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ORE SEPARATOR.

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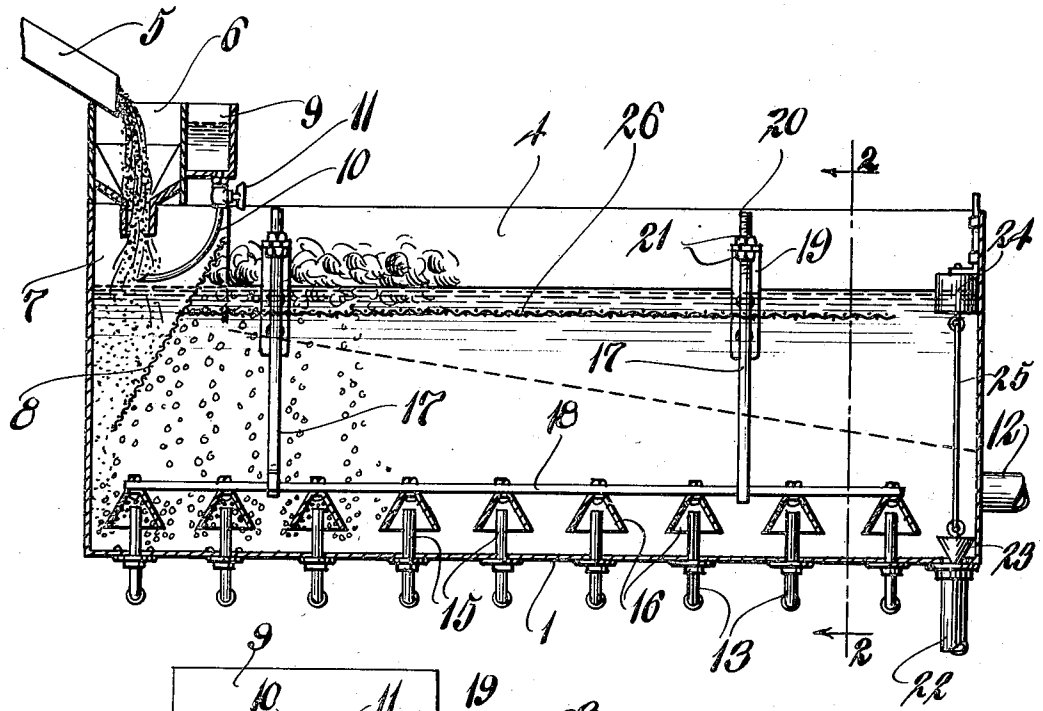


Fig. 1

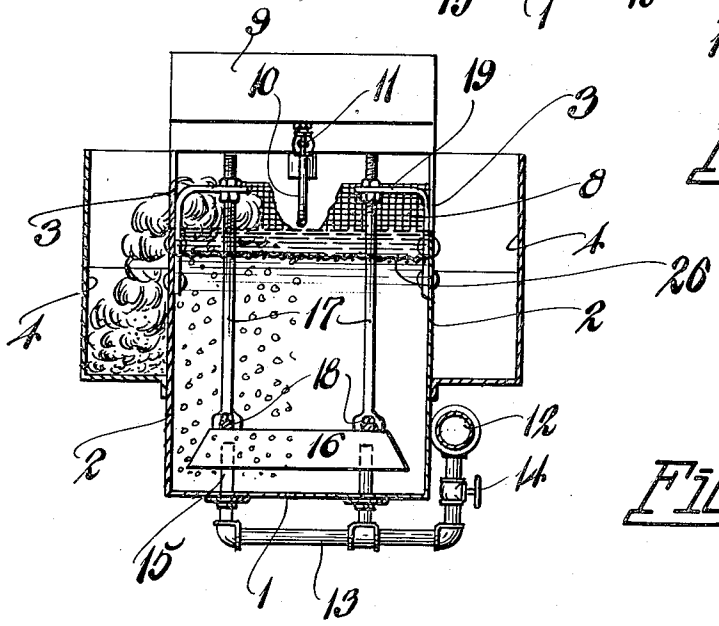


Fig. 2

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To all whom it may concern:

Be it known that I, ARTHUR H. CONNORS, a citizen of the United States, residing at Mullan, in Shoshone County and the State of Idaho, have invented certain new and useful Improvements in Ore Separators, of which the following is a specification.

My present invention relates to improvements in ore separators of the buoyant or flotation type for separating oiled concentrates or minerals from the gangue or pulp, involving the use of a bubble producing agent to convey the mineral particles to the surface of the pulp. The bubbles are produced by the introduction of air under pressure to an agitation chamber or cell and there mixed with the pulp or ore in ground state, through which the bubbles ascend to the surface of the pulp. The air bubbles are strengthened by the introduction of oil to the pulp which forms a coating or film over the bubbles, and the mineral particles adhering to these strengthened bubbles are carried by gravity to the surface of the pulp and floated to launders at the sides of the cell, the tailings or rocky gangue being disposed of from the bottom of the cell through the instrumentality of an automatically operated outlet device controlled by the rising and falling of a buoyant support on the surface of the pulp contained in the cell. The invention relates particularly to improved devices for the introduction of the pulp to the agitation chamber or cell, and involves also improved means for introducing the air under pressure to the pulp in order that it may be uniformly distributed throughout the mass in the cell, and in certain other novel combinations and arrangements of parts as hereinafter specified and claimed.

In the accompanying drawings I have illustrated one complete embodiment of the invention, wherein the parts are combined and arranged according to the best mode I have so far devised for the practical application of the principles of my invention, and it will be understood that I contemplate colorable changes and alterations of the apparatus, which is a mere exemplification of the physical embodiment of the invention, within the scope of my claims without departing from the spirit of the invention.

Figure 1 is a longitudinal, vertical, central sectional view of a cell or unit that may be used as an integer or may form one of a series of similar cells embodying the invention.

Figure 2 is a transverse, sectional view of the apparatus on line 2—2 of Figure 1 and looking in the direction of the arrows.

In the preferred form of the invention as illustrated in the drawings I utilize a box or cell of suitable material, rectangular in shape and having vertical side walls 2, 2, that are cut away at 3, 3 to form spillways into the lateral or side launders 4, 4, erected at the sides of the cell and of which the side walls form a part, and the launders are designed to receive, by flotation, the mineral particles from the agitation or separating chamber of the cell.

At the front or forward end of the cell the pulp is supplied from the pulp conducting spout 5 and deposited in the pulp receiving hopper 6 erected above the top of the cell and from which the pulp may pass to the receiving chamber 7 in the front end of the cell, the rear wall of which is fashioned by the transversely disposed foraminous screen or apron 8 attached to the side walls of the cell and disposed obliquely or in inclined position beneath the feed hopper 6. The screen serves the function of eliminating splash as the pulp drops into the receiving chamber and also directs the pulp toward the front end of the cell, thus preventing its too rapid flow toward the outlet or tail end of the cell.

Adjacent the hopper, an oil tank 9 is provided from which the oil contents may run through the curved outlet pipe 10 controlled by the regulating valve 11 in the pipe, and as will be apparent the oil is directed into the incoming or inflowing pulp, above the water line of the cell in order that the oil may thoroughly permeate and be distributed with the mass of ore in the cell. The oil is introduced for the purpose of strengthening the air bubbles that are produced at the bottom of the cell and rise to the surface of the pulp carrying with them the adhering mineral particles, and the oil which forms a film or coating around the bubbles also enhances the ability of the bubbles to retain and carry the mineral particles.

The bubble producing agent in this instance is air under pressure obtained from a

suitable source through the main line or pipe 12, from which run numerous branches 13, arranged horizontally and transversely below the bottom of the cell and spaced at regular and suitable intervals throughout the length of the cell. The supporting structure for the cell is not illustrated, but it will be understood that suitable supports are provided for the cell structure, and succeeding units or cells when such are utilized are also properly supported below the pictured cell.

The passage of air under pressure through the branch pipes is controlled and regulated by suitable valves 14 and the air currents and pressure may be varied thereby in the different pipes and as required. Preferably each branch pipe is provided with a pair of vertically arranged or perpendicular nozzles projecting the required distance up through the bottom of the cell and terminating at a predetermined altitude, and suitably spaced on transverse lines to uniformly distribute the air currents so that they will ascend through the pulp in the cell and permeate the entire mass thereof.

As a protection for the mouths of the nozzles and for the purpose of further distributing and separating the bubbles arising from the nozzles, I equip them with hoods 16 of suitable material and having a cross sectional shape of an inverted V the ends of the hoods also converging upwardly in order that the hoods may "shed" the gangue or rocky material as it sinks to the bottom of the cell. The hoods are elevated above the bottom a sufficient distance to avoid obstructing the passage of gangue, and they may be adjusted vertically with relation to their inclosed nozzles in order to produce best working conditions.

To accomplish the purpose of varying the altitude of the hoods when required, I utilize two pairs of vertically adjustable suspending rods 17, 17, spaced symmetrically in the longitudinal and transverse axes of the cell and these suspending rods support a pair of lateral and longitudinal horizontal bars 18 18 beneath which the hoods are secured at their apices, the bars extending the length of the cell and supporting each hood near each of its ends to render the structure rigid and well braced.

The perpendicular or vertical rods are supported in angle brackets 19 attached at the inner sides of the side walls and projecting toward the longitudinal center of the cell, there being four brackets one for each rod. The upper end of each rod is threaded as at 20 and passed through an opening in its bracket, and the lock nuts 21, 21, below and above the bracket arm on the threaded rod are utilized to secure the rod and bracket in rigid relationship. It will be apparent that by raising or lowering the rods with relation to their brackets and securing them in desired position by the clamping nuts, the hoods may be uniformly adjusted at a suitable level above their nozzles for the required purpose.

The mineral particles are carried off from the surface of the contents of the cell to the launders, and the tailings or gangue is disposed of through the outlet pipe 22 leading from the bottom of the cell at its rear end, and the outlet opening to the pipe is controlled by a valve plug 23 adapted to fit therein and controlled by a float 24, on the surface of the pulp, connected to the valve plug by the connecting rod 25. Thus the water line or surface of the pulp is maintained at the required level by the action of the float 24, which rises with an excess of pulp in the cell and opens the valved outlet, and falls as the level of the pulp falls to close the opening, thus automatically controlling the contents of the cell and holding or maintaining the surface or water level at the required height to be effective in the disposal of the particles of mineral being carried off by the flotation process.

The operation of the apparatus will be understood from the foregoing description taken in connection with the drawings, it being understood that the ground ore in the form of pulp is impregnated with oil in the receiving chamber and as it passes through the cell, the currents of air emerging from the nozzles form air bubbles which pass from beneath the bottom of the hoods and down around their sides, and as they ascend, these bubbles are coated with a film of oil to which the particles of mineral adhere and rise to the surface with the bubbles. At the surface of the pulp the bubbles float off to the sides of the cell and over the spillway into the launders, where they are received and proper disposition subsequently made of them.

As a means for overcoming the considerable swash and splash caused by the rapidly upward moving air bubbles I prefer to dispose slightly below the water line a comparatively coarse mesh screen 26 which will have a tendency to break up the upward draw of fluid and level it out over the entire area of the cell to eliminate undue movement of the water.

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

1. The combination with a cell of a multiplicity of nozzles arranged in pairs for air under pressure and projecting upward through the bottom of the cell, and a series of inverted V-shaped hoods over the nozzles in pairs, and adjustable supporting means for said hoods, for the purpose described.

2. The combination with a cell a multiplicity of nozzles arranged in pairs and projecting upward through the bottom of the cell for the introduction of air under pressure, an inverted V-shaped hood for each pair of nozzles, a pair of spaced horizontal bars attached to said hoods, pairs of spaced supporting vertical rods attached to the bars, brackets supported in the cells to receive said rods, threaded ends on said rods, and lock nuts for holding the rods in adjusted position with relation to the brackets.

In testimony whereof I affix my signature.

ARTHUR H. CONNORS.