March 1, 1932. F. W. MACLENNAN 1,847,659

FLOTATION APPARATUS

Filed Nov. 26, 1928

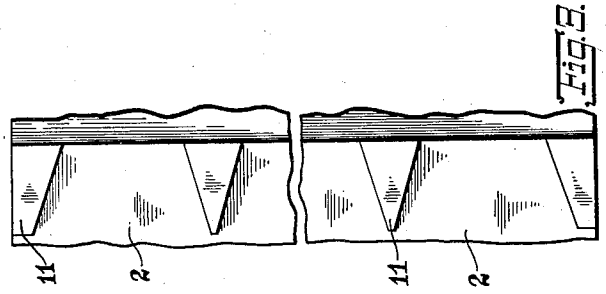


Fig. 3.

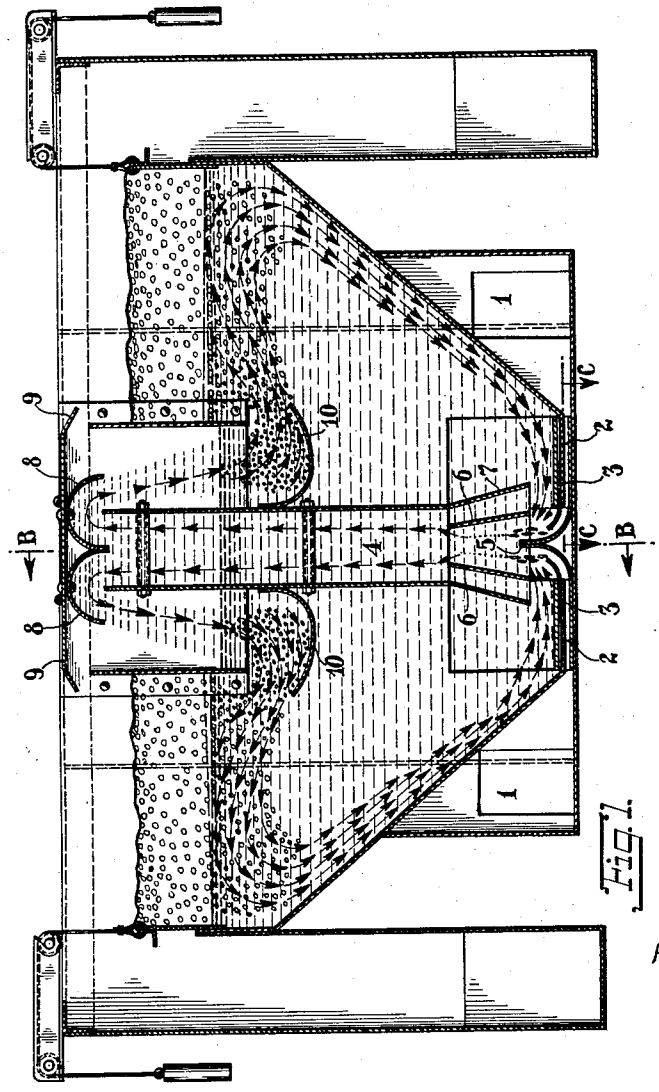


Fig. 1.

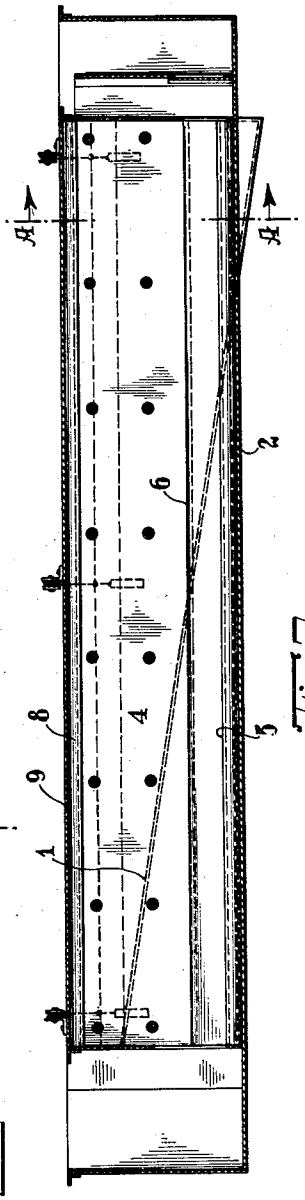


Fig. 2.

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UNITED STATES PATENT OFFICE

FRANK W. MACLENNAN, OF MIAMI, ARIZONA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO MATLESS CELL PATENT HOLDING CORPORATION, OF GILA COUNTY, ARIZONA, A CORPORATION OF ARIZONA

FLOTATION APPARATUS

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My invention relates to an improved apparatus for the concentration of ores by what is commonly known as the flotation process, in which the ores or other substances are subjected to aeration in an aqueous separating medium in the presence of suitable agents for formation of a froth containing valuable portions of said ores or other substances, and thereby separating said values from the barren or rocky constituents thereof.

The objects of the present invention are to provide certain improvements in flotation machines of the cascade type, which improvements increase the efficiency of such machines to a marked degree.

The principle of operation and novel features of the invention will be understood from the following description, taken in conjunction with the accompanying drawings, in which similar reference characters refer to similar parts throughout the several views.

Fig. 1 is a transverse section of the flotation cell taken on line A—A of Fig. 2.

Fig. 2 is a longitudinal section of the flotation cell taken on line B—B of Fig. 1.

Fig. 3 is a plan on C—C of Fig. 1, partly broken away.

Fig. 1 is a transverse section of one type of cascade flotation machine in operation, and illustrates my improved method of introducing the air which induces pulp circulation. The air under pressure enters the machine through the headers 1, and passes through the slot 2, under the flexible rubber strip 3 into the pulp near the bottom of the uplift chamber 4.

A curved longitudinal baffle 5 is placed centrally in the cell directly beneath the bottom of the uplift chamber 4 in order to deflect the current of pulp induced by the entering air directly upwards.

Baffle plates 6 may be applied at the bottom of the uplift compartment 4 and the lower edges of the walls may be flared as at 7. I have found these structures at the base of the uplift compartment tend to prevent eddying and cause a smoother inflow of the pulp. Curved throwback plates 8 are applied at the top of the uplift chamber in such a position that they cause the pulp to be deflected downwards with the least obstruction to rapidity of flow. Hinged splash covers 9 are applied over the outlet for escape of excess air at the top of the uplift chamber. The hinges allow the covers to be thrown back to permit inspection of the cascading pulp stream. Curved baffles 10 may be installed on the outside walls of the uplift chamber somewhat below the pulp level. These baffles have the effect of preventing coarse particles from being thrown directly to the bottom of the cell and for directing them with the remainder of the pulp toward the froth column. These baffles are of particular advantage when treating coarse pulp and for treatment of fine pulp may be omitted.

Fig. 3 shows the partitions 11, which are introduced at intervals in order to prevent collapse of the essentially continuous slot 2. These partitions are widely spaced so that they do not prevent the air entering in the form of a substantially continuous sheet.

The rubber strip 3 is applied along the entire length of the orifice of the slot in such a way that in case the air pressure goes off for any reason the weight of the pulp in the cell will force the rubber strip down over the slot thus effectively sealing it and preventing entry of pulp into the air chamber.

Heretofore the introduction of air into flotation machines of this type has been by means of a series of vertical pipes having their discharge ends near the bottom of the uplift chamber. This method has the marked disadvantage of introduction of air in the opposite direction from the pulp flowing into the uplift chamber, thus retarding the circulation. The air distribution along the length of the uplift chamber is also irregular owing to the necessary distance separating the air pipes.

Another method of introducing air to induce pulp circulation has been by air-operated injectors. This method is not only inefficient, but results also in an uneven air distribution throughout the length of the cell.

My method of introducing air in sheet-like form through an essentially continuous slot throughout the length of the cell induces a most efficient air lift action which results in

a rapid and uniform circulation of the pulp at all points along the entire length of the cell. This uniformity of, and increased rate of circulation of the pulp has the effect of exposing the mineral particles to aeration more times and consequently gives them the opportunity of passing into the froth column more times than if the circulation were slow and uneven; thus the efficiency of the cell is increased either in producing a greater recovery of mineral from the same tonnage or making the same recovery on a larger tonnage of ore fed.

I claim:

1. A flotation concentrator of the cascade type comprising an elongated tank adapted to contain ore pulp, having lateral froth overflows, a longitudinally extending uplift chamber within said tank, means for injecting air in an upward direction into the pulp in said chamber through a substantially continuous slot throughout the length of the tank, to maintain an upward circulation of the pulp within said uplift chamber, means responsive to changes in the pressure maintained by the air supply means for opening and closing the said slot, means at the top of said uplift chamber for directing said circulating pulp downwardly through an air space and for causing said pulp to impinge directly on the surface of the pulp in said tank whereby the pulp is effectively aerated with froth-forming bubbles.

2. In an ore flotation apparatus, a receptacle adapted to contain ore pulp, an uplift chamber within said receptacle, a baffle spaced from said uplift chamber, and projecting into the pulp, and defining a compartment freely open to the atmosphere, means for injecting air in an upward direction into the uplift chamber through a substantially continuous slot throughout the length of the chamber to maintain a rapid upward movement of pulp therethrough to a substantial height above the normal pulp level, and means at the top of said uplift chamber for directing the pulp downwardly through said compartment, in expanding cascade formation onto the surfaces of the pulp in said compartment, and means beneath the normal pulp level in said compartment for directing the froth-forming bubbles carried in the pulp outwardly into the main body of pulp in that portion of the receptacle beyond said baffle.

3. In an ore flotation apparatus, an elongated tank adapted to contain ore pulp, a longitudinally-extending uplift chamber within said tank, means disposed adjacent the lower end of said uplift chamber for defining a substantially continuous slot throughout the length of the chamber through which to direct air in an upward direction into the pulp for maintaining a rapid circulation of pulp upwardly through said uplift chamber, and means responsive to changes in the pressure maintained in the air supply means for opening and closing said slot.

In testimony whereof, I have signed my name to this specification this ninth day of November, 1928.

FRANK W. MACLENNAN.