end of the tank toward the tail end thereof, or any suitable distance below the surface of the bubbles, the baffles are suitably spaced from each other and from the sides of the tank, and the pulp being delivered between the baffles will be first directed lengthwise of the tank and then its course will be diverted, the flow at the sides being toward and finally through the constricted outlets J, and into appropriately placed launders K.

The leading advantage derived from this extended travel of the bubbles or the increased length of time the bubbles are retained in the tank, is to produce a much cleaner concentrate. From actual experience with the described construction in practice I have in one instance raised the grade of the concentrates from 200 ounces obtained from a tank with the long or extended discharge herein mentioned to 600 ounces when using the same ore in a similar tank having a constricted bubble discharge substantially as before explained.

The notches, recesses or openings forming the bubble-discharge may be anywhere along the length of the sides of the tank; at or near either end as shown in Figs. 2 and 3, or at an intermediate point, or even in either end wall of the tank, Figs. 4, 5, without departing from the scope of the invention.

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

1. A flotation tank adapted to contain pulp composed of powdered ore and water and a frothable agent, and having means for gasifying the pulp to thereby facilitate the formation of a froth or bubbles, which accumulate as a mass on the surface of the liquid, said tank having a froth accumulating space of substantial depth and extended area above the pulp level elongated in the direction of travel of the froth, and provided with a horizontally constricted outlet from said froth accumulating space and adapted to retard the flow of the bubbles of froth therefrom.

2. A flotation tank adapted to contain an ore pulp and having means for gasifying the pulp, and forming froth therein, said tank having a froth accumulating space of substantial depth and extended area above the pulp level subdivided, and elongated in the direction of travel of the froth, and provided with a horizontally constricted outlet from said froth accumulating space adapted to delay the froth discharge and thereby produce a concentration of said froth.

3. A flotation tank adapted to contain an ore pulp and having means for gasifying the pulp and forming froth therein, said tank having a froth discharge positioned above its liquid level, and means forming a horizontally tortuous passage along the liquid surface of the tank, said froth discharge being horizontally constricted to thereby slow the escape of the froth and facilitate the concentration of said froth.

4. The process herein described of concentrating the froth generated in a flotation

tank by gasifying a pulp containing powdered ore and water and a frothable agent, said process consisting, essentially, in accumulating a body of froth of substantial depth and extended area above the pulp level and extended in the direction of its travel, and prolonging the period in which the froth is retained in the tank by horizontally constricting the discharge through which the froth escapes from said tank.

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

CEDRIC JUDSON BEATTY ARMSTRONG.

Witnesses:

E. B. THORNHILL,

F. A. MOORE.