Feb. 25, 1936. A. C. DAMAN 2,031,590

FLOTATION APPARATUS

Filed Oct. 5, 1931 2 Sheets-Sheet 1

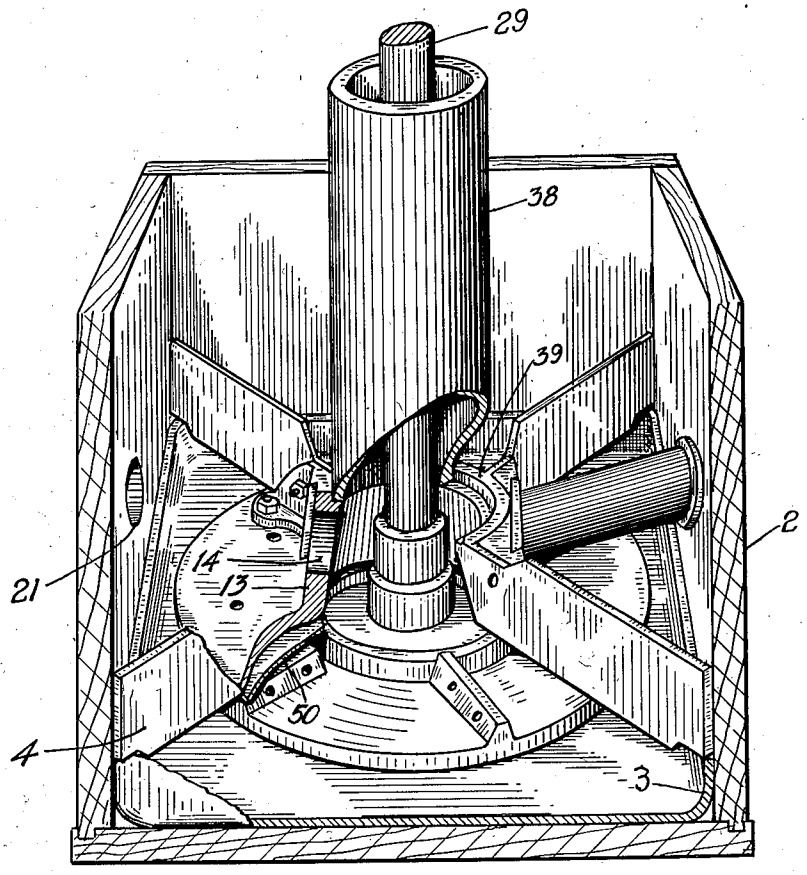


Fig. 1.

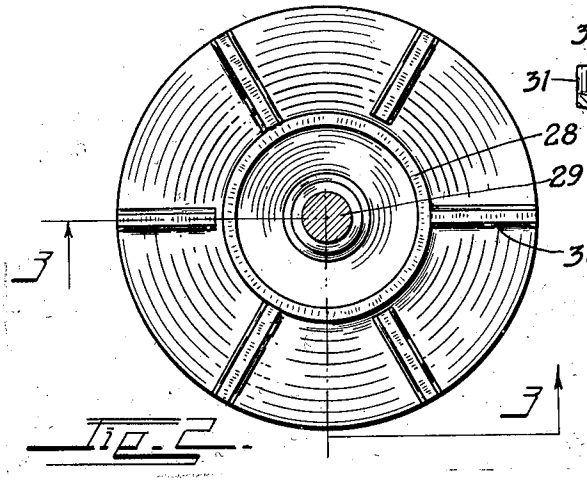


Fig. 2.

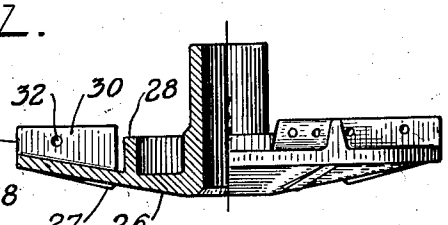


Fig. 3.

INVENTOR.
Arthur C. Daman
BY
Rollandet & Stratton
ATTORNEYS

Feb. 25, 1936. A. C. DAMAN 2,031,590

FLOTATION APPARATUS

Filed Oct. 5, 1931 2 Sheets-Sheet 2

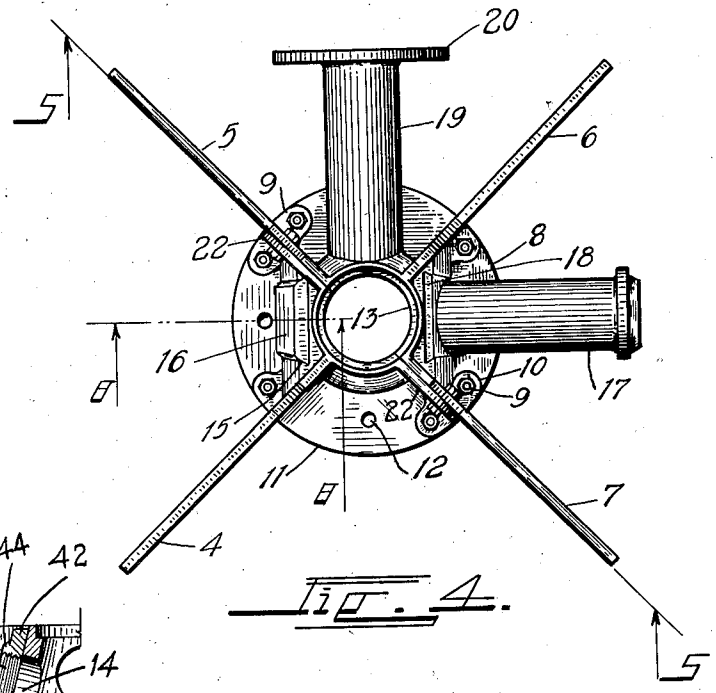


Fig. 4.

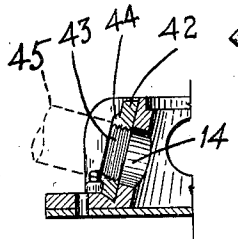


Fig. 8.

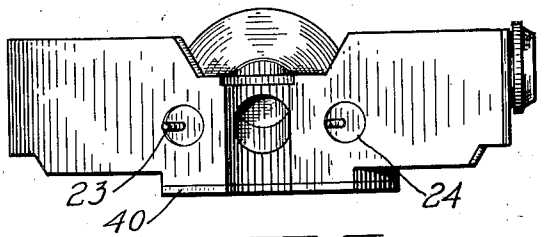


Fig. 5.

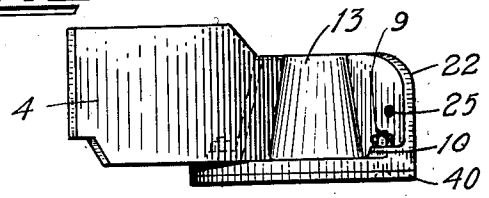


Fig. 6.

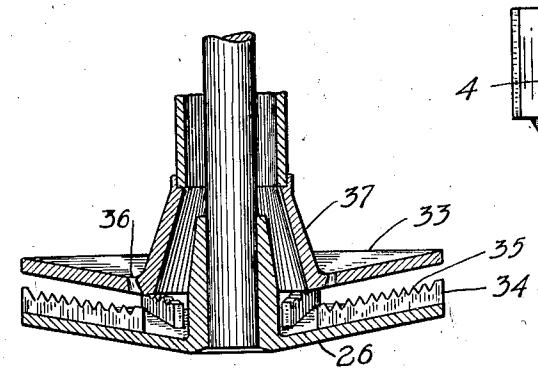


Fig. 7.

INVENTOR.
Arthur C. Daman
BY
Rollander & Stratton
ATTORNEYS.

Patented Feb. 25, 1936 2,031,590

UNITED STATES PATENT OFFICE

2,031,590

FLOTATION APPARATUS

Arthur C. Daman, Denver, Colo.

Application October 5, 1931, Serial No. 566,987

20 Claims. (Cl. 261—93)

My invention relates to flotation apparatus. An important object of the present invention is to provide an impeller for such an apparatus that may be easily removed for repairs or replacement.

Another object is to provide a sectional hood for the impeller, to facilitate removal of the impeller, by removing a section of the hood.

A further object is to reduce the height of the peripheral edge of the impeller blades, and thereby reduce the required horse-power, without reducing the capacity of the impeller.

Still another object is to provide means for impinging two streams of material, one upon the other, whereby to produce a more intimate mixture of air, pulp and reagents.

Another object is to prevent material from lodging under the impeller.

Further objects of my inventiin reside in novel details of construction and in novel combinations and arrangements of parts, which will appear in the course of the following description. In the drawings, like reference characters designate similar parts in the several views.

Figure 1 is a perspective view of an embodiment of my invention.

Figure 2 is a plan view of an impeller comprised in said embodiment.

Figure 3 is a section taken on the line 3—3 of Figure 2.

Figure 4 is a plan view of a hood, baffles and associated parts, included in the invention.

Figure 5 is an elevation taken on the line 5—5 of Figure 4, after a section of the hood and a baffle have been removed.

Figure 6 is an elevation of the removed hood section and baffle.

Figure 7 is a vertical, sectional view of a modified construction of the present invention.

Figure 8 is a section taken on the line 8—8 of Figure 4, showing a modified construction.

Referring more in detail to the drawings, the reference character 2 designates generally the walls of a rectangular flotation cell. A bowl 3, having the general contour of the interior of the cell, is disposed in the bottom thereof.

Upright baffles 4, 5, 6 and 7 project into the corners of the cell, to prevent their lateral movement, and rest on the upper edge of the bowl. Three of the baffles, 5, 6 and 7, are integral with a section 8 of a sectional hood, to provide a unitary structure. The hood sections carry bosses 10. Bolts 9, extending through the bosses, fasten replaceable, linings 50 on the under side of the hood sections.

The other baffle 4 is similarly bolted upon the other section 11 of the sectional hood, each of the hood sections being substantially half of the hood. The hood has recirculation holes 12. The section 11 has flanges 22 for connecting with the baffles 5 and 7. Bolts 23 for such connection project through holes 24 and 25 in the baffles and flanges respectively. The hood sections carry complementary, hollow hub members 13 that flare outwardly in the interior, from the top to the bottom, to distribute the feed material upon an impeller hereinafter to be described. The hollow hub has openings 14 therethrough for the return of feed material, such as middlings. Dove-tail grooves 15 are provided at the sides of said openings for a plug plate 16 having dove-tail edges.

When desired, the plate may be removed and replaced by a return feed pipe 17 having a head 18 provided with dove-tail edges. The original feed for the cell is supplied through conduit 19, having a flange 20 for fastening to the side of the cell, to receive material from the next preceding cell or to receive fresh feed material. Figure 1 shows an opening 21 through the wall of the cell for the entrance of the return feed. This, of course, may be plugged when not used.

The impeller for the present apparatus has a dished or upwardly inclined bottom, disk or plate member 26. Upwardly inclined, radial vanes 27 on the lower face of the dished bottom assist in moving material from under the impeller and tends to prevent coarser material from lodging thereunder.

Formed upon the dished impeller is a ring 28 concentric with shaft 29 that carries and rotates the impeller. The ring assists in distributing feed material around the impeller. Disposed upon the dished bottom, around the ring 28, are radial impeller blades 30 having smaller outer edges 31, by reason of the inclination of the bottom 26, as best shown in Figure 3. The horse-power necessary to rotate the impeller at a given speed is broadly proportionate to the length of the circumferential edge of the impeller blades, so that reducing the length of this edge will reduce the horse-power necessary to drive the impeller.

The blades have small passages 32, which assist in aerating the pulp in the cell. It will be noticed in Figure 2 that some of the blades 30 are connected with the ring 28 and that alternate ones are spaced from same.

A standpipe or air tube 38, resting in a circular groove 39 on the hub sections extends above the

liquid level in the cell, to supply air to the hollow hub 13 and to material therein.

In the form just described, the hood is substantially horizontal, as suggested in Figures 5 and 6, the top of the blades 30 are substantially horizontal, or parallel with the head, as suggested in Figure 3, and the bottom edges of the blades 30 conform with the conical bottom 26 of the impeller.

In the form shown in Figure 7, the hood 33 is also dished and substantially parallel with the dished bottom 26. In this form, the blades 34 are substantially parallelograms in side elevation and are provided with notched tops 35. Tapered holes 36 in the dished hood, near the hub 37, allow material to feed through upon the impeller.

To remove the impeller for repair or replacement, it is not necessary to remove all of the baffles, as heretofore. By removing the one baffle 4 and its associated hood and hub sections, the impeller and shaft may be moved laterally and then lifted directly out of the cell. In other machines, it has been necessary to remove all the grids and baffles, if the impeller had to be removed.

The modified construction shown in Figure 8 shows a plate 42 having a threaded opening 43 extending through a boss 44 on the plate. The opening 43 is alined with one of the passages 14 through the hub. The opening 43 has several uses. It may be used as a re-circulation opening for returning material in the cell to the impeller for further agitation and aeration.

One of the uses of the threads in the opening 43 is that a bushing having a smaller opening may be screwed therein, in order to restrict the opening. An air conduit 45 may be screwed into the opening 43 for supplying additional air to the impeller. It is thought clear without illustration that the opening 43 may be entirely closed by a threaded plug, or may be used for connecting a smaller middling return pipe.

The operation of the present invention is believed clear from the foregoing. The feed material is supplied by the conduit 19. Where desired, middling return pipes 17 may be provided. One or both of the return pipes may be eliminated and replaced by the plug plates 18.

The feed from the conduit 19 and from the return pipes 17 is supplied to the hollow hub, which, by means of the flaring interior, distributes same around the impeller and especially within the ring 28.

The centrifugal action of the rotating impeller causes a substantially horizontal, circular stream of material to be projected outward from under the hood. The dished bottom causes upwardly flaring streams of material to impinge upon the horizontal stream, which impingement produces an intimate inter-mixture of air, pulp and reagents.

During rotation of the impeller, the pulp vaults, escapes or slips over the top of the impeller blades. The notches 35 permit coarser material to pass over the blades, than pass through the small passages 32. It is thought clear that the passages 32 and notches 35 may be employed in the same blades.

Other changes may be made in the construction of the various elements of the invention and in the novel combinations and arrangements of parts, without departing from the spirit and scope of the invention.

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

1. In flotation apparatus, a rectangular cell, a plurality of baffles extending into the corners of the cell, to prevent their lateral movement, a sectional hood, the sections of which are respectively fastened to the baffles, one of the baffles being separately removable, a section of the hood being fastened to the latter baffle and removable therewith, a shaft in the cell, and a rotary impeller disposed on the shaft adjacent the hood.

2. In flotation apparatus, a cell, a bowl resting on the bottom thereof, a plurality of baffles in the cell resting on the bowl and supported thereby, a stationary hood supported by the baffles, a shaft, and a rotary impeller on the shaft disposed in the bowl and beneath the hood.

3. In flotation apparatus, a cell, a plurality of baffles in the cell, a sectional, stationary hood, the sections of which are fastened to the baffles, one of the baffles being separately removable, a section of the hood being fastened to the latter baffle and removable therewith, a shaft in the cell, and a rotary impeller disposed on the shaft adjacent the hood.

4. In flotation apparatus, a substantially rectangular cell, baffles in the cell extending into the corners thereof, three of the baffles forming a unit, a fourth baffle being separately removable, a hood cut substantially in half, one half being fastened to the baffle unit and the other half being fastened to the removable baffle, a shaft in the cell, and a rotary impeller on the shaft disposed to rotate next to the hood.

5. In flotation apparatus, a cell, a plurality of baffles in the cell, a sectional, stationary hood, the sections of which are fastened to the baffles, one of the baffles being separately removable, a section of the hood being fastened to the latter baffle and removable therewith, the removable hood section having flanges for fastening same to the other baffles, a shaft in the cell, and a rotary impeller disposed on the shaft adjacent the hood.

6. In flotation apparatus, a cell, a plurality of baffles in the cell, a sectional, stationary hood, the sections of which are fastened to the baffles, a sectional, hollow hub member, the sections of which are mounted on the sections of the hood, an air tube to supply air to the hollow interior of the hub, one of the baffles being separately removable, a section of the hood and its accompanying hub section being fastened to the removable baffle and removable therewith, a shaft in the air tube, and a rotary impeller disposed on the shaft beneath the sectional hood.

7. In a flotation apparatus, a cell, a vertical shaft in the cell, a stationary air supply tube around the shaft, arranged to extend above the level of liquid in the cell, a hood on the tube, an impeller on the shaft adjacent the hood, a conduit for supplying feed material to the interior of the tube, and a return feed pipe apart from said conduit arranged to return feed from a different cell to the interior of the tube.

8. In flotation apparatus, a flotation cell, a stationary hood having a feed inlet, a hollow column communicating with said inlet and extending above the liquid level in the cell for the introduction of air, and a dished rotary impeller covered by the hood, and having blades on its dished surface, the hood cooperating with the impeller to effect an intimate intermixture of feed and air by imparting an upward thrust to the material thrown outwardly by the centrifugal action of the impeller.

9. In flotation apparatus, a shaft, a stationary tube around the shaft, an enlarged, hollow hub member at the bottom of the tube, a hood supported by the hub member, a feed inlet communicating with the enlarged portion of the hub member, and a rotary impeller on the shaft in the path of feed material discharged from the hub member.

10. In flotation apparatus, a shaft, a stationary tube around the shaft, an enlarged chamber at the bottom of the tube having an opening providing a feed inlet and a rotary impeller on the shaft in the path of feed material discharged from the chamber.

11. In flotation apparatus, a shaft, a stationary tube around the shaft, an enlarged chamber at the bottom of the tube having a plurality of openings, a pipe connecting with one of said openings for the admission of feed material, a second pipe connecting with another of said openings for the return of middlings, and a rotary impeller on the shaft in the path of feed material discharged from the chamber.

12. In flotation apparatus, a shaft, a stationary tube around the shaft, an enlarged chamber at the bottom of the tube having a plurality of openings, a feed pipe, a plug, the pipe and plug being capable of interchangeable connection with said openings, whereby feed material may be admitted to any selected opening, and a rotary impeller on the shaft in the path of feed material discharged from the chamber.

13. In flotation apparatus, a flotation cell, a rotary impeller in the cell, baffles transversely of the cell adjacent the impeller, and a stationary hood for the impeller supported on the baffles, said baffles extending laterally from the hood.

14. In flotation apparatus, a flotation cell having a substantially flat bottom, a rotary shaft, a dished impeller on the shaft adjacent the bottom of the cell, the impeller having blades for agitation of material in the cell, and vanes projecting beneath the impeller with their exposed edges progressively decreasing in height toward the periphery of the impeller.

15. In flotation apparatus, a rotary shaft, a disk on the shaft, a ring on the disk spaced from the shaft, blades on the disk extending radially from the ring, and means for feeding material within the ring.

16. In flotation apparatus, a rotary shaft, a disk on the shaft, a ring on the disk spaced from the shaft, blades on the disk spaced from the ring and extending radially therefrom, and means for feeding material within the ring.

17. In flotation apparatus, a rotary shaft, a disk on the shaft to receive material under treatment, and radial blades on the upper surface of the disk having serrated upper edges in the path of the material thrown outwardly by rotation of the disk.

18. In flotation apparatus, a rotary shaft, a disk on the shaft to receive material under treatment, radial blades on the upper surface of the disk having serrated upper edges in the path of the material thrown outwardly by rotation of the disk, and a hood for the impeller spaced from the serrated edges of the blades.

19. In flotation apparatus, a rotary impeller, a plurality of sources of material under treatment, a hood for the impeller having a plurality of openings corresponding in position with said sources, a conduit capable of connecting with any of said openings for its connection with the respective source, and a removable plug for closing another one of said openings.

20. In flotation apparatus, a shaft, a stationary tube around the shaft, a hollow hub member at the bottom of the tube, a hood supported by the hub member, a feed inlet communicating with the hollow hub member, and a rotary impeller on the shaft in the path of feed material discharged from the hub member.

ARTHUR C. DAMAN.