May 14, 1929. J. C. MacINTOSH 1,713,046

FLUID DISTRIBUTOR

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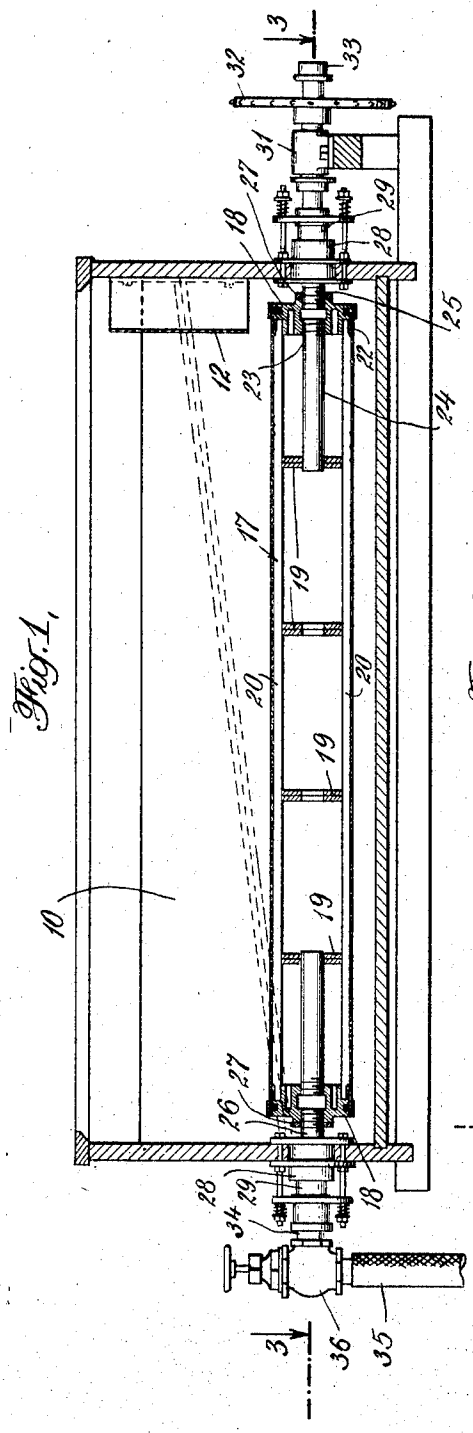


Fig. 1.

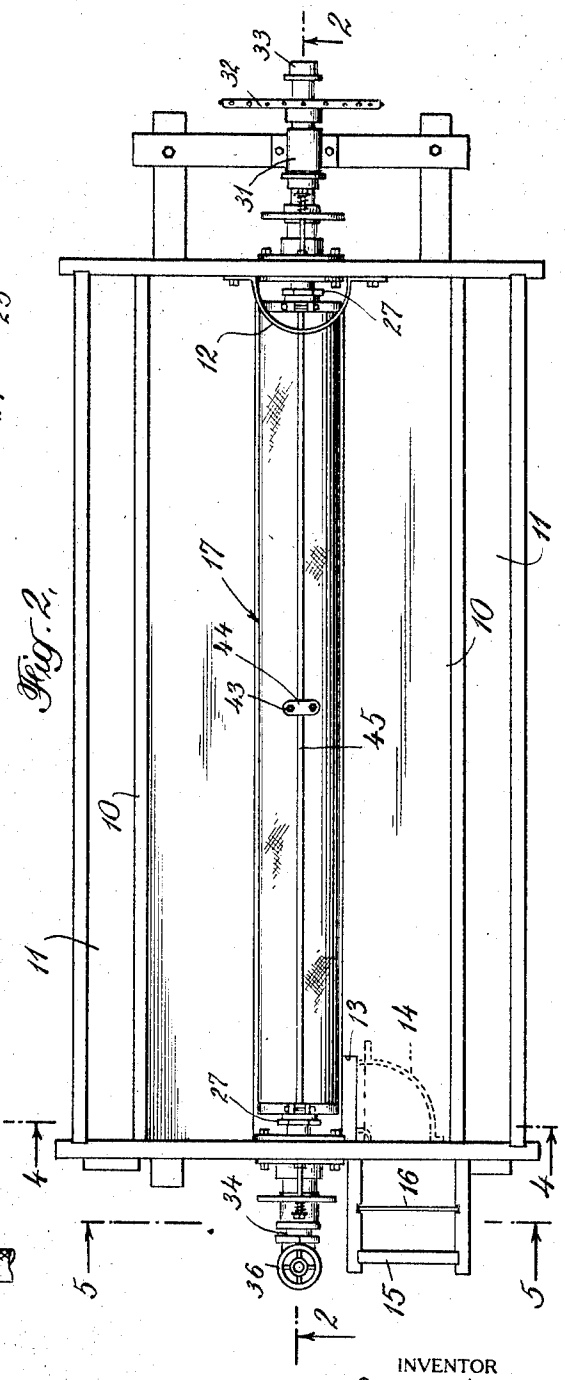


Fig. 2.

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Fig. 3.

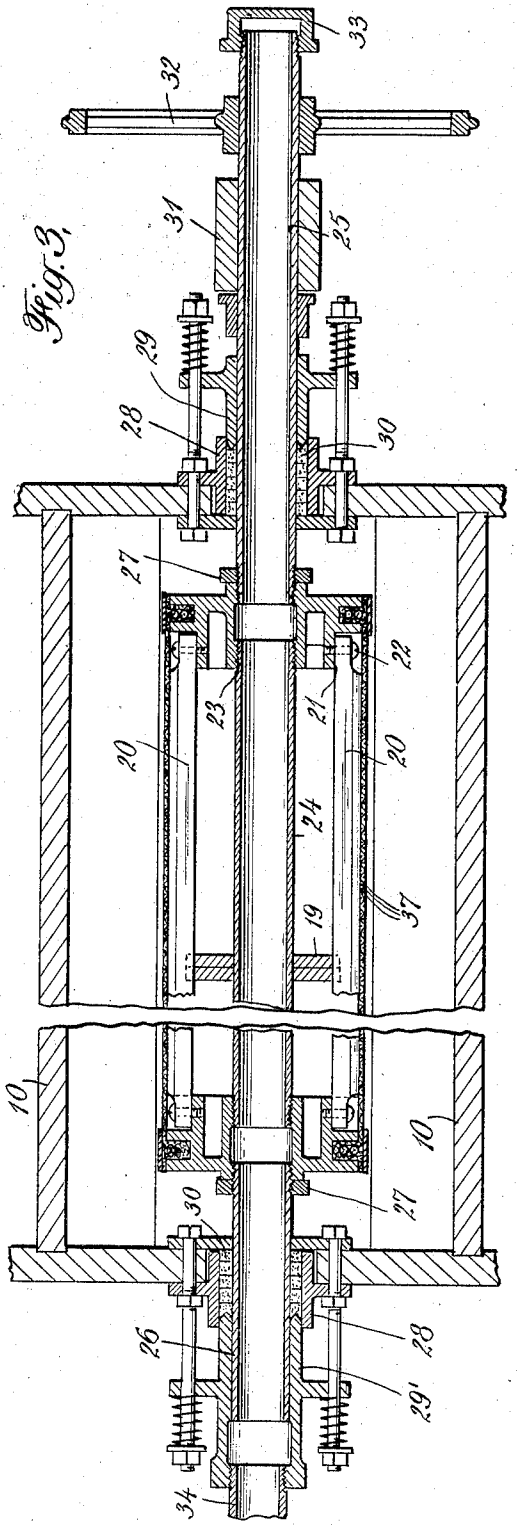


Fig. 6.

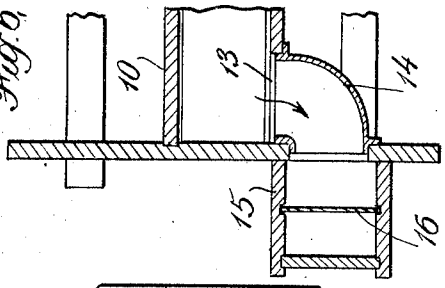


Fig. 5.

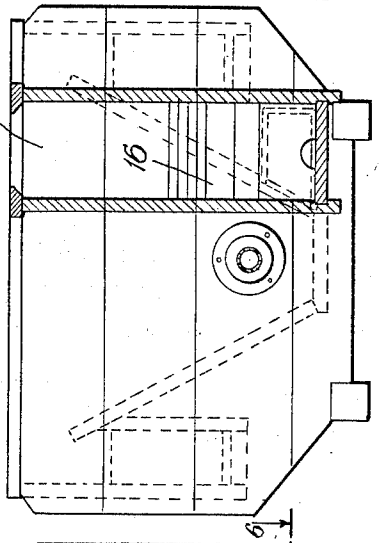
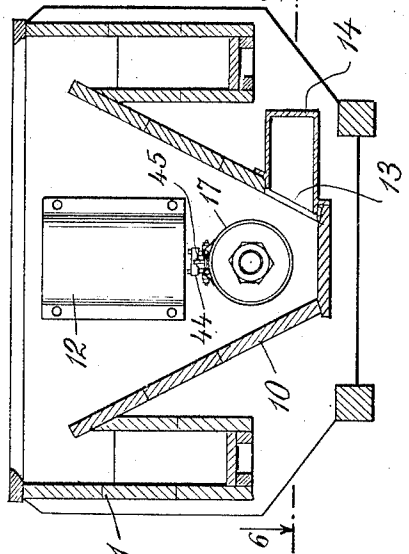


Fig. 4.



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FLUID DISTRIBUTOR

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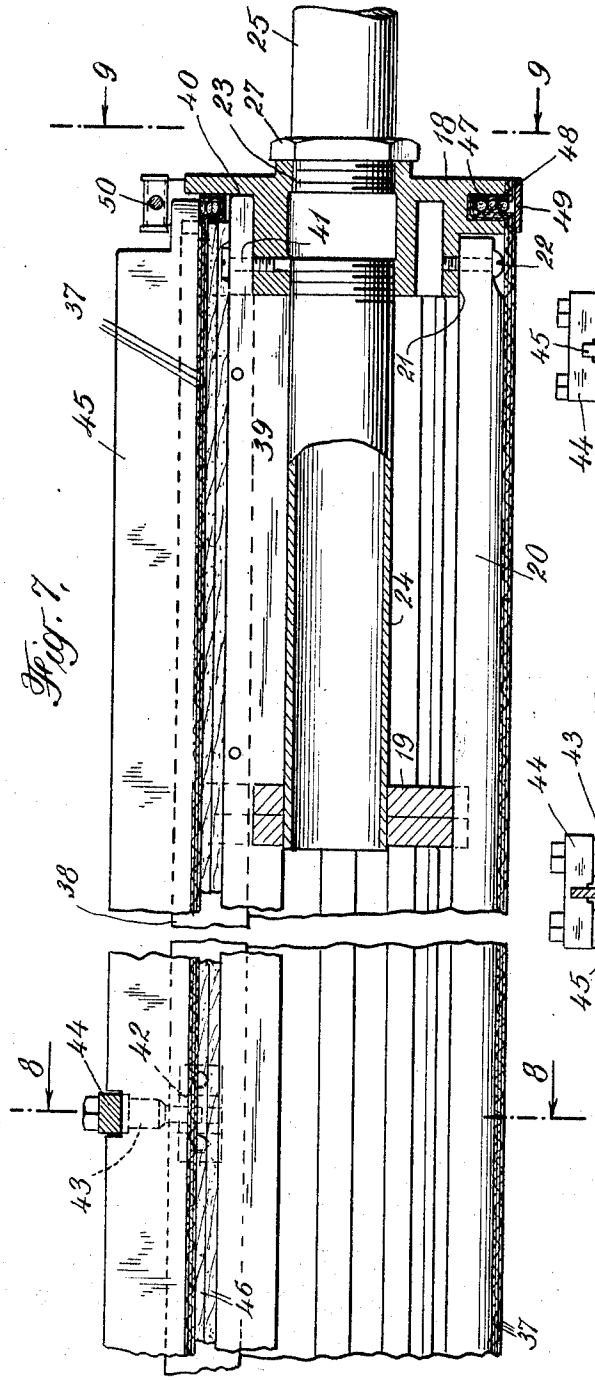


Fig. 7.

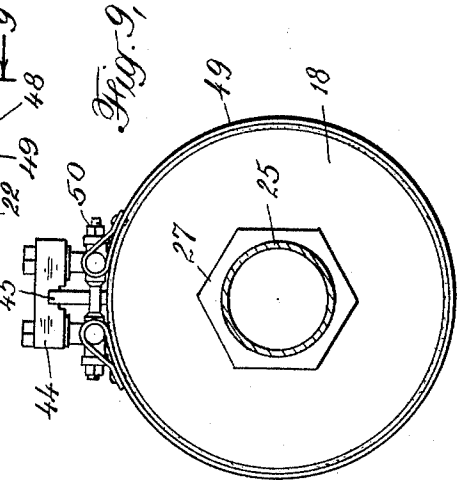


Fig. 9.

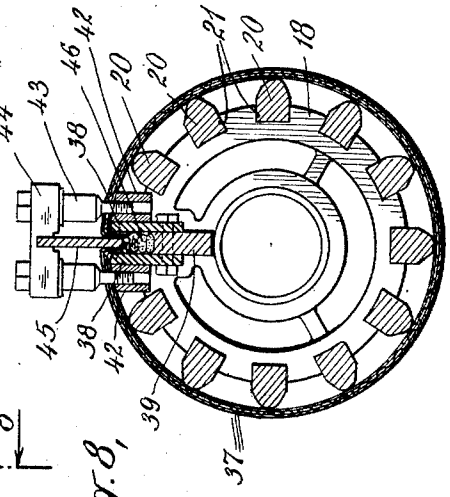


Fig. 8.

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UNITED STATES PATENT OFFICE.

JOHN C. MacINTOSH, OF SALT LAKE CITY, UTAH, ASSIGNOR TO THE GENERAL ENGINEERING COMPANY, OF SALT LAKE CITY, UTAH, A CORPORATION OF UTAH.

FLUID DISTRIBUTOR.

Application filed December 14, 1926. Serial No. 154,843.

This invention relates to fluid distributors and has for its object the provision of an improved fluid distributor especially adapted to be used in flotation apparatus, aeration machines, and the like. More particularly, the invention aims to provide an improved apparatus for efficiently distributing fluids, such as gas (air etc.) and/or liquid reagents (atomized, vaporized, etc.) into a body of pulp and thereby effecting a flotation operation in the course of which one or more constituents of the pulp are removed therefrom in the resulting froth or scum.

The present invention is of special advantage in the concentration of ores, minerals and the like by flotation, and more particularly by pneumatic flotation. The invention is, however, equally applicable to the flotation treatment of other materials, such as pulps in general, sewage and trade waste liquors, oil-water and other emulsions, and the like, where one (or more) constituent of the pulp, liquor, emulsion, or the like, is to be separated or removed therefrom by flotation. Since the invention is of peculiar advantage in pneumatic flotation, it will be hereinafter described in connection with a pneumatic flotation machine, although it is to be understood that the improved distributor of the invention may be advantageously embodied in other types of apparatus.

The improved distributor of the invention comprises a rotatable element adapted to receive a fluid and to distribute the fluid in a finely disseminated condition through a body of pulp or liquid. In its preferred form, the distributor of the invention is in the form of a hollow cylindrical frame appropriately mounted for rotation and having all or a part of its cylindrical surface composed of a porous medium, or other equivalent agency for finely divided fluid passing therethrough. These and other novel features of the invention will be better understood from the following description taken in conjunction with the accompanying drawings, in which

Fig. 1 is a longitudinal elevation, partly in section, of a pneumatic flotation machine embodying the improved distributor of the invention,

Fig. 2 is a top plan view of the flotation machine of Fig. 1;

Fig. 3 is a sectional plan on the section line 3—3 of Fig. 1;

Figs. 4 and 5 are sectional end elevations on the section lines 4—4 and 5—5, respectively, of Fig. 2,

Fig. 6 is a sectional detail of the tailings discharge taken on the section line 6—6 of Fig. 4,

Fig. 7 is a longitudinal elevation, partly in section, of the improved distributor of the invention, and

Figs. 8 and 9 are sectional end elevations of the distributor taken on the section lines 8—8 and 9—9, respectively, of Fig. 7.

The flotation machine illustrated in the drawings comprises a V-shaped tank or receptacle 10 adapted to contain the pulp or liquor while being subjected to flotation treatment. Launders 11 are arranged along each side of the tank and are adapted to receive the froth overflowing from the side walls of the tank. A feed inlet shield 12 is provided at one end of the tank for facilitating the introduction of pulp or other liquid. At the other end of the tank, and near the bottom, a tailings discharge opening 13 is provided. An elbow conduit 14 connects the opening 13 with a discharge well 15 at the end of the tank. An adjustable weir 16 is mounted in the well 15 for controlling the rate of discharge and tailings from the apparatus and also the pulp or liquor level within the apparatus.

The improved distributor 17 of the invention is rotatably mounted near the bottom of the V-shaped tank 10. In a general way, the distributor conforms in contour with the lower portion of the tank 10, and is approximately uniformly spaced from the adjacent side walls and bottom of the tank.

The distributor 17 comprises a frame-work built up of two end spiders 18 and a plurality of intermediate spiders 19 and a series of longitudinal strips 20 secured to the spiders. The spiders 18 are preferably made of cast metal. The inner portion of each spider 18 is provided with a plurality of spaced parallel recesses 21. The ends of the strips 20 rest in these recesses and are secured to the spider by bolts 22. The intermediate spiders 19 may conveniently be made of wood and are provided with spaced parallel recesses in which rest the longitudinal strips 20.

Each spider 18 has a screw-threaded central opening 23. A pipe 24 is threaded into the inner end of the opening 23, of each spider 18, and extends initially through the first adjacent spider 19. Pipes 25 and 26 are thread-

ed into the outer ends of the openings 23 in the spiders 18 and are rigidly secured to their respective spiders 18 by lock nuts 27.

The pipes 25 and 26 extend through the end walls of the tank 10 and serve as the journals for the distributor. Each end of the tank is provided with a stuffing box through which the pipes 25 and 26 pass. The stuffing box comprises a housing 28 bolted to the end of the tank and a spring-pressed gland 29 for maintaining an appropriate ring of packing material 30 in position between the housing and the rotating pipe.

The pipe 25 extends through a stationary bearing 31 and carries a sprocket wheel or pulley 32 for driving the distributor. The end of the pipe 25 is closed by a cap 33.

The pipe 26 terminates within the gland element 29′ of the stuffing box. The outer end of the gland element 29′ has a screw-threaded opening in which is secured a pipe 34 communicating with the fluid main 35. A valve 36 is provided for controlling the volume of fluid, such as air, admitted through the pipe 26 to the interior of the distributor.

The cylindrical surface of the distributor is composed of a plurality of plies of canvas 37 or other appropriate porous medium. The longitudinal ends of the canvas are overlapped in a longitudinal recess formed between the plates 38 bolted to the upper portion of a longitudinally extending plank 39. The ends of the plank 39 rest in relatively deep recesses 40 of the spiders 18 and are secured to the spiders by bolts 41. A boss 42, having a threaded opening, is secured to each plate 38 near the center thereof. Bolts 43 are threaded into the openings of the bosses 42 and carry a yoke 44. The yoke 44 engages the upper edge of a longitudinal bar 45, whose lower edge enters into the recess between the plates 38. The bottom of the recess between the plates 38 is preferably filled with an appropriate packing material 46, such as rope, and the overlapping longitudinal edges of the canvas 37 are clamped in the recess by the bar 45 and cooperating bolts 43. The side edges of the canvas 37 are lapped into recesses 47 in the periphery of the spiders 18, and are secured therein by ropes 48. A band 49, tensioned by cooperating tie-bolts 50, surrounds and closes the recess 47 and also serves to secure the ends of the bar 45 to the spider 18.

The distributor has a hollow interior to all parts of which the fluid, admitted through the entrance pipe 26, has free access. The fluid, for example, air, is introduced into the distributor under a certain pressure and escapes through the interstices of the porous medium, forming the cylindrical surface of the distributor, into the body of pulp or liquid in the tank. The strips 20 are preferably tapered or rounded at their outer edge (Fig. 8) in order not to objectionably decrease the effective surface area of the porous medium.

The distributor is rotated at any desired speed. In the apparatus illustrated in the drawings 30 to 40 revolutions per minute have been found suitable. The longitudinal bar 45 projects beyond the peripheral surface of the distributor and serves as a scraper and stirrer to prevent the settling of solids on the bottom of the tank 10. The turning of the distributor need not be continuous in one direction, but may, if desired, be oscillatory in nature.

The improved distributor of the invention possesses decided advantages over the stationary forms of distributors now commonly employed in flotation machines and similar aerating apparatus. In apparatus employing a stationary porous medium, the tendency of solid particles in the pulp to settle results in obstructing the issuance of the air, and punching or scraping of the porous medium must frequently be resorted to, with a consequent increase in labor cost and the rapid deterioration or destruction of the porous medium. These undesirable features are eliminated in the distributor of the invention. The rotation of the porous medium tends to prevent the settling on it of solid particles. The particles that do settle on the upper surface of the porous medium are dropped when, in rotation, that portion of the surface becomes the bottom surface of the rotating porous medium. Where the action of gravity is not sufficient to remove the deposited solid particles from the porous medium the pressure of the issuing air will ordinarily affect the dislodgment of such solids from the porous medium.

In the apparatus herein described and illustrated the rotation of the distributor is about a horizontal axis. This disposition of the distributor ordinarily gives the best results but it is to be understood that the axis of rotation of the distributor need not be horizontal but may be at any appropriate or desired angle to the horizontal.

It is to be understood that the invention is not restricted to the particular form of apparatus illustrated in the accompanying drawings and that departures may be made from the structures and arrangements herein shown and described without departing from the principles of the invention and without sacrificing its chief advantages, and I claim all changes and modifications that legitimately come within the spirit of the invention and the scope of the appended claims.

I claim:—

1. A distributor for introducing fluid into a liquid body confined in an appropriate receptacle, comprising a rotatably mounted substantially cylindrical frame built up of end spiders connected by a plurality of circumferentially spaced longitudinal strips, a porous medium enveloping said strips, a longitudinally extending scraper bar projecting radially beyond the cylindrical surface of the

porous medium, means for rotating said frame and scraper, and means for introducing a fluid into the interior of the frame during its rotation.

2. A distributor for introducing fluid into a liquid body confined in an appropriate receptacle, comprising a substantially cylindrical frame built up of end spiders connected by a plurality of circumferentially spaced longitudinal strips, a porous medium enveloping said strips, a longitudinally extending scraper projecting radially from the cylindrical surface of the porous medium, means cooperating with said scraper for securing together the longitudinal ends of the porous medium, means whereby the frame may be rotated, and means for introducing a fluid into the interior of the frame during its rotation.

In testimony whereof I affix my signature.

JOHN C. MACINTOSH.