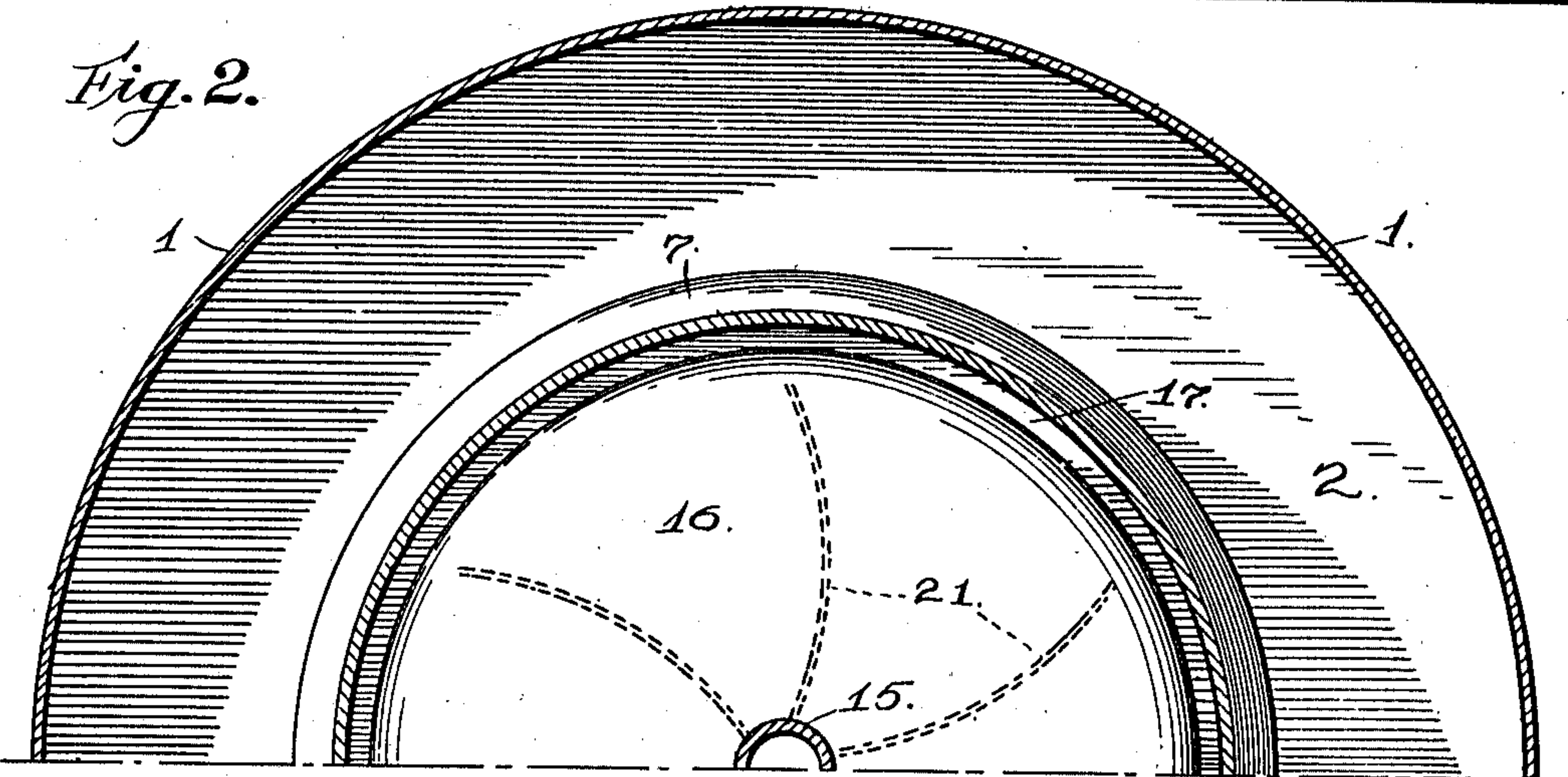
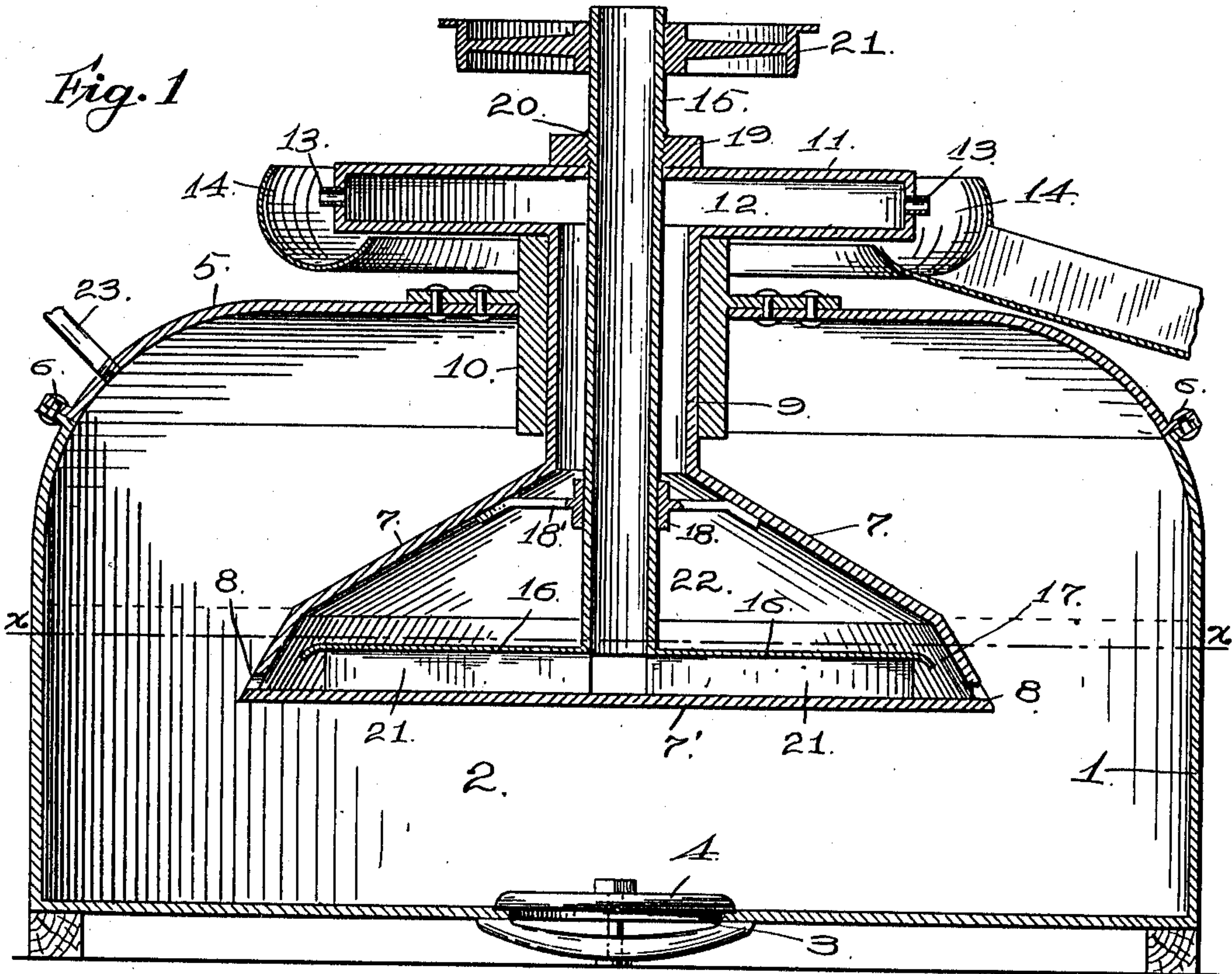


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CENTRIFUGAL SEPARATING WASHING APPARATUS.
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UNITED STATES PATENT OFFICE.

LAMARTINE C. TRENT, OF EAST AUBURN, CALIFORNIA.

CENTRIFUGAL SEPARATING WASHING APPARATUS.

978,238.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LAMARTINE C. TRENT, a citizen of the United States, residing at East Auburn, in the county of Placer and State of California, have invented certain new and useful Improvements in Centrifugal Separating and Washing Apparatus, of which the following is a specification.

The hereinafter described invention relates to a centrifugal apparatus for the separating of solids from liquid material generally, although the machine is designed more particularly with reference to the treating of cyanid solution in order to separate the heavier or coarser solids therefrom and to wash the separated solids free of such of the solution and lighter material as may adhere thereto as forced from within the centrifugal, the object of the invention being to subject the issuing separated solids to the action of an inflowing current under pressure, which, while permitting the solids to slip from within the centrifugal under the influence of an internal pressure, created by reason of the generated centrifugal strains, will thoroughly wash the same free of any of the original solution adhering thereto and cause the return thereof within the centrifugal in order to recover the same. To comprehend the invention, reference should be had to the accompanying sheet of drawings, wherein—

Figure 1 is a vertical sectional view of the entire apparatus. Fig. 2 is a sectional plan view taken on line $x-x$ Fig. 1 of the drawings.

In the drawings, the numeral 1 is used to indicate an outer closed stationary casing or tank within which the centrifugal separator revolves, the interior of the said vessel or tank forming a pressure chamber 2, into which the solids separated from the liquid passing through the centrifugal are discharged against the pressure therein. The said vessel or tank is provided with a bottom outlet 3 for the withdrawal of the solids from the pressure chamber 2, which outlet is closed by the manhole plate 4, and the tank or vessel is provided with a removable cover 5, which is held thereto by means of the flange bolts 6.

Within the pressure chamber 2 works the centrifugal, which, in the present case, comprises a rotatable conical shaped vessel 7, provided at its bottom edge with a series of peripheral outlets 8. The straight circular bearing extension 9 of the rotatable vessel 7

works within a bearing sleeve 10, secured to and extended through the detachable cover 5, and the said bearing extension terminates in a hollow disk 11, which serves as a vacuum pump, the vacuum chamber 12 thereof being provided with a series of contracted peripheral outlets 13, through which the liquid drawn into the vacuum chamber discharges into a circular receiving trough 14, surrounding the projecting extension of the bearing sleeve 10.

Through the vacuum pump 11 and bearing extension 9 is extended a hollow drive shaft 15, the lower end of which extends into the rotatable vessel 7 to within a short distance of its bottom 7', the said tubular drive shaft terminating at its lower extremity or end in an outwardly extended circular diaphragm 16, of a diameter slightly less than the interior diameter of the vessel 7 adjacent its bottom edge, so as to provide an annular passage-way 17 between the outer periphery of the diaphragm 16 and the inner wall of the vessel 7 above the peripheral outlets 8.

The tubular drive shaft 15 is feathered within a guide collar 18, connected to the interior wall of the vessel 7, by the arm 18', so that the rotation of the drive shaft 15 is transmitted to the vessel 7; the said drive shaft being vertically adjustable by means of the regulating nut 19, which works on the screw-threaded portion 20 of the shaft and against the upper face of the hollow disk 11. To the upper end portion of the drive shaft is secured a belt pulley 21, over which works a drive belt, not shown, for imparting rotation to the drive shaft.

On the under face of the diaphragm 16 a series of depending curved radial ribs 21 are formed, which ribs serve to guide or direct the liquid passing through the centrifugal toward the peripheral outlets 8, through which the separated solids escape into the pressure chamber 2 of the stationary or non-rotating casing or tank 1, while the liquid passes through the annular passage-way 17 and escapes into the chamber 22 of the vessel 7 above the diaphragm 16, from whence it is drawn into the chamber 12 of the vacuum pump 11.

Water may be admitted into the chamber 2, until the desired pressure has been established, through the tubular drive shaft 15, which shaft serves as a feed tube for the liquid material to be treated, or, in case of

a greater pressure be required than is thus obtainable, water may be admitted into the said chamber through the auxiliary supply pipe 23, which connects with any suitable source of pressure supply.

In the working of the apparatus for the separating and washing of the solids separated from the liquid material, a pressure is first secured within the chamber 2 equal to the internal pressure generated by the centrifugal rotating under high speed while submerged within the outer casing or tank 1. The liquid material to be treated is then fed into the centrifugal through the tubular drive shaft 15, being delivered beneath the distributing diaphragm 16, and guided outwardly by the radial ribs 21, under the influence of the generated centrifugal strains, toward the peripheral outlets 8, through which the separated solids gradually escape, the liquid flowing upwardly through the passage-way 17 into the interior chamber or compartment 22, and being drawn upwardly into the chamber 12 of the vacuum pump 11, due to the speed at which the machine is driven. As the solids escape through the outlet openings 8, against which they are forced under considerable pressure, the liquid will be held back by the external pressure within the chamber 2, which equalizes substantially the internal pressure of the centrifugal, so that as the solids are ejected they will displace a portion of the water within the chamber 2 and cause an inflow of the same into the centrifugal through the peripheral outlets 8, which inflowing liquid will wash the solids free of any of the solution or finer slimes adhering thereto, and force the same back into the centrifugal to pass with the separated liquid into the vacuum pump, a reverse current, as it were, being thus created, which current forces back into the centrifugal the lighter slimes and solids, while the heavier solids escape into the pressure chamber 2 in a washed condition and against the inward current from the pressure chamber 2. The said inward current from the pressure chamber being induced through the peripheral openings 8 by the vacuum created by the vacuum pump, while the heavier or solid material is thrown outwardly through said outlets 8 into the pressure chamber 2 by reason of its greater specific gravity. As stated, these solids entering from the revolving machine or centrifugal into the pressure chamber 2 of the tank 1, displaces a given quantity of the liquid therein and forces the same into the centrifugal through the outlets 8 and thus creates the desired reversed current for washing the escaping solids and retain the slimes from the coarser material, likewise to wash and retain any cyanid or other chemical solution that may adhere to the solids as they pass outwardly through the outlets 8.

Thus the outlets 8 are free for the solids to pass outwardly from the centrifugal into the pressure chamber 2, but the liquid entering therewith into the centrifugal and adhering to the solids is forced backwardly or held within the centrifugal. The return current thus placed into action is sufficient to retain the lighter slimes and the solution adhering to the solids, and to force the same into the vacuum chamber, from whence they are discharged from the contracted peripheral outlet 13 into the runway 14. However, should the discharge of the solids into the filled pressure chamber 2 fail to create a sufficient pressure by displacement for the desired inflow of liquid from the pressure chamber 2, the pressure of said chamber may be augmented by admitting additional pressure through the auxiliary supply 23.

The tendency for the liquid passing through the ordinary centrifugal is to escape with the separated solids, and a quantity does so escape, to such an extent as to require a re-washing of the solids to recover the same. In the present case, the reverse inflow to a great extent prevents such escape of liquid with the solids into the pressure chamber 2, and serves to thoroughly wash the solids. However, such of the original liquid as may escape into the pressure chamber 2 by adhering to the solids, is washed therefrom and returned by the inflowing current into the centrifugal and is thus recovered, being drawn upwardly into the vacuum-pump and discharged therefrom through the contracted outlets 13 into the runway or trough 14. The solids ejected from the centrifugal under the internal pressure, are thus subjected to the action of an inflowing current under pressure, which thoroughly washes the same of adhering liquid and lighter slimes. A clean mechanical separation is thus made of the solids from the liquids, and likewise the lighter slimes are separated from the heavier solids, the separated solids moving in one direction while the freed liquid and lighter particles are forced in another direction.

The essential feature of the described invention resides in forcing the separated solids from within the centrifugal against an inwardly flowing pressure, which pressure frees or washes the solids of adhering liquid and forces the same back into the centrifugal.

Having thus described the invention, what is claimed as new and desired to be protected by Letters Patent is:—

1. A centrifugal apparatus comprising an outer casing which constitutes a pressure chamber, a vessel provided with a series of peripheral outlets rotatable therein, a diaphragm within the vessel to form a passage-way for the flow of the material being treated toward the peripheral outlets, means

for delivering material below the diaphragm, a passage-way for the flow of the separated liquid into the rotatable vessel above the diaphragm, and means for drawing from within the vessel the liquid and lighter particles separated from the solids.

2. In an apparatus of the character described, the combination of a centrifugal provided with peripheral outlets rotatable in a chamber under pressure, a deflector plate within the centrifugal to one side of said outlets for directing the material to said outlets, of means for causing an upward flow of the separated liquid through the centrifugal and an inflow under pressure into the centrifugal during the discharge of solids therefrom.

3. In a centrifugal apparatus, the same comprising a rotatable vessel for receiving the liquid material to be treated, separating the solids therefrom and ejecting the same against an inflowing current under pressure, and vacuum creating means for withdrawing the separated liquid through the said vessel.

4. In a centrifugal apparatus, the same comprising rotatable means for receiving liquid material, separating the solids therefrom and ejecting the same against a current pressure moving in an opposite direction to the flow of travel of the separated solids, and vacuum creating means for withdrawing the separated liquid through the said vessel.

5. In a centrifugal machine for separating solids from liquid material, the same comprising means for separating the solids from the liquid material and deflecting the separated solids under pressure directly against a counter current under pressure, whereby the solids are freed of adhering material or liquids.

6. A centrifugal apparatus, the same comprising an outer casing which constitutes a pressure chamber, a vessel provided with a series of peripheral outlets rotatable therein, a diaphragm within the vessel to form a passageway for the flow of the material being treated toward the peripheral outlets, means for delivering material below the diaphragm, a passageway for the flow of the separated liquid into the rotatable vessel above the diaphragm, and a vacuum chamber carried by the receptacle for drawing from within the vessel the liquid and lighter particles separated from the solids.

7. A centrifugal apparatus, the same comprising a pressure chamber, a centrifugal arranged within the pressure chamber having adjacent one end a peripheral outlet, a feed for supplying liquid material into the centrifugal, and a transversely extending deflector adjacent the outlet end of said feed providing in the centrifugal a passageway directed toward said peripheral outlet.

8. A centrifugal apparatus, the same comprising a pressure chamber, a centrifugal arranged within the pressure chamber having adjacent one end a peripheral outlet, a feed for supplying liquid material into the centrifugal, and a deflector plate connecting with the lower end of the feed and extending laterally therefrom to form between said plate and the bottom of the centrifugal a passage, and a deflecting wing on one surface of said deflector plate.

9. A centrifugal apparatus, the same comprising a pressure chamber, a centrifugal arranged within the pressure chamber having adjacent one end a peripheral outlet, a feed for supplying liquid material into the centrifugal, a deflector plate connecting with the lower end of the feed and extending laterally therefrom to form between said plate and the bottom of the centrifugal a passage, and a series of curved radial ribs positioned between the deflector plate and the bottom of the centrifugal.

10. A centrifugal apparatus, the combination of a pressure chamber, a centrifugal therein comprising side walls, and a bottom, the side walls having an outlet opening adjacent said bottom, a tubular feed shaft for the centrifugal and a deflecting plate carried thereby for deflecting the material delivered from said shaft directly to said outlet.

11. In a machine of the character described, the combination of a pressure chamber, a centrifugal therein comprising side walls, and a bottom, the side walls having an outlet opening adjacent said bottom, a tubular feed shaft for the centrifugal, a deflecting plate carried thereby for deflecting the material delivered from said shaft directly to said outlet, and a vacuum chamber carried by said centrifugal adjacent the upper end thereof, as and for the purpose specified.

12. A centrifugal machine comprising an inclosing pressure tank, a centrifugal rotatably mounted in said tank and having a bearing in the top thereof, said centrifugal including side and bottom walls, and a vacuum chamber integral with said side walls, a feed shaft extending longitudinally of the centrifugal and terminating a slight distance from the bottom thereof for delivering material to said bottom, a deflector connected to said shaft and extending transversely of the centrifugal for deflecting the material toward the side of the centrifugal, and an opening in said side below said deflecting plate.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LAMARTINE C. TRENT.

Witnesses:

MARGARET B. CONNELL,
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