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APPARATUS FOR SEPARATING SOLIDS FROM LIQUIDS.

APPLICATION FILED MAR. 19, 1908.

952,590. Patented Mar. 22, 1910.

Fig. 1.

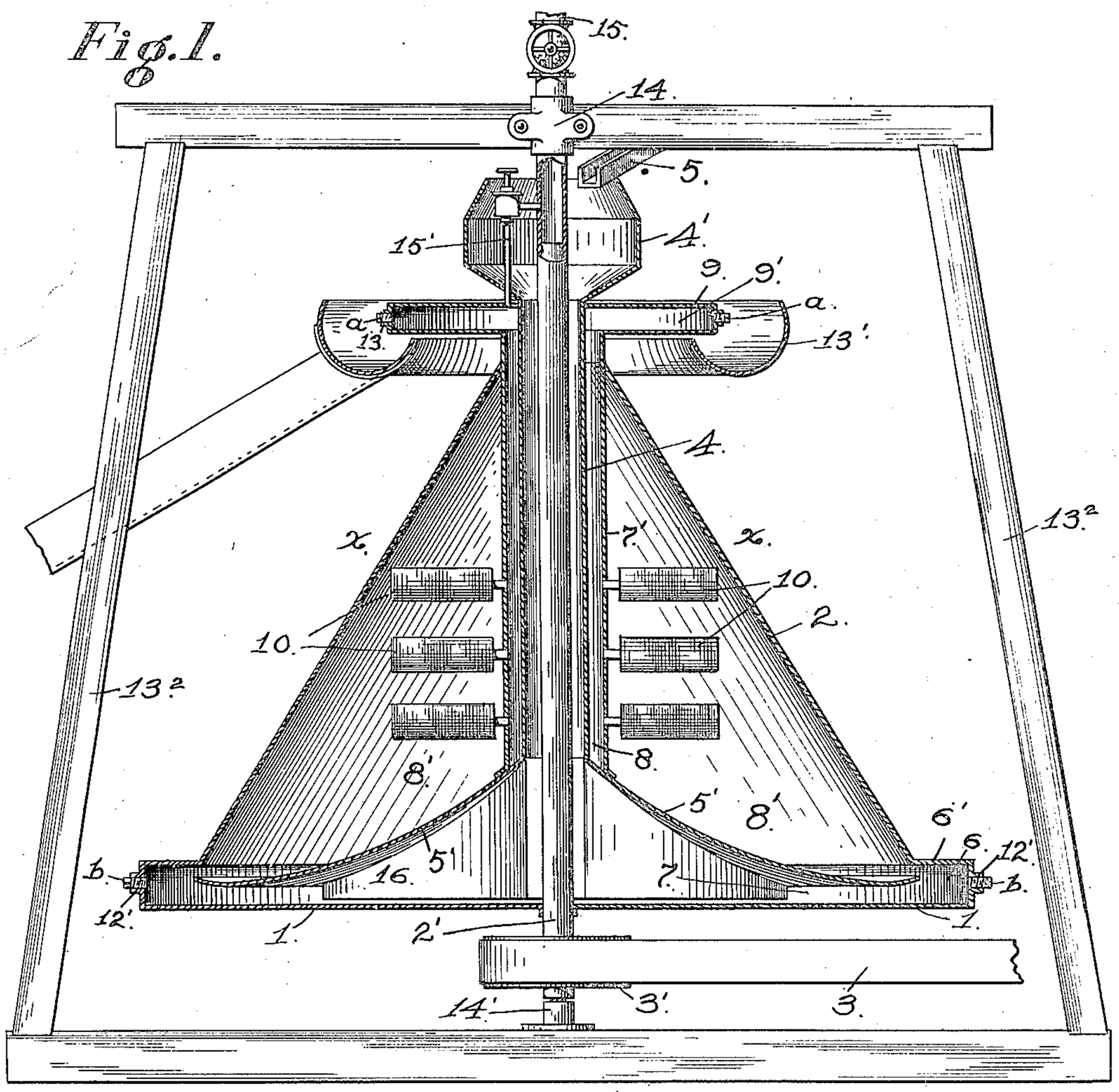


Fig. 2.

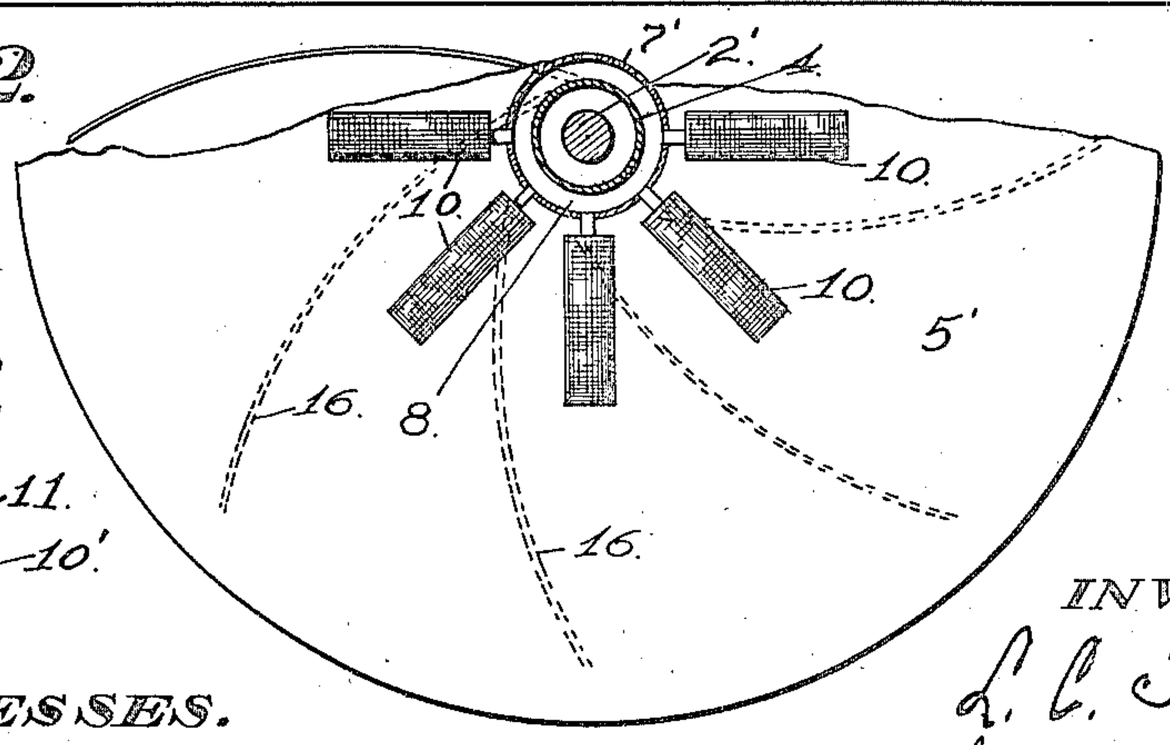
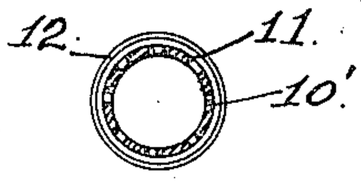


Fig. 3.



WITNESSES.

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APPARATUS FOR SEPARATING SOLIDS FROM LIQUIDS.

952,590. Specification of Letters Patent. Patented Mar. 22, 1910.

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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 Apparatus for Separating Solids from Liquids, of which the following is a specification.

The hereinafter described invention relates to an improved apparatus for separating finely divided solids from liquids, such as cyanid solutions from slimes and pulverized ores, and lime and other sediment from saccharine liquors, and for purifying liquids generally by removing the solids therefrom.

The object of the invention is to provide a continuous acting machine capable of separating a stream of pulp from a stamp battery or any other stream of liquid carrying finely divided solids, into a continuous stream of clear liquid from one discharge, and a stream of comparatively dry solids from a separate discharge.

The present invention contemplates removing approximately all the solids from the liquid by centrifugal action without filtering, the liquid thus freed of substantially its solids, where close separation is required, being then forced through a filter or filters of suitable construction to remove such solids as may be contained therein, thus simplifying and expediting the operation.

To comprehend the invention reference should be had to the accompanying sheet of drawings, wherein—

Figure 1 is a vertical sectional view of the apparatus. Fig. 2 is a sectional plan view taken across Fig. 1 of the drawings as approximately indicated at *x*—*x*, the outer casing being removed and the diaphragm of the feed tube being partly broken away. Fig. 3 is cross sectional view of one of the radial filters.

In the drawings the numeral 1 is used to designate any suitable style of an outer casing, preferably formed with an upwardly inclined or tapering body portion 2, the said casing being secured to a vertical drive shaft 2′, centrally extended through the casing, and, in the present case, being driven from the bottom by means of the drive belt 3, working over the pulley 3′ on the shaft. However, any desired type of mechanism may be employed for imparting rotation to the central shaft 2′.

Surrounding the drive shaft 2′, and within the casing 1, is arranged a feed tube 4, on the upper end of which is mounted a feed hopper 4′, into which the material to be treated is delivered by means of a stationary sluice 5, or otherwise. The feed tube 4 extends within a short distance of the bottom wall of the casing 1, and the lower end thereof terminates in an inclined outwardly circular diaphragm 5′, the outer edge of which projects within the groove or channel 6 of the outer casing, formed by the inwardly extended circular flange 6′ thereof. The diaphragm 5′ being a downwardly inclined one, it forms a gradually contracted passageway 7, for the flow of the liquid toward or into the groove or channel 6.

The feed tube 4 is surrounded by a shell 7′, of a diameter sufficient to form a chamber 8, which chamber serves as a receiving chamber for the liquid taken from the pressure chamber 8′ of the casing 1. This shell 7′ is closed at its lower end by being secured to the face of the diaphragm 5′, and, at its upper end carries the hollow disk 9, which disk, as hereinafter explained serves as a vacuum pump, the treated liquid being drawn into the vacuum chamber 9′ thereof.

There is interposed between the receiving chamber 8 and the pressure chamber 8′, one or more filters. In the present case a plurality of radially disposed filters 10 are illustrated, each being connected to the shell 7′ so as to communicate with the interior of the receiving chamber 8. These filters consist of a perforated short tube 10′, closed at its outer end, the inner reduced open end thereof screwing into circumferentially disposed openings in the face of the said shell 7′. This tube 10′ is covered preferably with a matting of fibrous material, such as cocoa matting 11, which fibrous covering 11 is wrapped or inclosed with a filtering or straining cloth 12, Fig. 3 of the drawings.

It will be understood that the type of the filter or filters employed is largely dependent on the form of the receiving chamber for the treated liquid. However, preference is given to the filter illustrated, due

to the fact that a series of the same may be utilized and a large filtering area thus secured and, also to the fact that caking of solids on the surface of the filter or filters is reduced to a minimum, which is a factor to be considered in an apparatus of this character.

The solids contained within the liquid being treated are mainly separated therefrom and discharged from within the circular groove or channel 6, through the peripheral outlets 12′ of the outer casing; while the treated liquid drawn into the vacuum chamber 9′, escapes therefrom through the outlets 13 into the stationary circular trough 13′ arranged below the disk 9, from which the liquid is conveyed to a suitable place of deposit.

The apparatus is mounted within a suitable frame or supporting structure 13^2, the same containing an upper bearing 14, and a lower bearing 14′ for the central shaft 2′. The said shaft 2′ is formed hollow from its upper end to within a short distance within the feed hopper 4′, and to the upper end of the shaft is connected by a running joint a valve controlled water supply pipe 15; while the hollow portion of the said shaft is tapped by an outlet pipe 15′, which extends into the vacuum chamber 9′.

On the under face of the diaphragm 5′, a series of curved radially extending ribs 16 are formed, which aid or assist in guiding or directing the liquid to be treated toward the groove or channel 6.

When in operation for the separation of solids from liquids, the central shaft is driven to rotate the casing 1 and its associated parts at a suitable speed, the liquid to be treated being introduced into the hopper 4′, flows into the feed tube 4 and is drawn downward by the vacuum created by the action of the lower part of the machine. The stream of liquid is carried to a point near the periphery of the casing 1 by the diaphragm 5′, the curved radial ribs 16 guiding the liquid. At this point, the rotation of the liquid confined within the casing, multiplies the difference in the weight of the solid particles carried thereby, and they are thrown into the groove or channel 6, and accumulate therein to be gradually discharged through the outlets 12′, while the liquid, deprived of most of its solids, flows upward into the pressure chamber 8′, from whence it escapes into the receiving chamber 8, and is drawn therefrom into the vacuum chamber 9′, to be discharged through the outlets 13 into the trough 13′. However, before entering into the receiving chamber 8′, it is required that the liquid pass through the filters 10, being assisted through the filters by the pressure within the chamber 8′. The liquid in passing through the filter or filters, is deprived of the remaining solids, which cake on the filters, from whence they are thrown and gradually work into the groove or channel 6, to be expelled through the outlets 12′. The clear liquid is drawn upwardly from the receiving chamber 8 into the vacuum chamber 9′ of the hollow disk 9, and is ejected therefrom through the peripheral outlets 13. Inasmuch as these outlets are restricted discharges, a vacuum is created in the working of the apparatus, which materially assists not only in drawing the material through the filters into the receiving chamber, but also in accelerating the circulation of the liquid within the apparatus. The hollow disk 9, with its contracted outlets, in reality constitutes a vacuum pump. While the pressure which accumulates within the chamber 8′ is sufficient to cause the liquids to pass through the filters into the receiving chamber and from said chamber through the restricted outlets 13, without the aid of the vacuum feature, still the vacuum behind the filters performs the functions of assisting in filtering, and to regulate the flow and pressure on the filters.

While the filters are essential for the treating of such liquids as require close working and the removal of all solids, yet with many liquids it is not necessary to remove all of the solids. With such liquids, the removal of the solids through the contracted outlets 12′ is sufficient for all practical purposes, and in such cases the filters may be removed and the substantially clear liquid permitted to flow through the perforated shell 7′ from the chamber 8′, or allowed to escape direct from within the chamber 8′ in any suitable manner.

Inasmuch as the centrifugal strain forces the liquid against the periphery of the casing 1 under considerable pressure, the solids contained therein will be gradually forced through the contracted outlets 12′.

The discharge of the liquid from the chamber 9′ is, as has been pointed out, effected through a plurality of peripheral openings 13 and such discharge may be regulated as desired by fitting plugs *a* into some of said openings. Similar plugs *b* may be fitted into some of the discharge openings 12′ to regulate the discharge from the groove or channel 6. The plugs *a* and *b* are for the purpose of regulating the discharge by increasing or decreasing the number of said plugs in action. It is essential that some means of regulation be provided for the discharge must always be somewhat less than the filtering capacity of the filters to prevent the possibility of the disk discharge pump pan emptying itself and destroying its vacuum. It is obvious of course that in lieu of the plugs other suitable or

equivalent means for controlling the discharge of liquid through the openings 13 and 12′ might be employed.

Should the solids separated from the liquid passing through the filter or filters tend to accumulate on the surface thereof to such an extent as to clog the same and materially destroy the filtering surface thereof, the same may be broken down by means of a water pressure admitted into or back of the filter. This is accomplished by permitting water to enter the receiving chamber 8 from the pipe 15′, which leads from the hollow portion of the shaft 2′, into which water is admitted under pressure from the valve controlled supply pipe 15. The water admitted into the receiving chamber 8, escapes into the filter or filters and exerting an internal pressure forces the caked solids from the surface of the filter or filters, thus freeing the same.

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

1. An apparatus for separating solids from liquids comprising a rotatable closed casing provided adjacent the lower end thereof with a plurality of peripheral outlets, a feed tube arranged within the casing, a diaphragm carried by the lower end of said feed tube and extending into proximity to the periphery of said casing, ribs on the under face of said diaphragm and a receiving chamber positioned within said casing and rotatable therewith, said receiving chamber being provided with a plurality of inlet passages.

2. An apparatus for the described purpose, the same comprising a rotatable casing having an outwardly extended circular passage-way therein for directing the liquid toward the periphery of the casing, means for conveying liquid into said passage-way, outlets in the periphery of the casing for the discharge of solids under pressure, means within the said casing for forming a pressure chamber and a receiving chamber for the liquid, a filter interposed between said chambers, and mechanism for imparting rotation to the casing and its associated parts.

3. An apparatus for the described purpose, the same comprising a rotatable casing, means for imparting rotation thereto, a feed tube arranged within the casing, a circular diaphragm carried by said tube and forming an outwardly extended passage-way through which the liquid is carried toward the periphery of the casing and a pressure chamber for the treated liquid, a series of outlets through which the solids separated from the liquid are discharged under pressure, a shell surrounding the feed tube and forming a receiving chamber for the liquid, and a radially disposed filter secured to said shell for admitting liquid from the pressure chamber into the receiving chamber.

4. An apparatus for the described purpose, the same comprising a rotatable casing, means for imparting rotation thereto, a series of peripheral outlets therein for the discharge of the separated solids, a feed tube arranged within the casing, a circular downwardly inclined diaphragm carried by the tube and forming an outwardly extended contracted passage-way for the liquid, radially disposed curved ribs on the under face of said diaphragm, a shell surrounding the feed tube and forming a receiving chamber for the treated liquid, and a plurality of radially disposed filters secured to the said shell and through which filters the liquid enters the receiving chamber.

5. In an apparatus for the described purpose, the combination with a rotatable casing provided with a series of peripheral outlets for the discharge of solids under pressure, of means arranged within the casing for forming a liquid receiving chamber and a pressure chamber therein, a vacuum chamber communicating with the liquid receiving chamber, a series of outlets leading therefrom, and a filter interposed between the pressure chamber and the receiving chamber.

6. In an apparatus for separating solids from liquids, a rotatable casing provided with means in the periphery thereof permitting the discharge of solids under pressure, means arranged within the casing for forming a receiving chamber and a pressure chamber therein, said receiving chamber being provided with means permitting the passage of liquid thereto from the pressure chamber, and means for creating a vacuum in the receiving chamber.

7. In an apparatus for separating solids from liquids, a rotatable casing provided with means in the periphery thereof permitting the discharge of solids under pressure means arranged within the casing for forming a receiving chamber and a pressure chamber therein, a filter positioned between said receiving chamber and pressure chamber, and means for creating a vacuum in said receiving chamber.

8. In an apparatus for separating solids from liquids a rotatable casing provided with a plurality of peripheral outlets permitting the discharge of solids under pressure, a receiving chamber arranged within the casing and provided with a plurality of radially disposed filters permitting the entrance of the liquid from the casing, and means for introducing the liquid to be treated into said casing under pressure.

9. In an apparatus for separating solids from liquids, a closed rotatable casing pro-

vided with a plurality of peripheral outlets permitting the discharge of solids under pressure, a receiving chamber positioned within the said casing and provided with a plurality of passages permitting the entrance of the liquid from the casing thereinto, said receiving chamber communicating with a hollow disk provided with a plurality of peripheral openings, and means for admitting the liquid to be treated into said casing under pressure.

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

LAMARTINE C. TRENT.

Witnesses:

N. A. ACKER,

D. B. RICHARDS.