

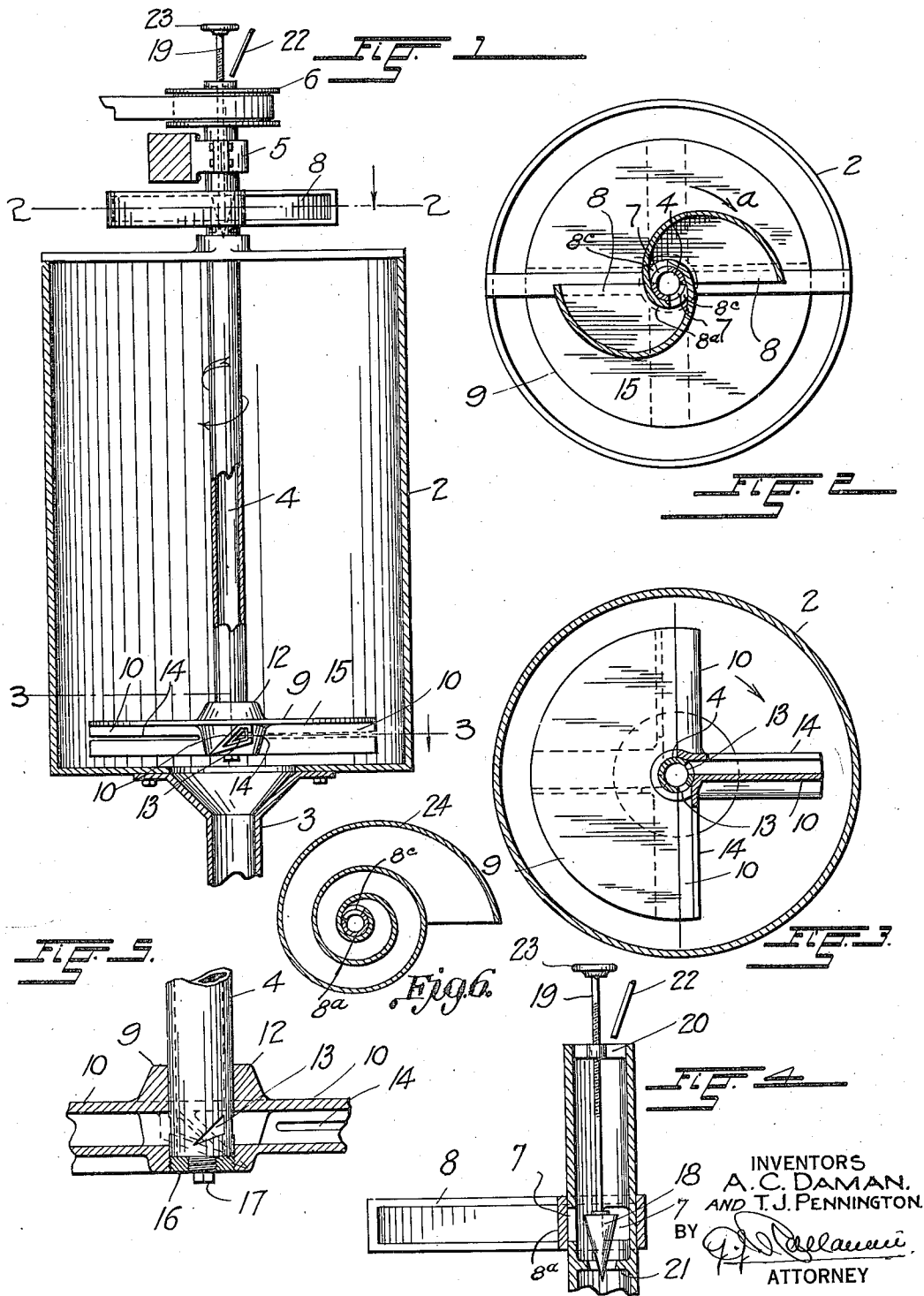
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AGITATOR

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UNITED STATES PATENT OFFICE.

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NAUGATUCK, CONNECTICUT.

AGITATOR.

Application filed November 1, 1917. Serial No. 199,682.

To all whom it may concern:

Be it known that we, ARTHUR C. DAMAN, residing at Denver, in the county of Denver and State of Colorado, and THOMAS J. PENNINGTON, residing at Naugatuck, in the county of New Haven and State of Connecticut, citizens of the United States, have invented certain new and useful Improvements in Agitators, of which the following is a specification.

Our invention relates to improvements in agitating apparatus and more particularly in apparatus of the type in which an intermixture of air or other gas with the material under treatment is a desideratum.

Our improved agitator is well adapted for use in flotation ore concentrating processes in which finely ground ore-pulp together with a certain percentage of oil is subjected to violent agitation to produce by the introduction of air and through agitation, a froth composed of bubbles of oil and air in which the mineral particles of the ore are entrapped.

The primary object of our invention is to provide an agitating appliance which during its operation, automatically induces an influx of air into the material under treatment.

To the above and other ends which will hereinafter appear, our invention consists in the provision of a rotary stirring device provided with an air passage the outlet of which discharges into the mass of ore or other matter in which the device has its movement, and the inlet of which connects with a scoop for the entrance of air which is drawn in by compression within the scoop as well as by the displacement of liquid produced during the rotary movement of the device.

The device is preferably provided with means adapted to increase the degree of liquid displacement produced by its rotation and an adjustable contrivance is connected with the agitating device to regulate the inflow of air to any desired amount.

An embodiment of our invention in its preferred form is illustrated in the accom-

panying drawings wherein like characters of reference indicate corresponding parts in the various views and in which

Figure 1 represents a vertical section through a container equipped with our improved agitating apparatus,

Figure 2, a transverse section taken along the line 2-2, Figure 1,

Figure 3, a similar section along the line 3-3, Figure 1,

Figure 4, an enlarged sectional view through the upper portion of the agitating appliance, showing the adjustable contrivance which regulates the flow of air to its outlet ports,

Figure 5, a fragmentary sectional view through the stirring device at the lower end of the agitating appliance, and

Figure 6, a sectional view of a modified form of the scoop included in the construction.

Referring more specifically to the drawings, the reference numeral 2 designates a container which may be of any suitable size and form although for the purposes of the present invention a cylindrical vessel is preferred.

The vessel has in its bottom a central opening connecting with a conduit 3 through which the ore pulp or other finely divided material to be treated is fed into the presence of the agitating and aerating appliance, the construction of which will now be described.

A tubular shaft 4 suspended within the container from a suitable superposed bearing 5, has adjacent its upper end, a pulley 6 for its rotation by connection with a conveniently located motor.

The rotary shaft has at a point above the level of liquid in the container, one or more inlet-ports 7 which connect its bore with a corresponding number of scoops 8.

The scoops consist of arcuate shallow casings open at their fronts and projecting reversely from a hub 8^a which is fitted around the shaft and which has openings 8^b in register with the opening 7 and separately in connection with the inner ends of the scoops

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During rotation of the shaft in the direction of the arrow *a* in Figure 2, air entering through the open sides of the scoops is forced through the inlet ports of the shaft

5 and into its bore.

Secured to the lower end of the shaft adjacent the bottom of the container is the stirring device 9 which in its preferred form consists of a plurality of impelling blades or

10 arms 10 which radiate from a hub 12 into which the shaft is fitted.

The arms which are wedge-shaped in cross section are hollow and open at their ends; they are connected with the bore of the shaft by means of egress ports 13 at the lower end thereof and they are provided in their faces rearward with relation to the direction of rotation of the element, with longitudinal slots 14 through which the air

20 entering the scoops at the upper end of the shaft, is forcibly ejected into the material under treatment.

The arms are connected by webs 15 which cover the spaces between them and aid in the

25 aeration of the charge by preventing the flow of material from above the arms to enter the spaces caused by liquid displacement during their rotation. The webs whose upper surfaces lie in a common plane,

30 furthermore reduce the power necessary to move the arms through the mass of material in the vessel by preventing the aerated material from reentering the spaces between them.

35 The open lower end of the shaft is normally closed by a threaded bushing 16 and a screw-plug 17. When these parts are removed a portion of the material introduced into the container through the conduit 3,

40 may enter the bore of the shaft to be discharged through the slots and open ends of the arms whereby to more thoroughly impregnate the material with the air.

A cone valve 18 at the lower end of a threaded stem 19 which works in a correspondingly threaded spider-bearing 20 at the upper end of the tubular shaft, cooperates with a seat 21 formed within the bore of the same at a point between the inlet ports 7

50 and the egress slots 14, to regulate the flow of air.

The compression produced at the ingress-opening of the shafts may be increased by providing scoops 24 of spiral form as shown

55 in Figure 6 of the drawings.

Having thus described the mechanical construction of our improved agitating appliance, it will be noted that during rotation of the element in the direction of the

60 arrow *a* in Figure 2, the compression produced in the scoops, and the liquid displacement produced between the impelling arms beneath the disk 15, cause rapid downward flow of air through the bore of the shaft.

The air which is forcibly ejected through the slots of the arms is diffused through the continuously agitated material introduced into the vessel through the conduit 3, with the result that a thorough inter-

70 mixture of the air and material is obtained.

The froth produced by the aeration and agitation of the material, entraps the metallic values and together with the unaffected gangue, rises to the surface of the liquid the level of which is in the construction

75 shown in the drawings, determined by the upper edge of the container across which the supernatant matter overflows into a conveniently disposed receptacle.

In case the apparatus is used in a process of concentrating ores by flotation, a percentage of oil may be introduced into the upper end of the tubular shaft through a pipe 22 or by other convenient means, and intermixed with the air and finely divided

85 ore to form a froth in which the mineral constituents of the ore are entrapped.

In order to expedite the impregnation of the pulp with the air, the end of the shaft may be partially or completely opened by

90 removal of the plug and bushing to admit a small quantity of material to the interior of the impelling arms.

The arms are open at their ends to prevent clogging of their longitudinal passages; the amount of air entering the material through their slots is regulated to any desired degree by adjustment of the valve

18 which to this end is provided with a hand-wheel 23, and the liquid displacement produced between the arms of the agitating device by which the air is drawn into and through the tubular shaft, is materially

100 promoted by the provision of the disk 15 and by the wedge shape of the radiating arms.

Having thus described our improved agitating and aerating apparatus in the best and simplest form at present known to us, we desire it understood that the apparatus

110 is susceptible of variations in the construction and arrangement of its parts without any material departure from the true principle and nature of the invention as defined in the following claim:

115 In an agitating apparatus for flotation ore-concentrating processes, the combination of an ore-pulp tank having, at its lower end, an ore-pulp inlet, a rotatable, tubular air-shaft projecting thereinto and having an

120 air-inlet exteriorly thereof and an air-outlet interiorly thereof, an ore-pulp agitating and air-distributing member carried by said shaft, adjacent to and communicating with said ore-pulp inlet, and comprising hollow

125 arms radiating from said shaft and communicating, at one end, with said air-outlet, and a disk concentrically carried by said

shaft immediately above said arms, each of
said arms having, in its rear wall, a longi-
tudinally-extending air-egress slot, and
having its front wall downwardly and for-
wardly inclined, thereby imparting to the
pulp entering the tank an upward move-
ment and splashing said pulp against said
disk, facilitating the mixture of the air
with the pulp.
In testimony whereof we have hereunto af-

fixed our signatures in the presence of two
witnesses.

ARTHUR C. DAMAN,
THOMAS J. PENNINGTON.

Witnesses for Daman:

Y. J. CALDWELL,
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Witnesses for Pennington:

G. H. BENNETT, Jr.,
E. E. BOOK.