June 4, 1946. J. H. V. FINNEY 2,401,345

LIQUID FEEDING APPARATUS

Filed May 24, 1943 2 Sheets-Sheet 1

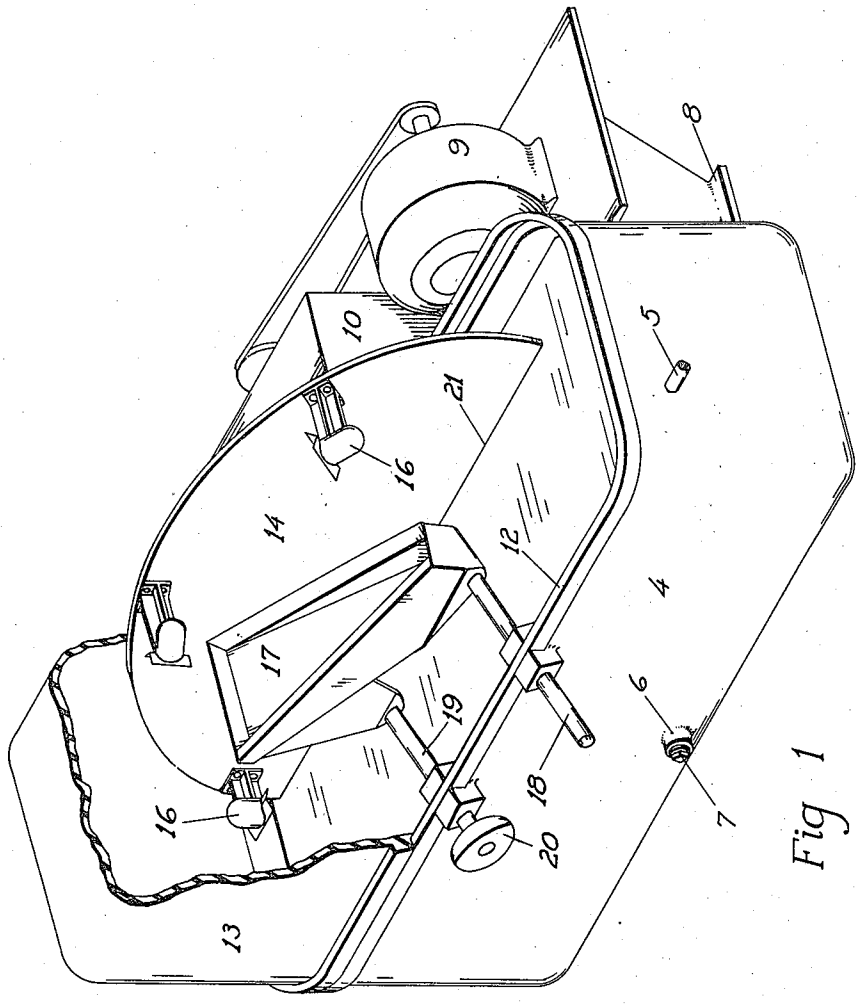

Fig 1

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LIQUID FEEDING APPARATUS

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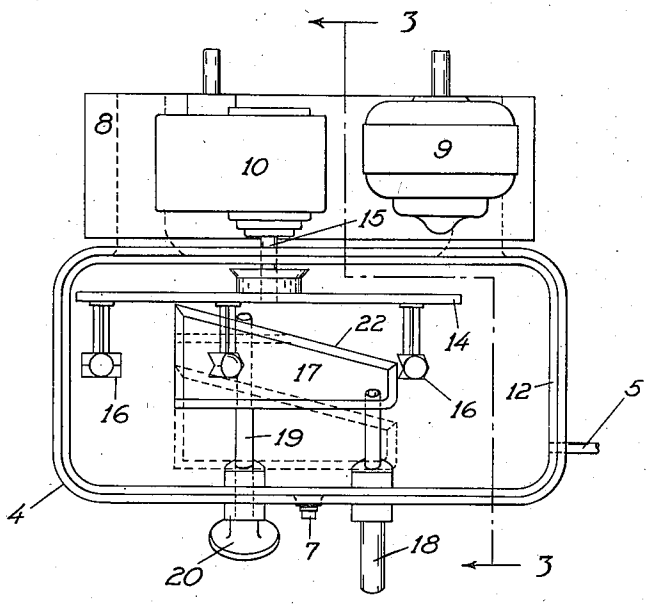

Fig. 2

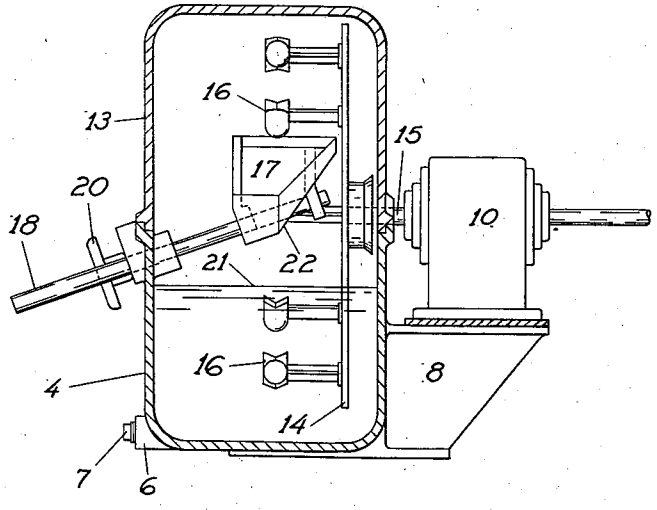

Fig. 3

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LIQUID FEEDING APPARATUS

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Application May 24, 1943, Serial No. 488,175

7 Claims. (Cl. 222—369)

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This invention relates to liquid feeding apparatus and more particularly relates to wet reagent feeders for use in froth flotation operations.

It is an object of the present invention to provide simple, durable and efficient mechanism for discharging liquid in a continuous flow that may be varied in minute graduations.

Another object of the invention is to provide a reagent feeder having means for varying the volume of the discharging feed.

A further object of the invention is to provide novel means for agitating and varying the discharge interval of a fluent reagent.

Other objects reside in novel details of construction and novel combinations and arrangements of parts, all of which will be described in the course of the following description.

The accompanying drawings illustrate a typical embodiment of the invention. In the drawings, in the several views of which like parts are designated similarly,

Figure 1 is a perspective, partially broken view of a reagent feeder embodying features of the present invention;

Figure 2 is a top plan view of the reagent feeder of Figure 1 with the cover removed; and

Figure 3 is a developed section taken along the line 3—3, Figure 2.

In the embodiment of the invention illustrated in the drawings, the reagent feeder comprises a tank 4 having an inlet 5 near its top and a lower drain outlet 6, normally closed by a plug 7. A base member 8 is formed integrally with the tank or otherwise fixed on its bottom and projects from the back of the tank to provide a support for a motor 9 and a speed reducer 10 driven thereby.

The top rim of the tank is shouldered to provide a seat 12 for a cover 13. A disk 14 is mounted for rotation on a shaft extension 15 of the speed reducer 10 and carries a series of cup members 16 disposed at uniformly spaced intervals adjacent its periphery. An inclined launder 17 is supported adjacent disk 14 by a tubular discharge outlet 18 and a lengthwise adjustable screw member 19, both of which extend upwardly at an acute angle to the front side of the tank and are journaled in the front side of the tank. A handle 20 is provided to facilitate turning screw 19 to move the launder 17 upwardly and toward or downwardly and away from disk 14.

In use, the tank 4 is mounted at the top of a flotation cell with the end of spout 18 overhanging the cell. A liquid, such as a flotation reagent, is introduced into the tank 4 until it submerges

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the lower portion of disk 14 to a level approximating the level 21 shown in Figure 3. The motor 9 and speed reducer 10 are then started to rotate disk 14 which causes the cups 16 to dip into the liquid and thereafter spill their contents into launder 17.

In order to vary the volume of liquid delivered into launder 17, the side of the launder adjacent disk 14 is inclined as shown at 22 so that it slants upwardly from right to left as shown in Fig. 1 and is at an acute angle with respect to the plane of the disk 14, the right end being farther from the disk than the left end as shown in Fig. 2. By moving the launder under control of screw 19 toward or away from disk 14, to different parallel positions, the quantity of liquid received by the launder from the spilling cups is varied as determined by the position of the intersection of the wall 22 and the plane of rotation of the cups 16, and thus varies the volume delivered through outlet 18 during each revolution of disk 14. It will be seen that when the launder is in its highest position, its lower end is at the intersection with the plane of the cups 16, and when the launder is in its lowest position, its upper end is at the intersection; this arrangement thus provides some degree of compensation for the differences in the height from which the liquid leaves the cups. The falling liquid is, therefore, divided by the edge of the launder at about the same distance from the cups in all positions of the launder; this facilitates the uniform and accurate control of the rate of flow of liquid into the launder.

The rotation of disk 14 agitates the liquid sufficiently to prevent density variations within the liquid body, and to maintain any solids in the liquid in suspension. The spilling of the liquid from cups 16 into launder 17 creates a head over outlet conduit 18 which insures a constant feed to the flotation cell.

Sometimes it will be necessary to feed heavy liquids with the reagent feeder of the present invention. Under such circumstances, it will be desirable to change the position of the cups 16, so that they will drain completely while in overhanging relation to launder 17.

If desired, the cups may be mounted on disk 14 for angular adjustment to change their spilling positions relative to launder 17. With such an arrangement, the positions of the cups 16 may be easily adjusted to accommodate a variety of reagents. However, in most instances, the feeder mechanism will be used with a single reagent combination only, and an initial setting of cups

16 will suffice to meet requirements of the treatment.

The range of launder movement is indicated in Figure 2 in which the dotted line represents one extreme in the range of movement, and the solid line representation indicates the other extreme position. It will be noted that the cups 16 have a uniform course of movement in the actuation of the mechanism and the movement of the trough relative to this course of movement determines what portion of the contents of the cups is delivered to the launder. Thus in the dotted line position, the trough receives only a fraction of the contents spilled by the cups, whereas in the solid line position substantially the entire content is delivered to the troughs.

The volume or head of liquid in the launders determines the rate of discharge through outlet 18 and this is independent of the volume or head of liquid in tank 4 so long as there is sufficient liquid therein to fill the cups. In this connection, the feed to the tank through inlet 5 may be continuous subject to valve regulation to prevent overflowing, or it may be intermittent to replenish the tank supply whenever it has become substantially exhausted.

The screw actuation through the medium of handwheel 20 permits a precise variation in the position of launder 17, and when it is desired to make an adjustment the cover is readily removable to permit visual observation of the variations. Because the control is dependent upon the positioning of parts, a constant speed drive is preferable, and substantial variations in the volume and rate of feed can be attained by the change in launder position alone. However, if desired, the motor and speed reducer assembly may be of the type permitting variations in the rate of rotation of disk 14.

Whenever it becomes necessary to change the reagent composition the mechanism is stopped and the plug 7 is removed from drain opening 6 to permit removal of the contents of the feeder. The disk 14 can be rotated after opening of the plug to insure spilling of any reagent in cups 16 so that complete removal is attained. The plug is inserted in outlet 6 after the liquid has been removed and the mechanism is then ready for a new operation.

While the invention has been described with particular reference to wet reagent feeding, it will be understood that it is suited for other uses such as the chemical industry where it is desired to mix a measured quantity of liquid with other liquid or solid matter in a continuous operation.

The design and arrangement of parts permits utilization of a variety of materials in forming the several parts. Preferably the tank, cover, cups, launder and disk are cast metal, but when corrosive substances are to be handled, these parts may be made of glass, plastics or ceramics, and for other purposes rubber or rubber substitutes may be employed.

Preferably the outlet member 18 will be formed of two tubes in telescopic arrangement, in which event the outermost section serves as a guide for the innermost section to simplify the movements under control of handwheel 20 to effect the precise adjustments required.

While the disk and cup assembly constitutes a preferred arrangement of parts, said assembly is in fact an endless conveyor having a lower intake and an upper discharge in overhanging relation to the launder. The essential feature is that

the tank liquid is taken in uniform volume and at a uniform rate from the tank supply to a fixed point of discharge above the launder, which launder may be moved relative to said fixed discharge point to vary the amount of liquid delivered to the launder. Other mechanism performing these functions may be substituted within the spirit of the invention.

Changes and modifications may be availed of within the spirit and scope of the invention as defined in the hereunto appended claims.

What I claim and desire to secure by Letters Patent is:

1. Apparatus for feeding fluids, comprising a tank containing fluent matter, a receptacle having a straight edge and being disposed in the tank above the level of fluent matter therein and having an outlet extending outside the tank for gravity discharge of said fluent matter, a rotary conveyor in the tank for elevating fluent matter in uniform volume and discharging it by gravity over the receptacle along a path intersecting said edge at an acute angle, and means for changing the position of the receptacle bodily in the tank while maintaining said edge at substantially the same angle to said path of discharge to vary the amount of fluent matter deposited therein.

2. In a device of the character described, a tank containing fluent matter, a receptacle disposed above the fluent matter and having an outlet conduit extending to a point outside the tank for gravitational discharge of matter deposited in the receptacle, a conductive system in the tank for delivering fluent matter along a fixed line of discharge above the receptacle, and means for moving the receptacle bodily along a straight path relative to said fixed line of discharge to vary the amount of fluent matter deposited therein, said outlet conduit being constructed and arranged to move bodily with said receptacle and constituting a guide for movement of said receptacle with respect to said tank.

3. Apparatus for feeding fluids, comprising a tank containing fluent matter; a receptacle having an inclined bottom and an open top disposed above the level of fluent matter in the tank; an outlet conduit leading from the lower end of said receptacle and extending through said tank; adjusting means connected with said receptacle and extending through the tank in parallel relation to said outlet conduit and operable from outside said tank to move said receptacle bodily to different substantially parallel positions; and mechanism in said tank for elevating fluent matter and discharging it by gravity above said receptacle.

4. Apparatus for feeding fluids, comprising a tank containing fluent matter; a receptacle having an open top disposed above the level of fluent matter in said tank and having an outlet extending outside said tank; mechanism for elevating fluent matter in said tank and discharging it by gravity over said receptacle along a path extending at an acute angle to one edge of said receptacle; and means for moving said receptacle bodily to different substantially parallel positions to change the point of intersection of said edge and said path and vary the quantity of fluent matter received by said receptacle, said edge of said receptacle being inclined at an acute angle to the direction of movement of said receptacle during change in position thereof.

5. Apparatus for feeding fluids, comprising a tank containing fluent matter; mechanism having a discharge portion movable in a plane for

elevating fluent matter in said tank and discharging the same above the level of fluent matter in said tank; a receptacle normally disposed in a position to receive fluent matter discharged from such mechanism and having an open top with an upper edge thereof disposed at an acute angle to the plane of movement of the discharge portion of said elevating mechanism, said edge being adapted to cause a greater or lesser proportion of the discharged fluent matter to flow into said receptacle and the remainder of said discharged fluent matter to flow back into said tank in accordance with the position of said receptacle; and means for moving said receptacle bodily toward and away from said elevating mechanism and for maintaining said edge at substantially the same angle with respect to said plane in all positions of said receptacle.

6. Apparatus for feeding fluids, comprising a tank containing fluent matter; elevating mechanism having a discharge portion movable from within the body of fluent matter to discharge points above the body of fluent matter, and adapted to discharge fluent matter so that the path of discharge of fluent matter lies substantially in a plane; a receptacle disposed beneath said discharge points and having an edge extending at an acute angle to such plane of discharge, said edge, in predetermined positions, being adapted to divide such discharged fluent matter into a portion passing into said receptacle and another portion passing back into said body of fluent matter; and means for moving said receptacle bodily so as to vary the amount of fluent matter passing into said receptacle, while maintaining said edge at substantially the same acute angle to said plane of discharge.

7. Apparatus for feeding liquids comprising a tank containing liquid, a receptacle disposed in said tank above the level of liquid therein and having an outlet extending outside said tank, said receptacle having a wall provided with a straight upper edge, a rotary conveyor arranged to rotate in a vertical plane in said tank for elevating liquid in uniform volume and for discharging the liquid by gravity from points along an upwardly extending arc of a circle, the path of liquid falling from said conveyor intersecting said edge at an acute angle, and means for changing the position of said receptacle bodily in said tank while maintaining said edge at substantially the same acute angle to said path, said edge also being inclined upwardly in the direction of said arc of discharge of the liquid to provide compensation for differences in elevation of the points of discharge.

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