Dec. 25, 1923. 1,478,674

E. S. PETTIS

DECANTING MACHINE

Filed Feb. 12, 1919 3 Sheets-Sheet 1

Fig. 1.

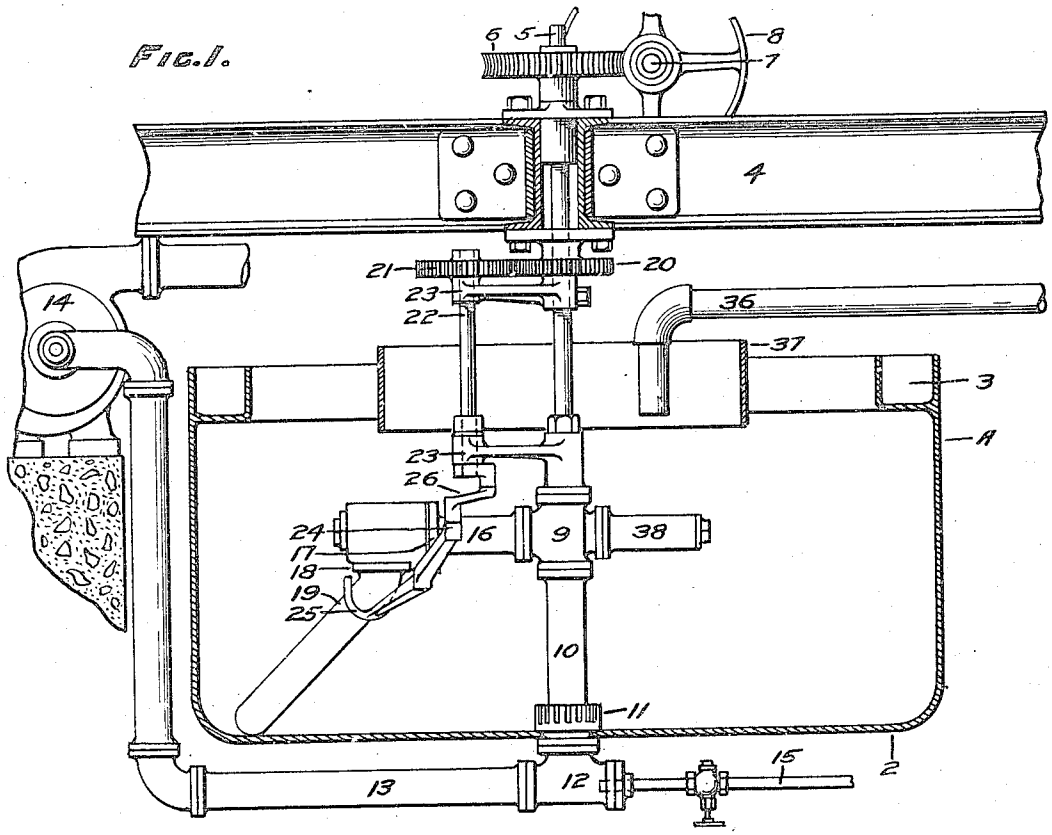
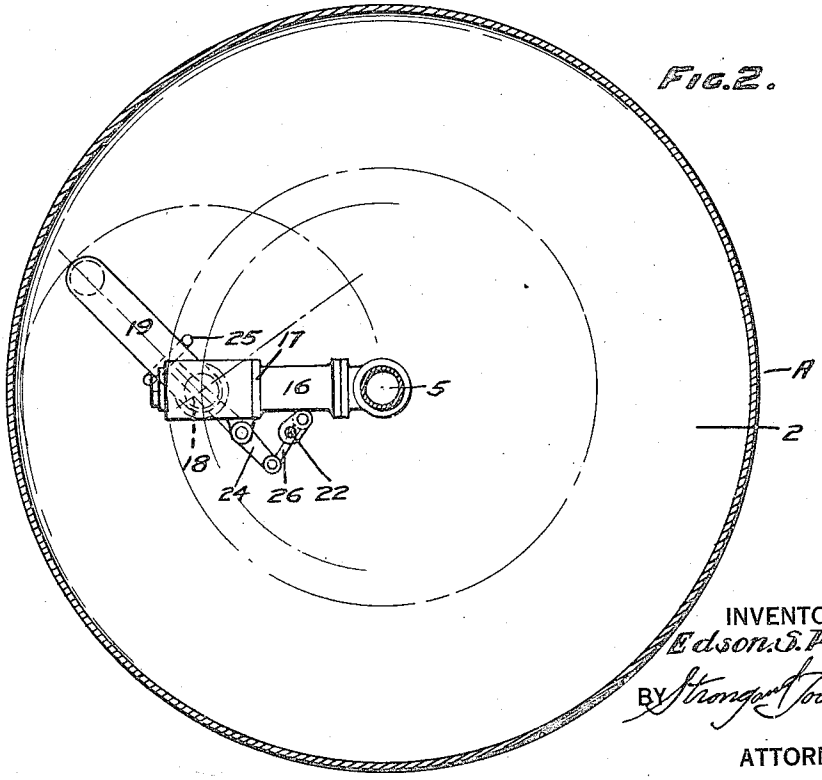



Fig. 2.




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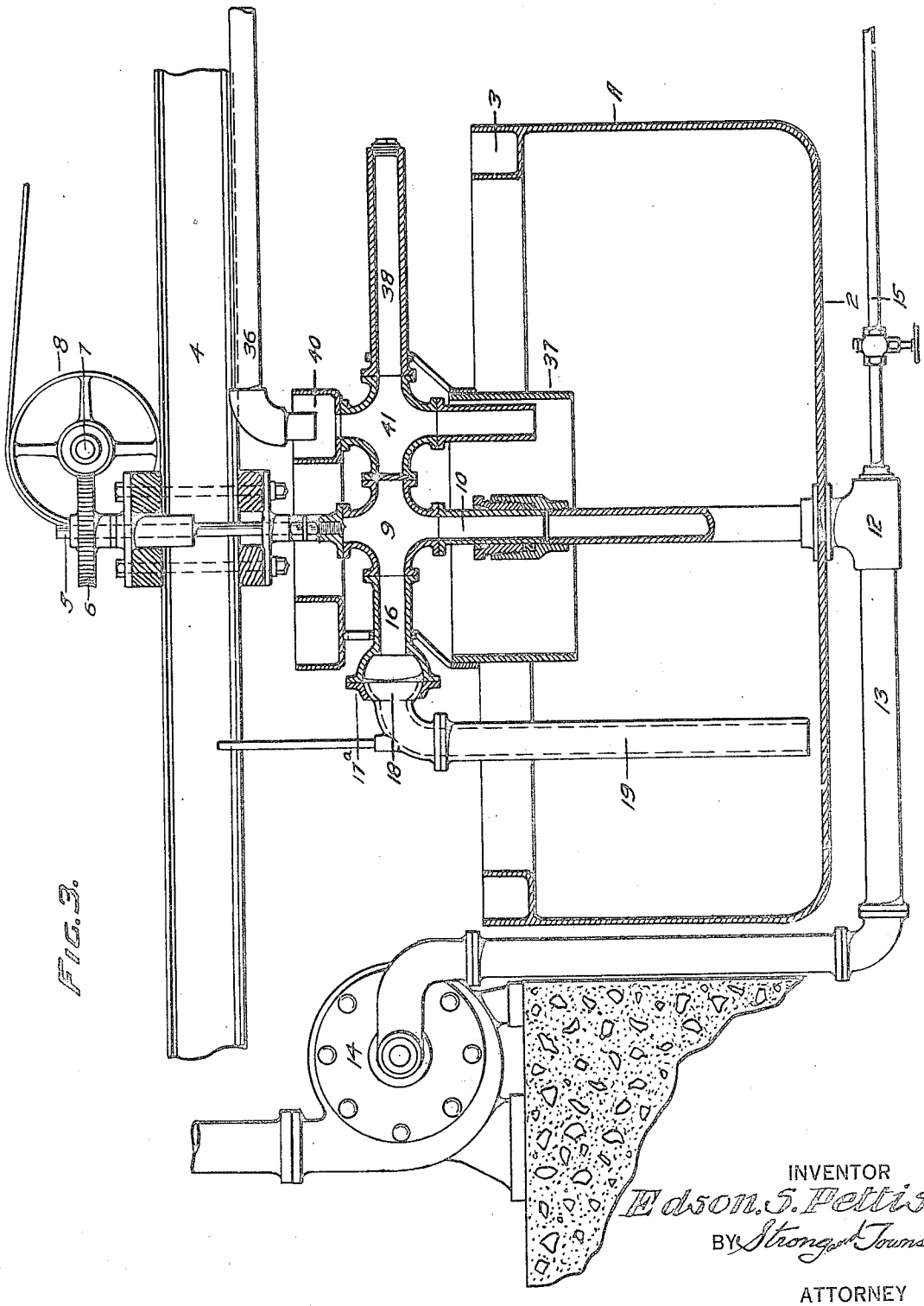



FIG. 3.

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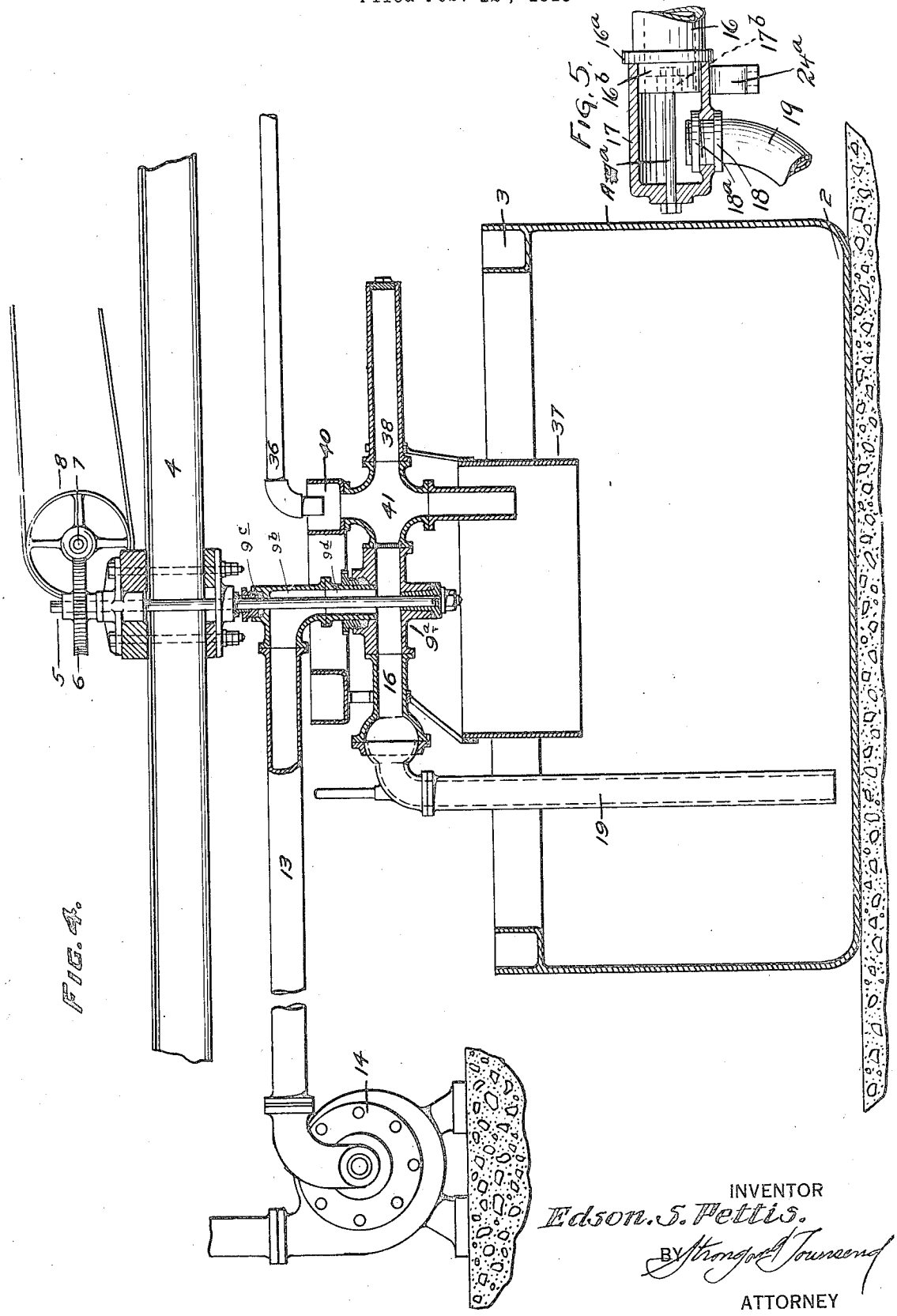



Fig. 4.

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# UNITED STATES PATENT OFFICE.

EDSON S. PETTIS, OF MILL VALLEY, CALIFORNIA.

## DECANTING MACHINE.

Application filed February 12, 1919. Serial No. 276,653.

*To all whom it may concern:*

Be it known that I, EDSON S. PETTIS, a citizen of the United States, residing at Mill Valley, in the county of Marin and State of California, have invented new and useful Improvements in Decanting Machines, of which the following is a specification.

This invention relates to the construction of pulp-thickening or decanting apparatus, particularly adapted to be used in the wet treatment of ores and the like.

One of the objects of the present invention is to provide a decanting apparatus which is simple in construction, positive and efficient in operation and from which the treated slimes or pulp may be intermittently or continuously discharged. Another object of the invention is to provide a rotating discharge member for removing the settled pulp, said discharging member being vertically and horizontally movable during rotation. Further objects will hereinafter appear.

The invention consists of the parts and the construction, combination and arrangement of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Fig. 1 is a central vertical section through one form of the apparatus.

Fig. 2 is a partial plan view of the same.

Fig. 3 is a view similar to Fig. 1, showing a modification of the same.

Fig. 4 is a view of another modification in which the suction discharge pipe is universally movable during rotation.

Fig. 5 is a detail sectional view showing the construction of the swivel members 17 and 18 as disclosed in Fig. 1.

Referring to the drawings in detail, A indicates a settling tank of circular form provided with a flat bottom 2 and an annular overflow or discharge launder 3. Disposed above the tank is a frame 4 and supported by said frame and journaled therein is a drive shaft 5 on which is secured a worm-gear 6 driven by means of a pinion secured upon the shaft 7 which is driven from any suitable source of power through a pulley 8.

Secured on the lower end of the shaft 5 is a T-fitting 9 and forming an extension of said fitting is a nipple 10 which enters a stuffing box 11 secured on the bottom of the tank. The T-fitting 9 is secured on the end of the shaft 5 and therefore rotates in unison with the same, the speed of revolution being, however, so slow that agitation of the settling pulp is prevented. Connected with the stuffing box or forming a part thereof is a T-fitting 12, one end of which is connected through a pipe 13 with a suction pump 14 while the opposite end is connected with a pipe 15 through which water under pressure may be supplied, as will hereinafter be described.

Connected with the fitting 9 and rigidly secured thereto is a horizontally disposed pipe 16. Mounted on the outer end of this pipe is a pair of swivel couplings 17 and 18 and attached to one of said couplings is a downwardly extending angularly disposed suction pipe 19. One of the couplings provided or that indicated at 18 permits horizontal movement of the suction pipe 19 while the other coupling permits vertical movement, the object sought being to permit both vertical and horizontal movement of the suction pipe 19 during the rotation of the shaft 5 and the parts attached thereto.

The horizontal movement transmitted to the suction pipe 19 is obtained in the following manner: Secured to the frame 4 is a gear 20 through which the shaft 5 extends. This gear is stationary and meshes with a gear 21 secured upon a crank shaft 22. The crank shaft 22 is journaled in bracket members 23, which are secured to the shaft 5 and rotate therewith. Rotation of the shaft 5 and the bearing brackets 23 imparts a planetary movement to the shaft 22 and the gear 21 carried thereby, thus causing this to rotate one or more revolutions during one revolution of shaft 5, the number of revolutions imparted depending upon the gear ratios provided. The rotating movement of the crank shaft is in this instance employed for the purpose of transmitting a horizontal swinging movement to the suction pipe 19. This is accomplished by pivotally mounting a rocker arm 24 on the outer end of the pipe 16. One end of this rocker arm is fork-shaped as at 25 to permit it to straddle the suction pipe 19 while the opposite end of the arm is connected by means of a rod 26 with the crank formed on the shaft 22. The revolving movement of the crank shaft thus transmits an oscillating movement to the suction pipe 19 and as an odd number of teeth are employed in the gears 20 and 21, it can be seen that the suction pipe will pass over the entire bottom area of the tank during

the revolution of the shaft 5 and the parts attached thereto, as the path of travel of the suction pipe is constantly changing its position and will thus pass over different portions of the bottom section while it is oscillating and traveling with the shaft 5.

The swivel members 17 and 18 which are shown in detail in Fig. 5 are constructed as follows:

The pipe 16 is flanged as indicated at $16^a$ and has a short extension $16^b$ upon which the swivel member 17 is turnably mounted; the swivel member 17 being secured on the extension $16^b$ and abutting the flange $16^b$ by means of a centrally disposed rod $17^a$. This rod is fastened in the web $17^b$ extending across the mouth of the extension $16^b$. A nut is placed on the outer end of the rod and secures the swivel member 17 against endwise movement, but it permits a free turning movement of the swivel member 17. The pipe 19 is secured to the swivel member. This member enters the bottom of the member 17 and is turnably mounted therein, being held against endwise movement by a collar $18^a$. The swivel 18 permits horizontal swinging movement of the pipe 19 across the bottom of the tank, while the swivel 17 permits vertical movement of the pipe 19 about the pipe 16, which is connected and supported by the T-fitting 9. The arm 24 is pivotally mounted and supported by a bracket extension $24^a$. This bracket is formed as an extension of the flange $16^a$. One end of the arm 24 is fork shaped as shown at 25 and straddles the suction pipe 19. The opposite end of the arm 24 is connected by means of the link 26 with the crank arm secured on the lower end of the shaft 22; this shaft being rotated by means of the gears 20 and 21 as previously described.

In actual operation the pulp to be treated is delivered through a launder or pipe 36. The pulp discharging passes through a suspended cylindrical-shaped hopper 37 which is concentric with relation to shaft 5. The tank is kept full to overflowing during continuous operation and the product delivered by the pipe 36, discharges directly into the hopper or open-ended cylinder 37.

From this partly submerged vertical cylinder the solids immediately begin to gravitate to the bottom of the tank while the clarified liquor flows to the tank periphery, overflowing into the circular launder 3, from where it may be conveyed to any suitable point of discharge. By regulating the pump suction or outlet of the discharge pipe the settled solids are removed from the tank bottom as rapidly as deposited, the quantity of flow from the bottom discharge being maintained so as to obtain a clear liquor overflow; the dilution discharged will depend on the amount of original feed; that is, its dilution, nature of solid contents, temperature and other factors. The interior suction pipes 10, 16 and 19 which convey the settled solids from the tank, continually revolve but the motion is slow and will therefore not stir or agitate the settling solids.

A pipe 15 is connected through a stuffing box with the lower end of the pipe 10. Water under pressure may be delivered through this pipe or air may be delivered. Means are therefore provided for blowing or cleaning out the suction connections if they should become clogged. All connections can therefore be kept perfectly free and a continuous and uniform discharge maintained.

The water admitted, through pipe 15, may also be employed for washing or diluting the pulp removed by the pump 14.

By referring to Fig. 3, which is a modification of the form of apparatus shown in Figs. 1 and 2, it will be seen that the mechanism employed in the first instance for imparting a horizontal movement to the suction pipe 19 is eliminated. A universal connection $17^a$, however, is employed and pipe 19 is provided with a handle so that its position may be manually adjusted from the top of the tank. It will also be seen that the partially submerged cylinder 37 rotates with the T-fitting 9 and that due to this fact it is necessary to provide an annular feed launder 40 into which pulp may discharge. This launder revolves with the structure shown, being supported by the central T-fitting 9 and a discharge fitting 41. The operation of this apparatus is identical with that shown in Fig. 1, the only difference being the simpler form of mechanism and the fact that movement of the suction pipe during rotation must be manually adjusted. Again, by referring to Fig. 4, a still further modification is shown. The centrally disposed suction pipe is in this instance turned upwardly and connected with the suction pump 14; the suction pipe 19 is in this instance provided with a universal joint, which permits universal adjustment. The universal joint is secured to a T-fitting $9^a$, through which the shaft 5 extends, the shaft being secured in the lower end of the T-fitting to permit the T-fitting the universal fitting, the pipe 19, the discharge pipe 41, and the receiving launder 40 to revolve in unison therewith. The pipe 13 is connected with an elbow fitting $9^b$ which is held stationary by means of the pipe 13. This elbow fitting is provided with a stuffing box $9^c$ at its upper end through which the shaft 5 extends and the lower end of the elbow fitting extends into a stuffing box $9^d$ which is formed in the upper end of the T-fitting $9^a$. This arrangement permits the material elevated by the suction pipe 19 to pass through the T-fitting $9^a$, the elbow

$9^b$ and pipe 13, which is directly connected with a pump 14 and it will at the same time permit the shaft 5 to transmit a rotary movement to the fittings by which the suction pipe 19 is supported. The suction pipes are in all instances free to move vertically as this is of considerable importance, particularly when intermittent discharge is required. For instance, the settling tank may be employed as a partial storage tank and pulp admitted thereto may settle until the overflow begins to show escape of settling pulp. The pump can then be started and the power applied, thus permitting the suction pipe to remove the pulp. This pipe should be held in the horizontal position while the tank is being filled with pulp and it is only dropped down on the pulp surface when it is desired to empty the tank of the solids settled therein. It will therefore ride on top of the pulp and gradually remove the same and as it is vertically movable it can readily be seen that it will settle down and down as the pulp is removed, finally riding on the bottom when the tank is about empty. Where the suction pipe is provided with only one universal joint, as shown in Fig. 4, a small amount of pulp will remain.

One of the main advantages obtained in the present instance is the fact that the apparatus may be operated continuously, if desired, or intermittently, if desired. Its range of application and use is therefore greater than most standard forms of decanting apparatus now employed. Another advantage is the economy obtained as far as power consumption is concerned. Where scrapers, plows, rakes and like devices are employed, considerable power is consumed, due to the fact that such devices have a tendency to become clogged with the settling pulp and in some instances buried therein. Such apparatus require considerable power when starting up and in many cases causes twisting of shafts or breakdowns which in the present instance is obviated as the suction pipe will always ride on the surface of the settling pulp and does not have to plow or be forced through the same. In fact, intermittent operation of decanting apparatus employing rigid horizontal suction pipes, plows, scrapers and the like, is practically impossible, due to the objections above mentioned.

The present form of apparatus may employ an overflow launder such as shown. The fork-shaped arm through which horizontal swinging movement is imparted to the suction pipe 19 is of considerable importance as it permits vertical movement of the suction pipe during rotation; that is, it permits the suction pipe to settle downwardly as the pulp is being discharged, without in any way affecting the mechanism through which the horizontal swinging movement is transmitted. It furthermore permits the suction pipe to be raised entirely out of the tank when not in operation, this operation being possible not only with the structure shown in Fig. 1 but also in the modifications shown.

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

1. The combination with a settling tank, of a rotatable conduit member centrally mounted therein, and an extension conduit member secured thereto, the outer end of said extension conduit being vertically and horizontally movable independently of the centrally mounted conduit.

2. The combination with a settling tank of a revoluble member centrally mounted therein, a suction arm secured to said member and rotatable therewith and a second suction arm connected with the outer end of said first named arm, adapted to move horizontally and vertically with relation to the bottom of the tank during the revolution of the first-named arm.

3. A decanting apparatus comprising a settling tank, a frame mounted adjacent the same, a shaft journaled in said frame and centrally positioned with relation to the tank, a suction pipe adapted to rotate in unison with said shaft, a second suction pipe carried by the first named suction pipe and horizontally and vertically movable with relation thereto and means for imparting a horizontal oscillating movement to said last named suction pipe during the revolution of the shaft and the first named suction pipe.

4. A decanting apparatus comprising a settling tank, a frame mounted adjacent the same, a shaft journaled in said frame and centrally positioned with relation to the tank, a suction pipe adapted to rotate in unison with said shaft, a pair of universal joints mounted on the free end of the suction pipe, a second suction pipe attached to one of said swivel joints, said swivel joints permitting horizontal and vertical movement of the second suction pipe, and means for imparting a horizontal oscillating movement to the second suction pipe during the rotation thereof.

5. A decanting apparatus comprising a settling tank, a frame mounted adjacent the same, a shaft journaled in said frame and centrally positioned with relation to the tank, a suction pipe adapted to rotate in unison with said shaft, a universal joint on the free end of the suction pipe, a second suction pipe attached to said universal joint, said universal joint permitting vertical movement of the pipe and a suction pump connected with said suction pipes.

6. A decanting apparatus comprising a

settling tank, a frame mounted adjacent the same, a shaft journaled in said frame and centrally positioned with relation to the tank, a suction pipe adapted to rotate in unison with said shaft, a universal joint on the free end of the suction pipe, a second suction pipe attached to said universal joint, said universal joint permitting vertical movement of the pipe, a suction pump connected with said suction pipes, and means for admitting air or water under pressure to the suction pipes.

7. A decanting apparatus comprising a settling tank, an annular overflow launder supported thereby, a revoluble suction discharge member centrally positioned in said tank, an extension conduit on said revoluble suction discharge member and rotatable in unison therewith, means permitting vertical movement of the outer end of said extension conduit as the accumulation of settling pulp in the tank increases or decreases, and means permitting a horizontal oscillating movement of said suction member during the revolution thereof substantially as described.

8. A decanting apparatus comprising a settling tank, an annular overflow launder supported thereby, a revoluble suction discharge member centrally positioned in said tank, an extension conduit on said revoluble suction discharge member and rotatable in unison therewith, means permitting vertical movement of the outer end of said extension conduit as the accumulation of settling pulp in the tank increases or decreases, and power actuated means for transmitting a horizontal oscillating movement to said suction member during its revolution.

9. A decanting apparatus comprising a settling tank, a revolvable suction discharge pipe vertically and centrally positioned in said tank, a suction arm supported by said pipe and extending radially therefrom at a point above the pulp level in the settling tank, and a second suction pipe depending from said suction arm.

10. A decanting apparatus comprising a settling tank, a revolvable suction discharge pipe vertically and centrally positioned in said tank, a suction arm supported by said pipe and extending radially therefrom at a point above the pulp level in the settling tank, a second suction pipe depending from said suction arm and horizontally and vertically movable with relation thereto.

11. A decanting apparatus comprising a settling tank, a revolvable suction discharge pipe vertically and centrally positioned in said tank, a suction arm supported by said pipe and extending radially therefrom at a point above the pulp level in the settling tank, and a second suction pipe depending from said suction arm and universally movable with relation thereto.

12. A decanting apparatus comprising a settling tank, a revolvable suction discharge pipe vertically and centrally positioned in said tank, a suction arm supported by said pipe and extending radially therefrom, and a second suction pipe depending from the suction arm.

13. In an apparatus of the character described, a tank, a rotatable conduit member therein, an extension conduit connected and rotatable in unison therewith, and means permitting horizontal movement relative to the rotatable conduit and also vertical movement of one end of the extension conduit.

14. In an apparatus of the character described a tank, a rotatable conduit member mounted therein, and an extension conduit connected and rotatable in unison therewith, the free end of said extension conduit being movable transverse of its circular movement during the turning movement of the centrally revoluble member.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

EDSON S. PETTIS.

Witnesses:
ALBERT W. HINZ,
N. C. WILSON.