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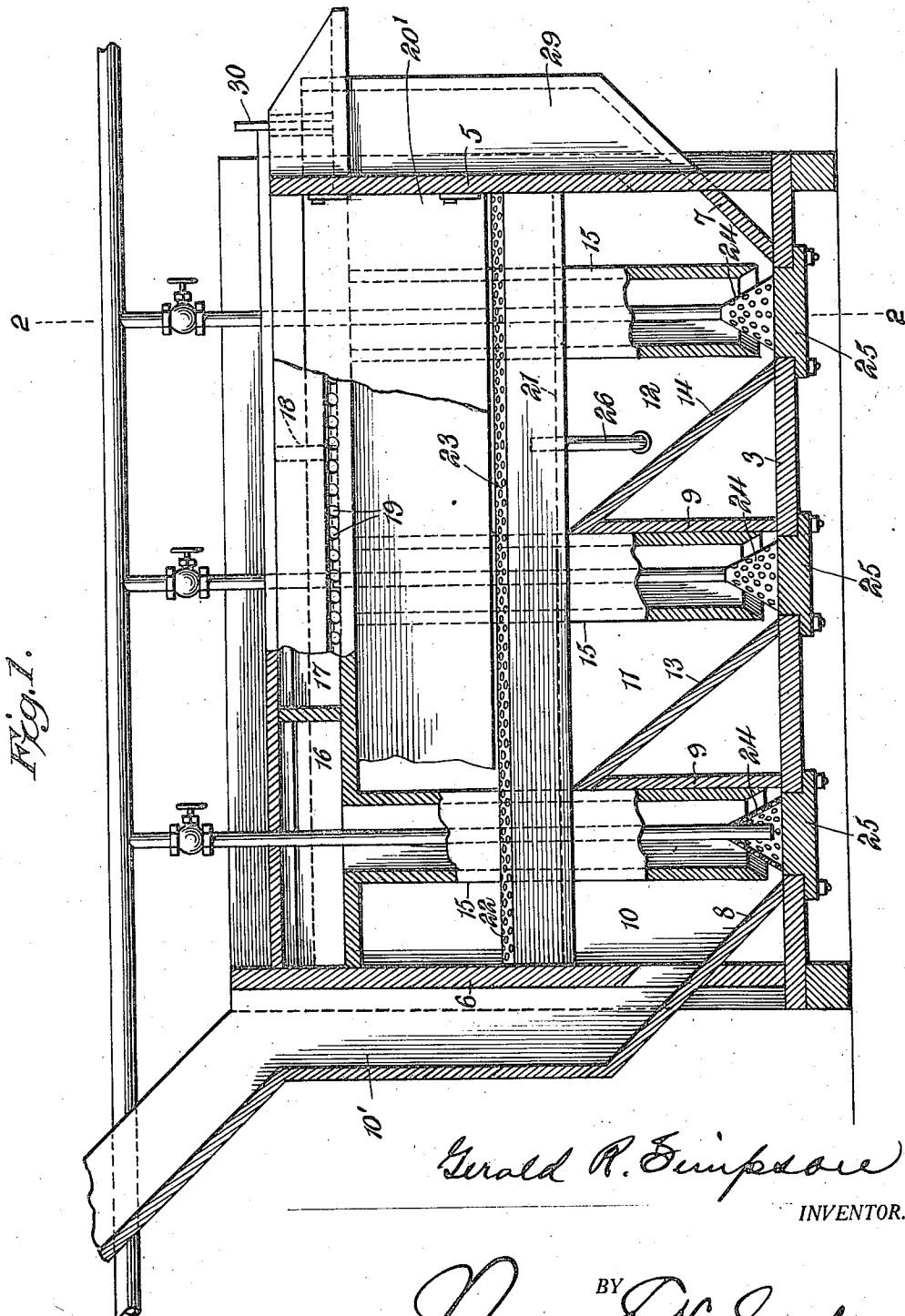
1,518,010

G. R. SIMPSON

PNEUMATIC FLOTATION CELL

Filed May 4, 1920

2 Sheets-Sheet 1



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Fig. 3.

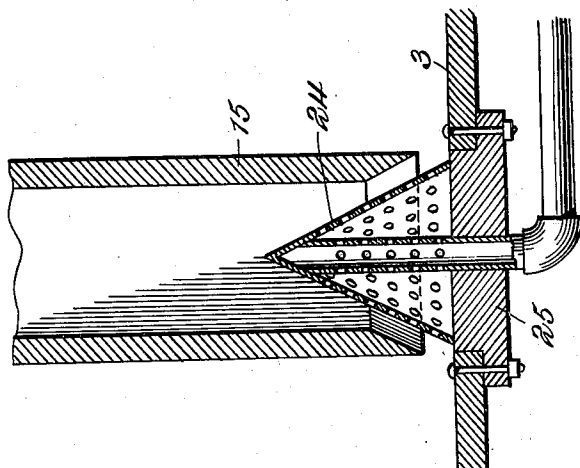
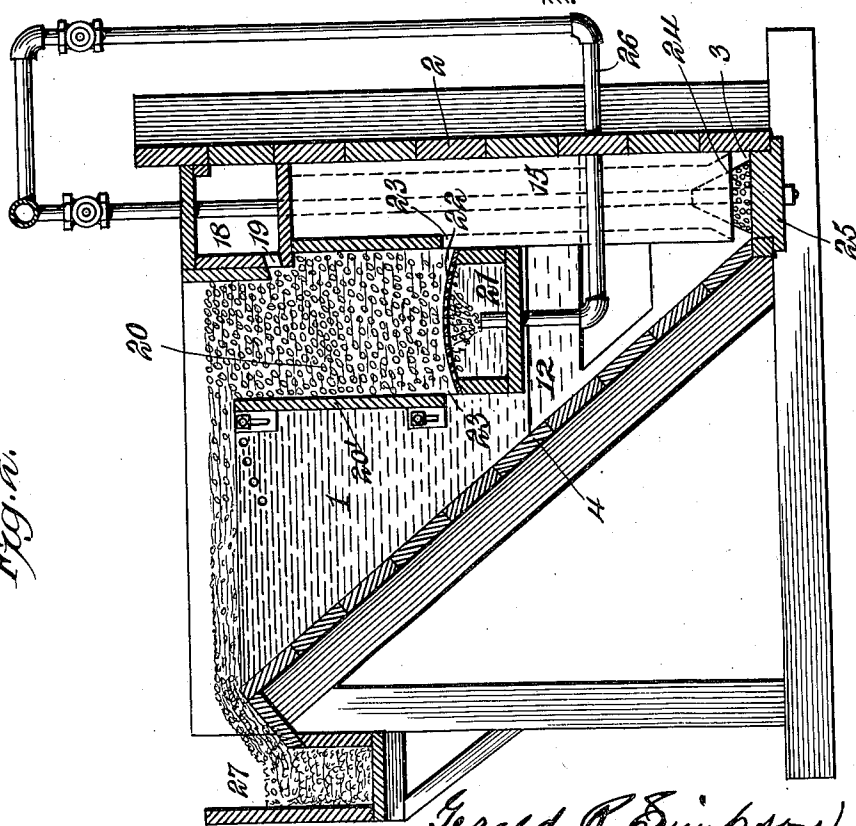


Fig. 2.



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PNEUMATIC FLOTATION CELL.

Application filed May 4, 1920. Serial No. 378,758.

To all whom it may concern:

Be it known that I, GERALD R. SIMPSON, a citizen of the United States, residing at Kingman, in the county of Mohave and State of Arizona, have invented certain new and useful Improvements in Pneumatic Flotation Cells, of which the following is a specification.

This invention relates to a pneumatic process of ore concentration and ore concentrators, and especially to concentrators operating on the flotation principle.

The object of my invention is to separate the valuable from the non-valuable particles of ore by feeding the material to the bottom of an air-lifting compartment, to which air under pressure is admitted for circulating, emulsifying and aerating the pulp, after which it is discharged into a distributing box, from whence it is discharged through ports into an agitating compartment provided at its bottom with a porous air mat, through which an air or gas is admitted under pressure, causing a bubbling action at this point which carries the sulphide or sulphidized particles in contact with the gas or air bubbles upwardly with the rising froth, while the gangue, or non-floatable particles may settle on either side of the mat, or filtering medium, to the bottom of the air lift, where the operation is repeated, the froth, in turn, being carried upwardly and across a quiet water-spitzkasten where any gangue material which may by chance have been carried with the froth is given an opportunity to settle to the bottom of the cell and is again treated, while the clean froth concentrate is discharged.

Another object of my invention is to construct a machine of this character which is entirely pneumatic, having no mechanical impellers, or the like, to dash or beat the pulp against the walls of the machine, causing excessive wear and tear, etc.

Fig. 1 is a front elevation, partly in section, of my device.

Fig. 2 is a transverse section thereof, on line 2—2 of Fig. 1.

Fig. 3 is an enlarged detailed view of a modified form of an air injector.

The machine preferably consists of a flotation cell, 1, which comprises a main vertical front wall, 2, a bottom, 3, and an outwardly and upwardly inclined rear-wall, 4, and vertical side-walls, 5 and 6, which, as indicated at 7 and 8, converge toward the

bottom, 3. 9 indicates a plurality of vertically arranged partitions, located between the front and rear walls, 2 and 4, which are adapted to extend upwardly in the cell a certain distance, thereby forming a plurality of compartments, 10, 11 and 12, these compartments being provided with additional inclined partitions, 13 and 14, which converge inwardly from the upper edge of the partition wall, 9, thereby converting the compartment into hoppers, the several inclined walls of the several compartments directing all materials beneath the air lift hereinafter described. Arranged along the end wall, 6, is the feed inlet 10' leading to the first compartment, 10.

Arranged in each of the compartments is a vertically arranged air lift, 15, having its lower end open and spaced from the bottom of the compartment, while directly above these air lifts is a distributing box composed of a plurality of compartments, 16, 17 and 18, provided with a plurality of outlet ports, 19, which lead into an agitating chamber 20 having arranged therebeneath a compartment 21. The lower compartment is provided with a covering consisting of a porous diaphragm, or air-mat, 22.

The upper compartment is provided at the bottom with longitudinal slots or openings, 23, extending the full length thereof directly above the air mat, whereby the settling gangue, or non-floatable particles in the upper compartment will be permitted to again settle to the bottom of the compartment passing out into the main cell 1 and settled to the bottom thereof and be again treated. The side wall or baffle, 20', of the compartment 20, is adjustably secured in a vertical position and if desired may be also placed at an incline, in order to assist in producing a suitable froth for the treatment of ores of various characters. The position of the air-mat is also adjustable for the same reason. A portion of the outlet ports, 19, are vertically over the adjoining compartment. Therefore, the settling gangue material is divided, a portion being re-treated in the same compartment, and a portion passing to the succeeding compartment. Suitable to the ore being treated these partitions can be so constructed as to convey any desired proportion of the material which has been treated in one air lift compartment to the following compartment.

As a means of causing the material to

raise in the air-lifting compartments, I preferably arrange below the lower open end of each an air-injector, 24, with sloping side walls constructed of a porous material or textile fabric, or perforated or slotted metal, to which air is admitted through a pipe leading downwardly through the air-lift, or through a pipe leading through the floor. The injector is preferably fitted to a plug, 25, which is inserted through the floor of the compartment, whereby the injector may be removed when desirable.

To effect a frothing agitation in the compartment, 20, an air-pipe, 26, leads to the compartment, 21, directly beneath the diaphragm or air-mat, 22, which, as mentioned, is porous, through which the air, or gas, is admitted under pressure slightly above that exerted by the weight of the column of water on the mat. The bubbles rise from beneath the cross-flow from the discharge ports, 19. At this point the sulphide particles, or sulphidized particles, come in contact with gas or air-bubbles and are carried into the rising froth, the gangue, or non-floatable particles, which did not chance to connect, with an air or gas bubble, may settle on either side of the air mat, or filter medium, 22, to the bottom of the air-lift. The froth arising from the agitating compartment, 20, passes over the baffle, or vertical wall 20', of the compartment and pass over a quiet space of water, commonly known as a water-spitzkasten, and while crossing the quiet water-spitzkasten any gangue or material which, by chance, may be carried with the froth is given an opportunity to settle and be re-treated, while the froth passes over into the launder, 27, where a clean froth concentrate is secured.

The discharge of the treated pulp is accomplished by means of a suitable gate operating in conjunction with an air-lift, which may be one that discharges into the last distributing compartment or one used solely for discharging purposes. As an auxiliary to this discharging device, I employ an overflow weir which maintains a definite water level within the body of the machine, and thus automatically provides additional discharging capacity which will accommodate a fluctuation in the volume of the feed, delivered to the body of the machine. The water discharged by the weir is taken from below the lower compartment 21 containing the air-mat, consequently no concentrate froth can be discharged by it. The sands or gangue material are carried by the air-lift to the main discharge gate, consequently no accumulation of sands can occur in the bottom of the machine.

While I have shown the main discharge gate at the end of the last air-lift, at or near the water level of the machine, an

important feature where head-room or grade is a matter of consequence, I do not wish to be limited to such a discharging device. Obviously a float controlled valve could be placed at the bottom of the machine, which would accomplish an effective discharge without the use of the air-lift, but would lose a certain amount of head-room, then, again, a separate air-lift, distinct from those employed to circulate the pulp within the machine, may be used solely for discharging purposes.

In operation the pulp enters through the feed compartment, 10', passes down on the inclined partitions to the bottom of the first air-lifting compartment, 10. At this point it is picked up by the air-lift, and is discharged through the ports, 19, in the first distributing box, 16, into the agitating compartment, 20, provided at its bottom with a porous air-mat, 22, through which air or gas is admitted under pressure, causing a bubbling action at this point which carries the sulphide or sulphidized particles to contact with the gas or air bubbles and rise upwardly with the rising froth, while a portion of the material settles downwardly through the openings, 23, into the air-lift compartments, to be again treated. The particles being carried off by the froth in turn being carried across a quiet water-spitzkasten where any gangue material which may, by chance have been carried with the froth is given an opportunity to settle to the bottom of the cell and again be treated, while the clean froth concentrate is discharged.

I claim:

1. A flotation cell having a distributing box arranged therein, compartments arranged adjacent to the distributing box and having an air-mat interposed therebetween, an overflow baffle board adjustable to vary the capacity and overflow level of the upper mat compartment, a froth decanting compartment adjacent to the baffle board and receiving the overflow thereover, and means for supplying air to the air-mat.

2. A flotation cell having a sloping bottom, a distributing box arranged in the upper portion of the cell, compartments arranged adjacent to the distributing box and having an air-mat interposed therebetween, an overflow baffle board adjustable to vary the capacity and overflow level of the upper mat compartment, a froth decanting compartment adjacent to the baffle board and receiving the overflow thereover, and means for supplying air to the air-mat.

3. A flotation cell having a sloping bottom, a distributing box arranged in the upper portion of the cell, and having outlets, air-lift conduits depending from the distributing box, means for supplying air under pressure to said air-lift conduits, compartments arranged adjacent to the distrib-

uting box and having an air-mat interposed therebetween, an overflow baffle-board adjustable vertically and laterally to vary the capacity and overflow level of the upper mat compartment, a froth decanting compartment adjacent to the baffle board and receiving the overflow thereover, and means for supplying air to the air-mat.

4. In an ore treating apparatus, a substantially V-shaped elongated tank subdivided to provide a plurality of compartments, each having a region at its top for the formation of a froth layer, a distributor box co-extensive with the said tank at one side of the top thereof, said distributor box being subdivided to provide a number of closed ended passages corresponding in number to that of the compartments of said tank and having its inside walls perforated throughout its

length, air lift conduits depending from said distributor box one into each compartment of said tank, means for supplying air under pressure to said air lift conduits whereby the latter function to transfer the ore pulp from one end of said tank to the other progressively of the compartments thereof, means for directing the flow of ore pulp discharged from the perforated wall of the distributor box to a point immediately below the lower end of the adjacent air lift conduit, and means for supplying air under pressure to each compartment of said tank below the level of the distributor box and vertically below the region of the froth layer formation for agitating the ore pulp in its flow therethrough.

In testimony whereof I affix my signature.
GERALD R. SIMPSON.