E. W. ENGELMANN AND W. T. MacDONALD.

AERATION CELL FOR FLOTATION APPARATUS.

APPLICATION FILED OCT. 16, 1918.

1,344,123.

Patented June 22, 1920.

Fig. 1.

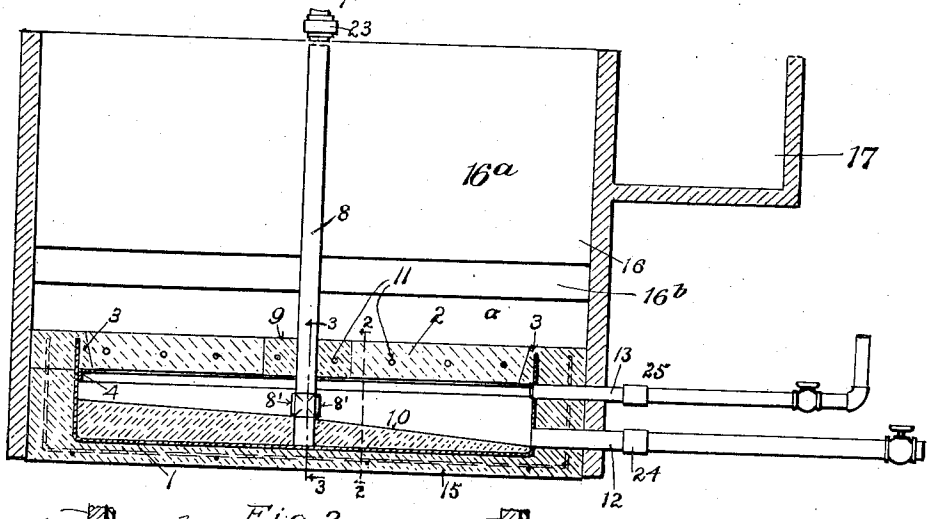


Fig. 2.

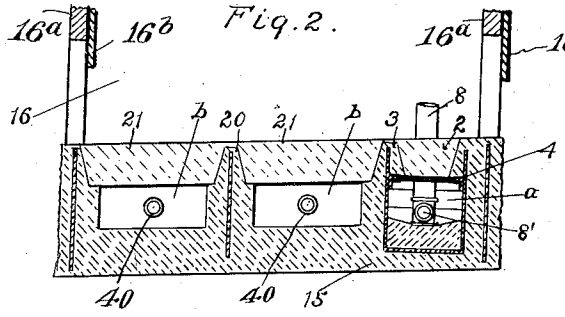


Fig. 3.

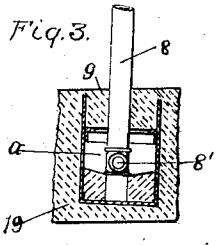


Fig. 7.

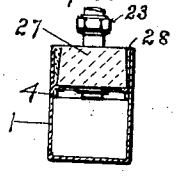


Fig. 4.

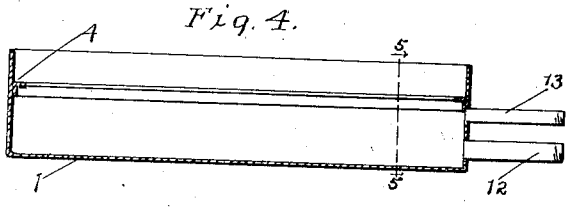


Fig. 5.

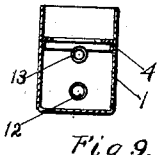


Fig. 8.

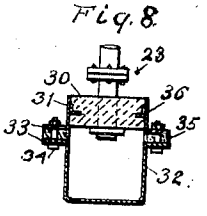


Fig. 6.

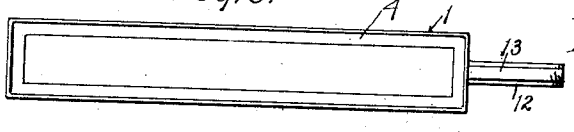
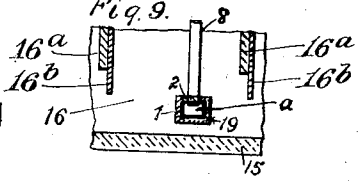


Fig. 9.



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AERATION-CELL FOR FLOTATION APPARATUS.

1,344,123. Specification of Letters Patent. Patented June 22, 1920.

Application filed October 16, 1918. Serial No. 258,450.

To all whom it may concern:

Be it known that we, EDWARD W. ENGELMANN and WILLIAM T. MACDONALD, citizens of the United States, residing at Hayden, in the county of Gila and State of Arizona, have invented a new and useful Improvement in Aeration-Cells for Flotation Apparatus, of which the following is a specification.

This invention relates to aeration cells for distributing gaseous medium containing flotation agent into the ore pulp in flotation apparatus. Such cells are advantageously made as baskets or chambers with porous mats through which the compressed gaseous medium is forced, and, for the sake of convenience in construction and permanence in operation, it has been found desirable to make the cells of concrete, the mats being made of porous concrete set in baskets of dense, impervious concrete. The construction heretofore adopted for this purpose comprised a molded concrete body formed with the chambers for distributing the gaseous medium carrying flotation agent (so as to cause "oiling-aeration") and also formed with chambers for distributing gaseous medium alone for producing further aeration, the several chambers or compartments of such construction being separated by partitions of dense concrete. We have found that with such a construction there is liable to be more or less escape or leakage of the gaseous medium carrying flotation agent, through cracks or flaws in the concrete, walls or partitions, with the result that the flotation agent is either lost or improperly distributed. The main object of the present invention is to so construct the distributing means or aeration cells as to avoid any such escape or leakage of flotation agent.

Another object of the invention is to provide a unit or individual cell construction adapting the cell for insertion and removal, in the most convenient manner, so as to facilitate the construction, replacement or repair thereof.

The accompanying drawings illustrate embodiments of our invention, and referring thereto:

Figure 1 is a transverse section of a flotation cell, provided with our improved aeration cell or gas distributing means;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a section of the aeration cell, taken on line 3—3 of Fig. 1;

Fig. 4 is a longitudinal section of the metallic lining of said cell;

Fig. 5 is a section on line 5—5 of Fig. 4;

Fig. 6 is a plan view of said lining;

Fig. 7 is a transverse section of a modified form of the cell;

Fig. 8 is a transverse section of another modification;

Fig. 9 is a transverse section of a flotation cell showing a modified arrangement of the gas distributing means.

The form of our invention shown in Figs. 1 to 6 comprises a cell or chamber *a* formed with a metallic lining or box 1, preferably of sheet metal, water and gas-tight at the bottom, sides and ends and open at the top; and a mat 2 of porous concrete set in the top of said box and making a gas tight joint therewith by means of a filling 3 of dense concrete joining and sealing said porous concrete mat to the walls of the box. The porous mat 2 may be pre-formed and then secured in position by pouring in dense concrete grouting between it and the walls of the box 1, or the filling 3 may be molded in position first and the porous concrete then molded in the space thus provided. In either case, we prefer to provide a flange 4 around the inner face of the walls of box 1 on which the filling 3 is supported, and the sides of the porous mat are preferably flared outwardly and upwardly to give a better support therefor.

An air inlet pipe 8 is mounted so as to make communication with the interior of the box 1 in any suitable manner. For convenience, this pipe may lead through a plug 9 of a portion of dense concrete set or molded in the top of the box and resting on the flange 4, said plug making a gas tight joint with the porous mat 2 and with the pipe. The lower end of pipe 8 may be set in a floor body 10 of dense concrete molded on the bottom of box 1 and said pipe may have lateral outlets 8′ opening into the interior of the box, below the mat 2. The members 2 and 9 extending over the top of the box 1 may be reinforced, as indicated at 11. In order to facilitate drainage of any liquid from the box 1, the floor body 10 may incline toward one end, and a drain pipe 12 may enter the box at that end at the lowest part of the floor. A pipe 13 may also communicate with the interior of the box, for supply of steam or air for cleaning out the box when necessary. The pipes 12 and 13

are secured to the metal box 1 in such manner as to make gas tight joints therewith.

The cell constructed as above described may be assembled as an individual unit and then mounted in position in a flotation cell or apparatus in any suitable manner, for example, as shown in Figs. 1 and 2, a bed of dense concrete 15 being molded in position at the bottom of the flotation tank 16, so as to form the floor of such tank, and such bed embedding the individual aeration cell unit above described, as part of the floor, the top of the porous mat 2 being flush with the floor surface, or if desired, above or below the same. In Figs. 1 and 2, we have shown one cell of a flotation tank, such cell being formed by partition walls 16^a spaced from the bottom to permit flow of pulp and fluid along the bottom of the tank, such flow being regulated by means of the sliding gates 16^b, the height of which may be adjusted as desired. It will be apparent that any desirable number of these cells may be provided in the tank, but since our present invention resides in the gasifying cell structure, we have not thought it necessary to further amplify the showing. For example, as shown in Fig. 9, the cell *a* may be positioned clear above the floor 15 of the flotation tank. In case the floor of the flotation apparatus is inclined, as shown in Fig. 2, the upper face of the mat 2 may also be correspondingly inclined, or it may be level. A launder 17 is provided for collection of the concentrates. The floor or bed 15 of the flotation tank is shown in Fig. 2 as provided with additional aeration chambers *b* separated by dense or impervious concrete partitions 20 molded in the said bed and provided with porous mats 21 above the same, air being supplied to the chambers *b* by pipes 40, for example. An important feature of our invention in connection with such a construction of aeration cells, (providing for air distribution by chambers following oiling aeration by cell *a*), is that leakage of oil or other flotation agent from the cell *a* to chambers *b* is avoided. The individual aeration cell *a* may have a wall of dense concrete molded around and under the same (as indicated at 19 in Fig. 3), and the unit so formed may be molded into the floor of the flotation cell, or the metal box 1 may be directly molded into such floor. In either case, the construction is individual, in that the unit is, or may be, assembled or constructed before it is placed and molded into position, and it may be removed as a whole and replaced or repaired with little difficulty. With a view to facilitating such assembling of the cell unit in position, the several pipes 8, 12 and 13 leading thereinto are preferably connected by unions or couplings, such as indicated at 23, 24 and 25, to the various pipe connections therefor.

In the operation of the apparatus, compressed air or other gas carrying flotation agent, preferably in the form of vapor (for example vapor of any suitable flotation oil or of tarry material) is supplied to cell *a* through pipe 8 and passes through the porous mat 2 in the form of fine streams or jets, producing bubble columns which distribute the flotation agent into the ore pulp flowing in the flotation cell, and also effect aeration of the pulp with such agent. This operation, in connection with the subsequent aeration by aeration cells *b*, produces flotation of the mineral values in the ore pulp.

Various modifications may be made in the aeration cell without departing from our invention; for example, as shown in Fig. 7, the porous mat, indicated at 27, may rest on the flange 4 of the metal box 1 and may be held in position by a luting 28 of dense cement or grouting, which also seals the joint between the mat and the walls of the box. Or, as shown in Fig. 8, the porous mat, indicated at 30, may be molded in an upper section 31 of the box, said upper section being secured to the lower section 32 of the box by flanges 33 and bolts 34, or otherwise, suitable packing 35 being provided at the joint between said sections to make the joint gas-tight. Flanges 36 on the upper section may extend into the porous mat to reinforce and anchor the same. With the constructions shown in Figs. 7 and 8, the porous mat may be easily removed without disturbing the box as a whole.

What we claim is:

1. A gas distributing means for flotation apparatus comprising a cell having impervious concrete sides and a porous concrete top.

2. A gas distributing means for flotation apparatus, comprising a metallic box having an inwardly extending flange, a porous concrete mat forming the top of the box and supported on said flange and sealed to the sides of the box, and a pipe communicating with the interior of the box for supplying compressed gas thereto.

3. A gas distributing means for flotation apparatus, comprising a concrete structure formed with a chamber, a metallic lining in said chamber, a mat of porous concrete forming a top for said chamber, and pipe means for supplying compressed gas to said chamber.

4. A gas distributing means for flotation apparatus comprising a structure of dense concrete formed with a chamber, a metallic lining at the sides, ends and bottom of said chamber, and provided with inwardly extending flanges, a porous mat forming the top of said chamber and a filling of dense concrete resting on said flanges and supporting said mat.

5. In an aeration-flotation apparatus, a cement structure provided with a plurality

of aerating chambers, and metallic impervious walls in said concrete structure between said chambers.

6. In an aerating flotation cell, a concrete structure provided with a plurality of chambers, each chamber having a porous member for distributing gas through the material in the cell, means for supplying compressed gas, together with vapor of flotation agent, to certain of said chambers, and means for supplying compressed gas without flotation agent to another of said chambers, and impervious walls in said concrete structure between said last named chamber and the adjacent chambers.

7. A gas distributing means for flotation apparatus comprising a cell having impervious concrete sides and a porous concrete top, a gas supply pipe extending through said porous top and a plug of impervious material surrounding said pipe.

In testimony whereof we have hereunto subscribed our names this seventh day of October, 1918.

EDWARD W. ENGELMANN.
WILLIAM T. MacDONALD.