F. GROCH.

APPARATUS FOR ORE CONCENTRATION.

APPLICATION FILED DEC. 27, 1917.

1,281,351.

Patented Oct. 15, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

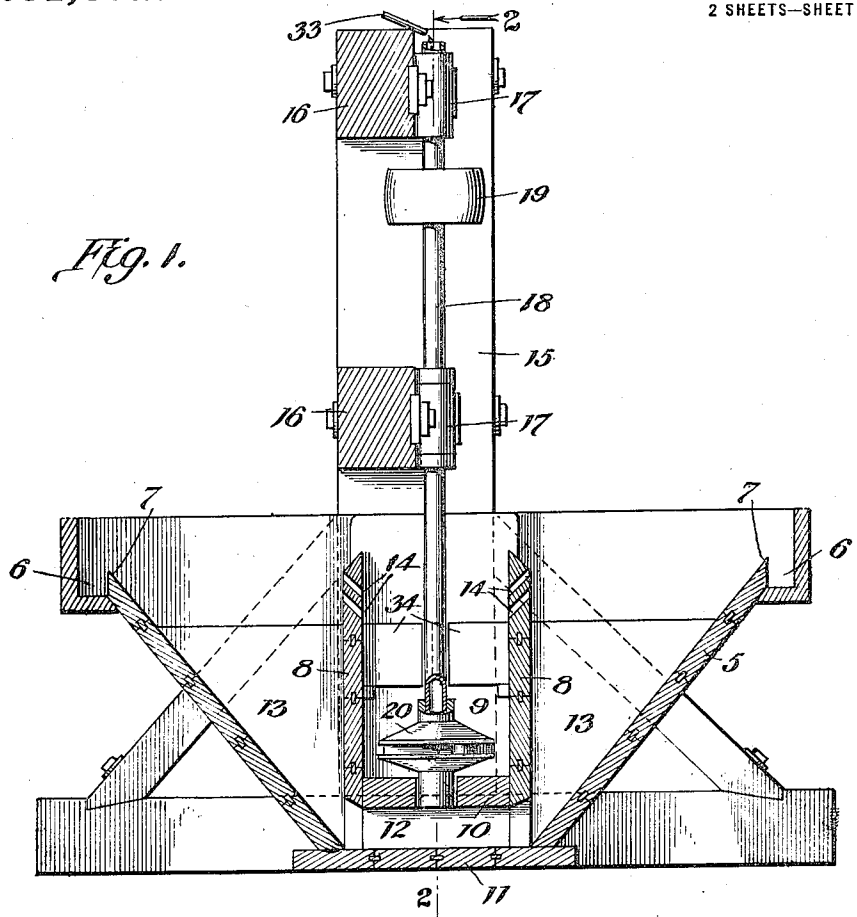
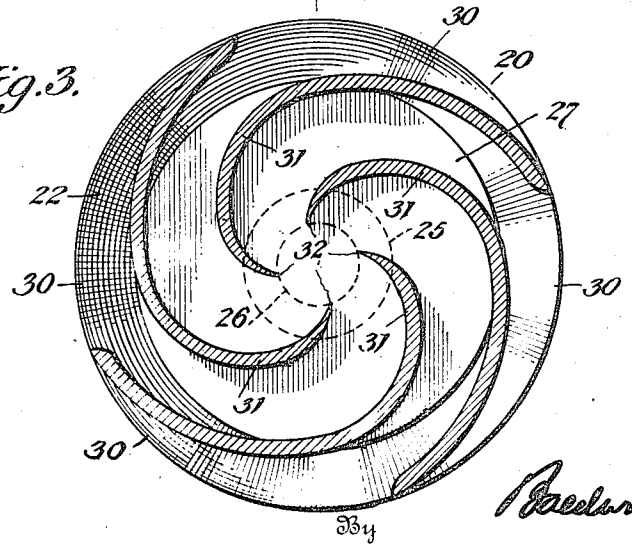


Fig. 3.



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2 SHEETS—SHEET 2.

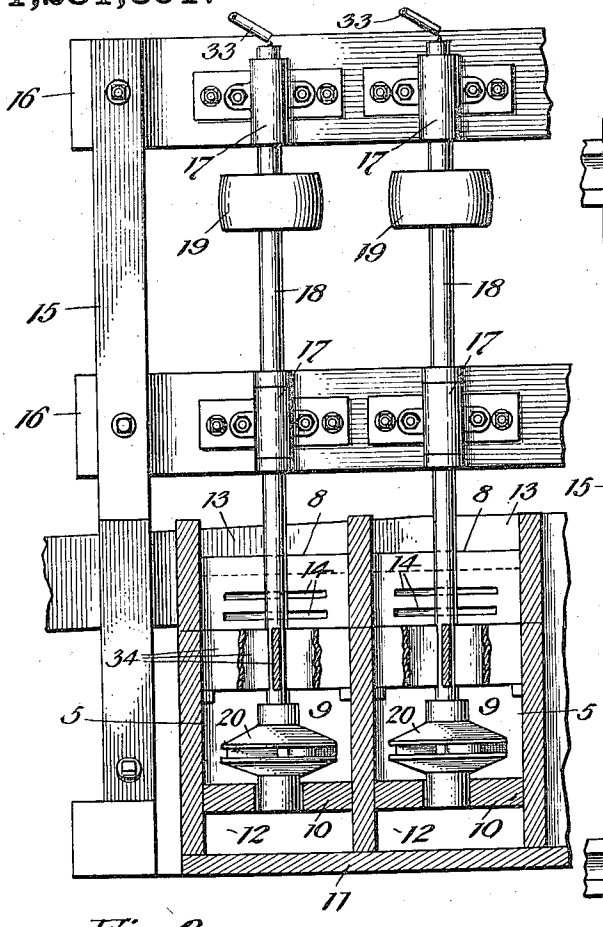


Fig. 2.

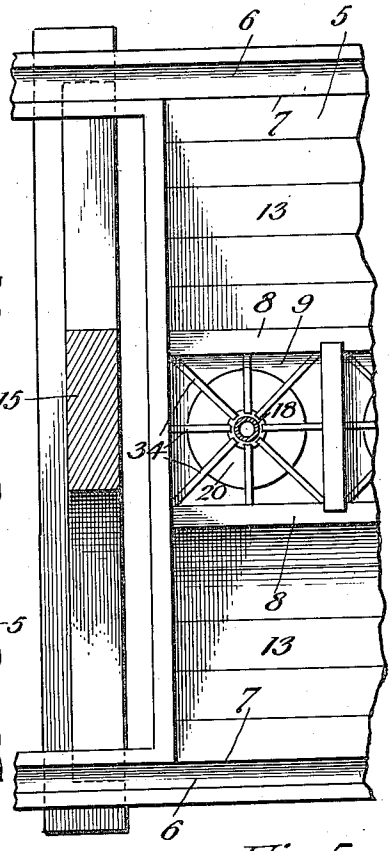


Fig. 5.

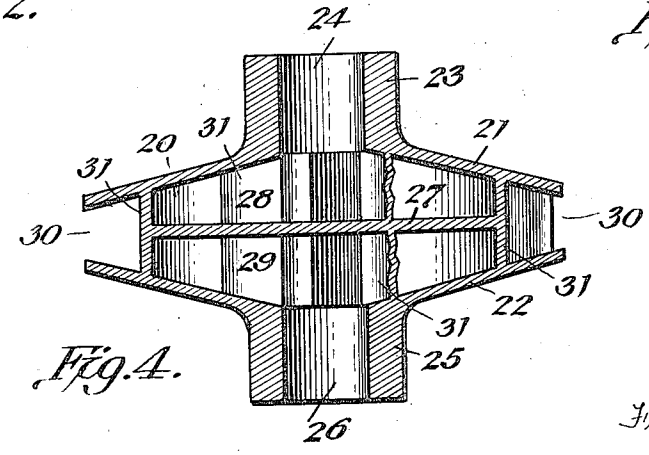


Fig. 4.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR ORE CONCENTRATION.

1,281,351. Specification of Letters Patent. Patented Oct. 15, 1918.

Application filed December 27, 1917. Serial No. 209,117.

To all whom it may concern:

Be it known that I, FRANK GROCH, a citizen of the United States, residing in Cobalt, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Apparatus for Ore Concentration, of which the following is a specification.

The present invention relates to means for effecting the concentration of ore by the flotation process in which foam is produced in the metal carrying pulp, which foam supports the metallic particles while the gangue is allowed to settle.

The primary object of the present invention is to provide means which effects a more thorough commingling of the pulp and foam-producing materials, this means being of a decidedly simple character, but thoroughly practical in operation.

In the accompanying drawings:—

Figure 1 is a vertical cross sectional view through the preferred embodiment of the invention.

Fig. 2 is a detail sectional view on the line 2—2 of Fig. 1, at right angles thereto, showing a battery of two cells of a flotation apparatus.

Fig. 3 is a vertical sectional view on an enlarged scale through the impeller.

Fig. 4 is a horizontal sectional view therethrough.

Fig. 5 is a horizontal sectional view of a portion of the structure.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In the embodiment illustrated, a tank or reservoir is employed, designated generally by the reference numeral 5, and is provided at its opposite sides with launders 6 separated from the interior of the tank 5, by overflow lips 7. These launders are for the purpose of receiving the froth or foam and the concentrates carried thereby. The interior of the tank is sub-divided by vertical partitions 8 into an agitation compartment 9 having a bottom 10 above the main bottom 11 of the tank, and forming a channel 12 which is in communication with the compartments 13 on opposite sides of the agitation compartment 9. The upper ends of the partitions 8 extend above the level of the overflow lip 7 and are provided with outwardly and upwardly inclined slots 14.

In the embodiment disclosed, two cells constructed as above described are provided, but it will be evident that any number may be utilized, all preferably corresponding in structure and arrangement.

A suitable supporting frame 15 extends over the cells and includes a pair of parallel beams 16 carrying journal boxes 17, in which are mounted vertical tubular shafts 18 having suitable driving means, as for example, pulleys 19. The lower ends of the shafts 18 extend downwardly into the respective agitation compartments 9 and support at their lower ends impellers, designated generally by the reference numeral 20.

Referring more particularly to Figs. 3 and 4, it will be noted that each impeller consists of upper and lower substantially conical walls 21 and 22 arranged in reversed relation, thereby providing a body that tapers toward its periphery, the upper wall having a hub 23 that receives the lower end of the shaft 18 and provides an axial vertically disposed inlet opening 24. The lower wall 22 has a depending boss 25 having an opening 26 providing an axial inlet through the lower wall. Interposed between the upper and lower walls and spaced from both is a horizontal partition plate 27 that divides the interior of the impeller into an upper compartment 28 and a lower compartment 29. This partition terminates short of the periphery of the body, so that the two compartments are in communication with each other at their outer portions, but within the body of the impeller and adjacent to the peripheral outlet opening 30. Curved impeller blades 31 are located in each compartment and are preferably in alinement, these blades having their inner ends 32, either alined with the walls of the inlet openings 24 and 26 or not, their outer ends extending beyond the partition 27 and terminating at the periphery of the body.

In actual practice, the tubular shafts constitute air or gas inlet means to the impeller and pipes 33 are also employed for delivering oil to the upper ends of these shafts. The lower gudgeons 25, as will be clear by reference to Figs. 1 and 2 are in communication with the lower channels 12.

Briefly outlined, the action of the apparatus is as follows. The tanks or reservoirs being supplied with the pulp and water from any suitable source, the shafts 18 and consequently the impellers 20 are given rapid rotation. As a consequence the im-

peller blades in the lower chambers 29 will cause an upward flow of the mixture through the inlet openings 26 and expel it with great force outwardly through the peripheral opening 30. The impeller blades in the upper chamber effect a like movement of the air or gas and oil delivered downwardly through the tubular shafts 18, and this action is greatly assisted by the liquid discharged from the lower compartment, which increases the vacuum at the periphery so that an increased amount of air is sucked down through the upper half of the impeller. The oil and air is thus very thoroughly commingled with the liquid, an increased amount of froth or foam is produced, which rises to the surface, and finds its way over the lips 7 into the concentrate launders 6.

To prevent the swirl and vortexing of the liquid due to the rotation of the impeller, vertical and preferably radial baffle blades 34 are located in the upper portion of the agitation compartment 9 above the impeller 20 and below the level of the liquid, these blades being fixed, and absolutely overcoming the tendency of the liquid to swirl within the compartments.

It will be evident that this apparatus is relatively simple, and experience has demonstrated that it has a high rate of efficiency in atomizing, agitating, dissolving and emulsifying oils and gases in solutions from which mineral particles, metallic or other valuable substances are thereby extracted and recovered either by floating or by precipitating them. It will be understood that this is due in great measure to the particular structure of the impeller which forces the air or gas into the pulp to agitate and float or dissolve the chemicals and metals from the pulp, it being also useful for forcing gases into a solution in which the chemicals are dissolved for the purpose of precipitating these chemicals.

In my application for Patent No. 107,434, filed July 3, 1916, and in the division thereof filed July 29, 1918, No. 247155, I show an apparatus for concentrating ores comprising a tank and a rotary member which is provided with a set of passages extending from its central portion toward its periphery, and a hollow member through which said passages are in communication with the atmosphere above the liquid which the tank is adapted to contain and another set of similar passages having both ends in communication with the liquid in the tank. Said application also shows a rotary head having a set of passages for gas or air extending outwardly from the center toward the periphery of the head, and a set of liquid passages also extending toward the periphery, all of said passages being open at both ends. The rotary head consists of an impeller somewhat similar to that herein shown and described, having axial inlet ports in its opposite walls and a discharge opening, a partition within the impeller in spaced relation to the opposite walls thereof, and impeller blades on opposite sides of the partition. I do not claim such subject matter in the present application, said subject matter being claimed in my application Serial No. 247,155 filed July 29, 1918, which is a division of my application No. 107,434, filed July 3, 1916.

No claim is made herein to the construction and arrangement of the baffle plates 34 shown in the accompanying drawings or their combination with other features of the invention herein shown, as claims thereto are made in my copending application Serial No. 219,996, filed Mar. 2, 1918.

What I claim is:—

1. An impeller of the character set forth, comprising a rotatable hollow body having axial inlet ports in its opposite walls and a peripheral discharge opening, a partition within the body in spaced relation to the opposite walls thereof and terminating short of the periphery, and impeller blades on opposite sides of the partition extending beyond the periphery of said partition and terminating substantially even with the peripheral discharge of said hollow body.

2. An impeller of the character set forth, comprising a rotatable hollow body having axial inlet ports in its opposite walls and a peripheral discharge opening, a partition within the body in spaced relation to the opposite walls thereof and terminating short of the periphery and dividing said hollow body into compartments, and impeller blades in at least one of the compartments, said blades extending beyond the partition.

3. An impeller of the character set forth, comprising a rotatable hollow body having axial inlet ports in its opposite walls and a peripheral discharge opening, a partition within the body in spaced relation to the opposite walls thereof and terminating short of the periphery and dividing said hollow body into compartments, and impeller blades in both compartments extending beyond the partition.

4. An impeller of the character set forth, comprising a rotatable hollow body, the chamber of which is provided with outwardly convergent walls having their peripheries spaced apart to form an outlet and each wall having an axial inlet, a partition between said inlets terminating short of the peripheral outlet, and blades for compelling an inward flow of materials through the inlets, said blades extending beyond the partition for insuring the commingling of such materials within the outlet of the impeller and their subsequent expulsion through the peripheral outlet.

5. An impeller of the character set forth, comprising a rotatable hollow body the chamber of which is provided with substantially conical walls arranged in opposing relation, each wall having an axial inlet opening, a partition interposed between the walls in spaced relation thereto and terminating short of their peripheries, and impeller blades on at least one side of the partition projecting beyond the edge of the same.

6. An impeller of the character set forth, comprising a hollow body the chamber of which is provided with oppositely disposed substantially conical walls that converge toward their peripheries, each wall having an axial inlet, a partition located between the walls and spaced from both, forming opposite compartments with which the inlets respectively communicate, the periphery of said partition terminating short of the peripheries of the walls, and impeller blades located in both compartments and extending beyond the periphery of the partition substantially to the peripheries of the walls.

7. An impeller of the character set forth, comprising a hollow rotatable body having opposite independent axial inlet openings for materials of different characters and a common peripheral outlet, means within the body for creating an indraft through both inlets upon the rotation of the body, the commingling of the materials within said body and their expulsion in commingled condition through the peripheral outlet.

8. An impeller, comprising a rotatable hollow body having axial inlet ports in its opposite walls and a peripheral discharge opening, a partition within the hollow body dividing the space between the walls into compartments and which terminates short of the periphery of the hollow body, impeller blades in a least one of said compartments extending beyond the periphery of the partition, a rotary hollow shaft to which the hollow body is secured and through which air is drawn to one of the compartments, and means for feeding a liquid to the other compartments.

9. An impeller, comprising a rotatable hollow body having inlet axial ports in its opposite walls and a peripheral discharge opening, a partition within the hollow body dividing the space between the walls into compartments and which terminates short of the periphery of the hollow body, impeller blades in at least one of said compartments extending beyond the periphery of the partition, a chamber for containing a liquid in which said impeller operates, a rotary hollow shaft extending above the liquid level to which the hollow body is secured and through which air is drawn to one of the compartments, and means for feeding a liquid to the other compartment of said hollow body.

10. An impeller, comprising a hollow body having oppositely disposed walls provided with axial inlets and spaced at their peripheries to form a peripheral outlet, a partition between and spaced from said walls, said partition terminating short of the periphery of the body, and impeller blades on opposite sides of said partition and extending beyond the edge thereof to form a mixing chamber within the outlet and beyond the partition.

11. An impeller, comprising a hollow body having opposite axial inlets and provided with an intermediate partition dividing the same into independent chambers, said partition terminating within the body of the impeller, and blades on opposite sides of the partition extending beyond the edge of the same and terminating substantially even with the impeller body for compelling an independent flow through each of said inlets and then forcing the same outwardly through both of the chambers, the discharge from one of said chambers passing across the discharge from the other of said chambers to produce an aspirating action on the contents thereof.

In testimony whereof I have hereunto subscribed my name.

FRANK GROCH.

Witnesses:
GEO. MITCHELL,
W. N. MOORE.