Feb. 25, 1930. W. A. BUTCHART 1,748,107

FLOTATION APPARATUS

Filed April 23, 1927

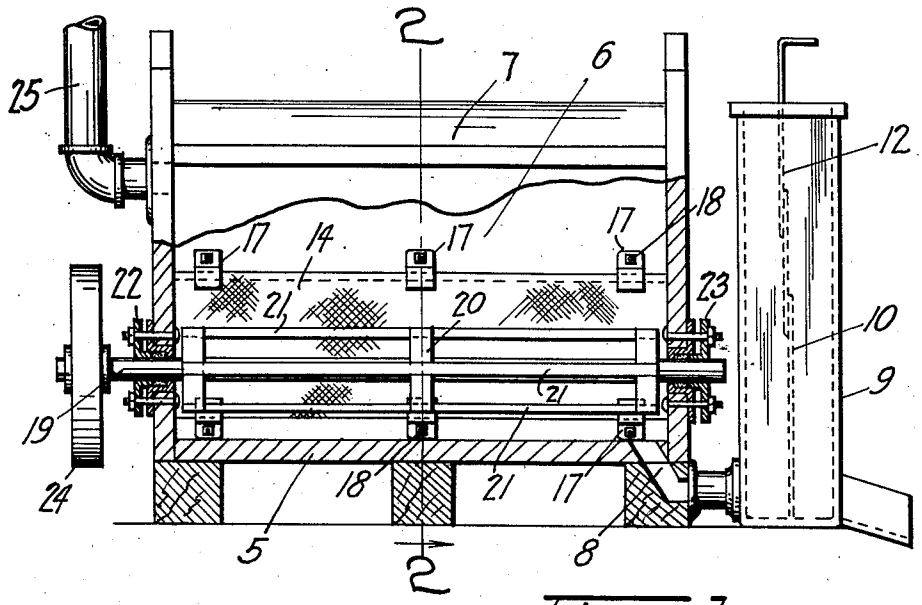


Fig. 1

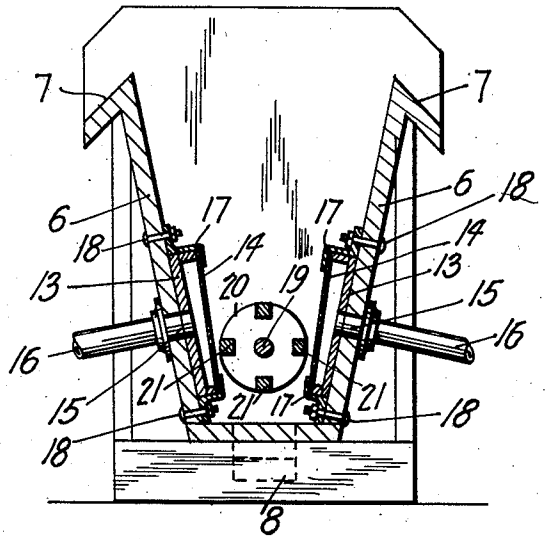


Fig. 2

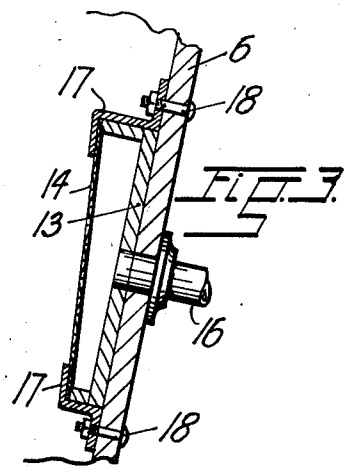


Fig. 3

INVENTOR.
William A. Butchart.
BY
ATTORNEY.

Patented Feb. 25, 1930 1,748,107

UNITED STATES PATENT OFFICE

WILLIAM A. BUTCHART, OF JOPLIN, MISSOURI

FLOTATION APPARATUS

Application filed April 23, 1927. Serial No. 186,057.

This invention relates to apparatus for the extraction of values from ores by the flotation process and more particularly to apparatus of this type in which ore pulp intermixed with a suitable froth-forming agent is subjected to aeration and agitation beneath a determined liquid level in a vessel of suitable form and proportions.

It is an object of the present invention to provide in apparatus of the above described character, aerating elements of novel construction which provide for the distributed discharge of air in the vessel through the medium of porous surfaces extending at a precipitous angle so that the material subsiding in the vessel cannot obstruct the free passage of the air by settling upon or "blanketing" the surfaces but must precipitate to the bottom of the vessel.

A further object is to provide for the agitation of the material in the vessel by an agitating element interposed between two or more aerating elements of the above stated type and still other objects reside in details of construction as will appear in the course of the following description.

An embodiment of the invention has been illustrated in the accompanying drawings in which like parts have been correspondingly indicated throughout the views and in which

Figure 1 represents a sectional elevation of a flotation tank in which the improvements are installed,

Figure 2, a section taken on the line 2—2, Figure 1, and

Figure 3, an enlarged section of one of the aerating elements of the machine.

The reference numeral 5 designates a tank or spitzkasten, the longitudinal sides 6 of which slope toward a flat bottom. The tank has at the upper edges of its sides openings for the discharge of froth at the level of a liquid in the tank, across slanting aprons 7.

The tailings of the flotation process are discharged from the tank through an outlet 8 near its bottom, and enter into an upright box 9, which by means of a vertical partition or weir 10 controls and determines the liquid level in the tank. A gate 12 sliding upon the partition provides an adjustable means to vary the liquid level according to different requirements.

The aerating elements by which the air required for the separation of the minerals from the ore pulp by flotation, is admitted to the vessel, are arranged upon the lower portions of the sloping sides of the tank and the agitating element likewise required in the process is disposed intermediate of the aerating elements. Each of the aerating elements consists of a shallow box 13 and a covering 14 of canvas or other porous material stretched across the sides of the box in spaced relation to its bottom.

The bottom member of the box has an opening 15 alined with an opening in the respective side of the tank and fitted in or to the last-mentioned opening is a conduit 16 connected with a conveniently disposed source of air under pressure.

The boxes extend along the entire length of the sides of the tank and the air entering the same through the conduits, is thus compelled to pass through the foraminous covers and be distributed throughout the material in the bottom portion of the tank. The covers of the aerating elements are held in place on the sides of the boxes by means of Z-shaped clamps 17 which project across the sides of the boxes and are fastened to the sides of the tanks by bolts 18.

The agitating element comprises a shaft 19 extending lengthwise of the tank intermediate of the aerating elements and rotatably supported in bearings at the end walls of the tank. A plurality of spiders 20 made in the form of peripherally notched disks and mounted on the shaft, support blades or paddles 21 which are fitted in the notches and extend in substantially parallel relation to the shaft.

In the construction illustrated in the drawings, four blades are disposed at quadrant points of the spiders and the openings in the end walls of the tank through which the shaft projects are made water-tight by suitable packing devices 22 and 23. At one end of the shaft is a pulley 24 for its connection with a conveniently located motor or other source of energy.

In the operation of the machine, pulverized ore intermixed with a suitable proportion of water into a pulp, is fed into the tank together with a suitable frothing agent through an inlet conduit 25.

A measured quantity of air under pressure is admitted to the air chambers at the sides of the tank and this air being forced through the foraminous coverings of the air chambers, into the pulp, produces a froth which carries the minerals in the ore to the liquid level determined by the weir in the tailings discharge box.

The rotating agitator meanwhile maintains the solid particles of the pulp in suspension thereby subjecting them individually and separately to the action of the flotation agent and the air. A substantially clean separation of the values from the gangue is thus obtained and the mineral bearing froth overflows across the aprons to suitable receptacles.

The sides of the tank or spitzkasten extend at a steep angle and the porous coverings of the aerating boxes being substantially parallel to the sides are thereby disposed at a precipitous angle greater than the angle of repose of the solids suspended in the material under treatment. It follows that no solids can settle on the porous surfaces to obstruct the passage of air by "blanketing" or "blinding" as frequently occurs in machines in which the surfaces through which the air is admitted extend nearer to the horizontal and the air is thus permitted to enter the material to the full capacity of the aerating elements throughout the operation.

The supply of air to the air chambers is regulated by valves in the supply pipes, the agitating element is rotated at the velocity necessary to maintain the solids in suspension in the pulp and the elements thus combined cooperate to produce a froth of any desired characteristics required for the subsequent recovery of the mineral particles, and to effect a clean separation of the minerals carried upwardly by the froth, from the worthless matter that subsides to the bottom of the vessel and is discharged through the opening into the box.

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

1. In flotation apparatus, a horizontally elongated tank, air chambers extending lengthwise of the sides thereof and having opposed porous surfaces for the discharge of air into the tank, and an agitating element extending lengthwise of the tank between said surfaces.

2. In flotation apparatus, a horizontally elongated tank, air chambers extending lengthwise of the sides thereof and having opposed porous surfaces for the discharge of air into the tank, and a rotary agitating element co-extensive with the surfaces.

3. In flotation apparatus, a horizontally elongated tank, air chambers extending lengthwise of the sides thereof and having opposed porous surfaces for the discharge of air into the tank, and an agitating element rotating about an axis extending lengthwise with respect to the surfaces.

In testimony whereof I have affixed my signature.

WILLIAM A. BUTCHART.