Feb. 10, 1931. W. H. CURRY ET AL 1,792,286

AERATOR

Filed Dec. 4, 1928

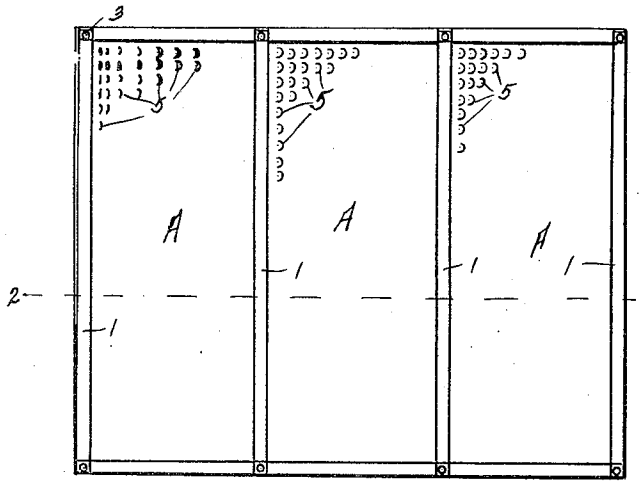


Fig. 1.

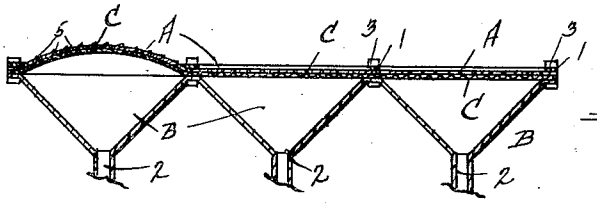


Fig. 2.

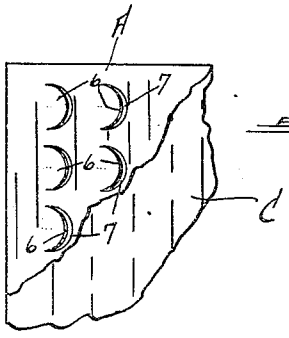


Fig. 3.

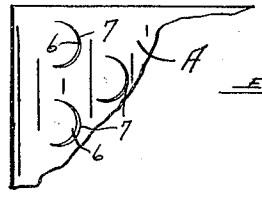


Fig. 4.

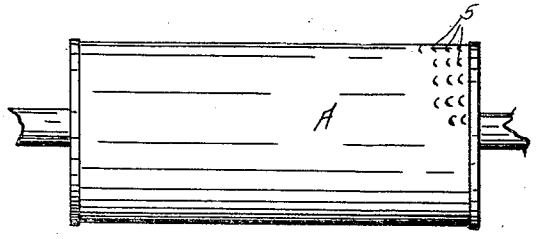


Fig. 5.

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UNITED STATES PATENT OFFICE

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AERATOR

Application filed December 4, 1928. Serial No. 323,651.

Our invention relates to aerators used in oil flotation devices to separate mineral particles from the gangue or rock with which minerals are usually associated, and has for its object to provide a new and improved aerator which, when used in connection with the present practice of separating ore, will reduce the maintenance costs and will improve the present practice of separating ores.

A further object is to provide an improved aerator which will not require the frequent repairs and new installations which are necessary with the present mats used in flotation of minerals, and which will minimize the precipitation of lime on the mat.

A still further object is to provide an air mat which will be easily installed, will not require the removal for cleaning because it will not have a rough surface on which particles may catch, and which will divide the air into more and finer air bubbles, making a better froth on the top of the water than has heretofore been accomplished.

A still further object is to provide an aerator which will be used in combination with the usual mats used in flotation cells and one which will lengthen the life of the mats being used and will increase the efficiency of the aeration of the cell.

In the process of flotation air is introduced through the cell in many different means, all of which are to make a froth or mass of air bubbles on the top of the water in the ore pulp and which bubbles start at the bottom of the cell and pass up through the water and acids used and through the finely ground ore pulp to carry the mineral particles to the surface, forming a mineral-carrying froth on the surface of the cell, where it is skimmed off or carried over into launders for further treatment. In these processes where acids, oils, lime and other chemicals are used, the action thereof rots and disintegrates the usual types of mats used to form the air bubbles, and the lime precipitates on the mat, closing the opening therein, but with our mat, which we make of rubber, there is no rotting or disintegration from these sources, and the surface of the mat is smooth so that the lime will not precipitate as readily thereon, and the mat may be used a much longer period of time.

Also the use of the rubber mat superimposed over the usual type of mat will lengthen the life of both and will be much more efficient and therefore less expensive in the life of the mat.

These objects we accomplish with the device illustrated in the accompanying drawings, in which similar numerals and letters of reference indicate like parts throughout the several views and as described in the specification forming a part of this application and pointed out in the appended claims.

In the drawings we have shown the best and most preferred manner of building our invention. Figure 1 is a plan view of the three mats used in a single cell with the one mat shown inflated as when the air is being passed therethrough. Figure 2 is a section on line 2—2 of Figure 1. Figure 3 is a small portion of one of the mats enlarged to show the shape of the perforations therethrough, with the rubber shown stretched to open the perforations, with parts cut away to show the regular filter mat thereunder. Figure 4 is a view showing the opening of the perforations should the rows be placed diagonally across the mat. Figure 5 is a diagrammatic view of the mat in use on the rotary type machine.

In the drawings we have shown the mats as A and the cells or pans over which they are secured as B. The said mats A are made of flat sheets of rubber and are secured to the pans B by the metal strips 1 and the bolts 3. Other means may be used to secure the mat to the pans, or rotors used. The said pans B are provided with air inlet openings 2, through which air under pressure is forced to inflate the mats. Semi-circular or crescent-shaped perforations 5 are molded or cut through the rubber A from the bottom side so that the top surface of the rubber will be smooth with only the small cut of the perforation therethrough. The said rows of perforations are made longitudinally with the mat or can be made diagonally therethrough. This is for the purpose that, when the mat is expanded by the pressure of the air, it will

stretch upwardly and open the cuts, allowing the air to pass therethrough. The said perforations are made with a very sharp tool and are so made that when the mat is deflated they are semi-circular cuts and there is no opening through the rubber whatsoever, but when the air is introduced through the pans the valves will open in moon-shaped perforations 5, allowing the air to pass therethrough.

The perforations and the shape thereof are the prime factors of this invention and are so constructed, as will be seen from the drawings, that when the mat stretches the inner lip portion 6 of the crescent cut 5 will be forced upwardly and the outer periphery 7 of the cut will be drawn away from the portion 6, making a small crescent-shaped opening therein, and when the rubber is allowed to resume its primary position the lip portion 6 resumes its initial position, acting as a valve, and the periphery 7 is drawn back to contact with the portion 6, forming a slit through the rubber which will completely close the hole therethrough, and the placing of the mat over the top of the usual mat adds life to both mats and protects the rubber mat from excessive stretching and the permanent stretch resulting therefrom.

It will be seen that varying air pressures and volume will affect the arch of the rubber mat and that the valve action of the lip portion 6 will open according to the pressure and volume used. The perforations are made close together and in such number that the air, in inflating or arching the mat, will not stretch the rubber mat A too greatly and, to insure that this stretching will not take place, the mat A is superimposed over the top of the porous fiber or canvas mat C, which mat is made as in the present day use, but when the rubber mat is placed thereover and the air is passed through the mat C and through the perforations 5 the mat C is used to reduce the velocity of the air and to finely separate the air stream while the perforations 5 distribute the bubbles throughout the cell. Also the mat C is to prevent the rubber mat A from stretching to such a degree that it will be permanently stretched and will not return to its initial position. The use of the mat C will more evenly distribute the air through the mat A, and the action of the valve portions 6 will prevent the gangue or the liquid from getting through the perforations 5 and rotting the mat C or precipitating thereon or from getting into the pans B below the mats.

This construction of the mats, one superimposed over the other, provides an aerator which, when the air is introduced thereunder, will arch without stretching and the mat C and the mat A do not separate, but the air under the mat C will arch both mats simultaneously and will open the valves 6 of the perforations 5 in the mat A by the arching or bending rather than by stretching the rubber mat. When the mats are so arched the bending of the rubber mat A will partially open the perforations 5, and when the air pressure is sufficient the valves 6 will open distributing the air through the perforations 5.

It may be possible that a porous mat of sponge rubber or other such material could be formed on the bottom side of the mat A or integral therewith and accomplish the results required.

Applicants have also discovered that this construction of mats may also be applied to filtering processes.

In using the mat on the rotary type of aerators the mat will be placed around the rotor and will be made in a tubular shape and will be held thereon by circular strips or hoops of metal or rubber bands slid over the ends of the rotor. Figure 5 of the drawings shows the use with the rotor, and it will be obvious that the mat can be used with all types of machines, using the porous medium for the distribution of air therefrom.

Having thus described our invention we desire to secure by Letters Patent and claim:

1. In a device of the class described the combination of an air chamber; a sheet of filtering material secured to the edges over the entire surface thereof; and a sheet of rubber secured and superimposed thereover, with crescent-shaped cuts through said rubber to allow for passage of air therethrough.

2. In a mat for use in distribution of air through liquids the combination of a pan and a mat of canvas secured thereover and to the edges thereof; and a sheet of thin rubber superimposed over said canvas having rows of semi-circular perforations through said rubber adapted to open when air is introduced into said pan and through said mat, and to allow said air to pass through said perforations at varying pressures and volume.

3. In a mat for use in distribution of air through liquids, the combination of a sheet of porous mat secured over a pan; and a thin sheet of rubber carried on said porous mat with perforations through said rubber having a lip portion adapted to be raised from and lowered to the main body of the rubber by the air pressure allowed to enter said pan and pass through said mat.

4. In a mat for use in the distribution of air through liquids the combination of a porous mat secured over a suitable pan; a sheet of rubber carried over said porous mat having crescent-shaped perforations therethrough, with the lip or inner portion of the crescent adapted to be raised or lowered to open or close the perforations by the valve action thereof when air pressure is introduced into said pan.

5. In a mat for use in distribution of air through liquids, the combination of an air chamber; a porous mat secured thereover;

a sheet of thin rubber superimposed over said mat and secured to the edges of the air chamber with the porous mat and the sheet of rubber adapted to arch over the air chamber when air is introduced thereinto; and semi-circular perforations through said rubber sheet adapted to have the inner valve portion thereof raised by the arching and the air pressure thereunder to allow passage of air therethrough.

6. In a mat for use in the distribution of air through liquids, the combination of an air chamber having a porous mat secured thereover and a sheet of rubber carried over said mat, having semi-circular perforations through said rubber adapted to break the seal thereof but not open when the mat and sheet are arched over said air chamber and to open when the air pressure is applied sufficiently thereunder.

In testimony whereof we have affixed our signatures.

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HENRY F. DIETZ.