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CENTRIFUGAL SEPARATION.

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1,355,559. **Patented Oct. 12, 1920.**

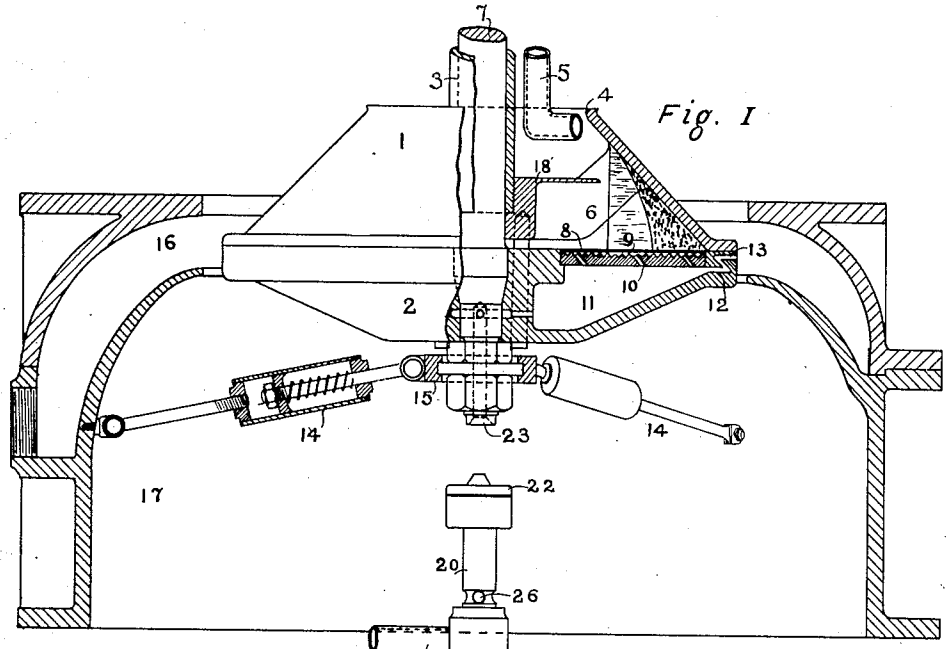


Fig. I

Fig. III

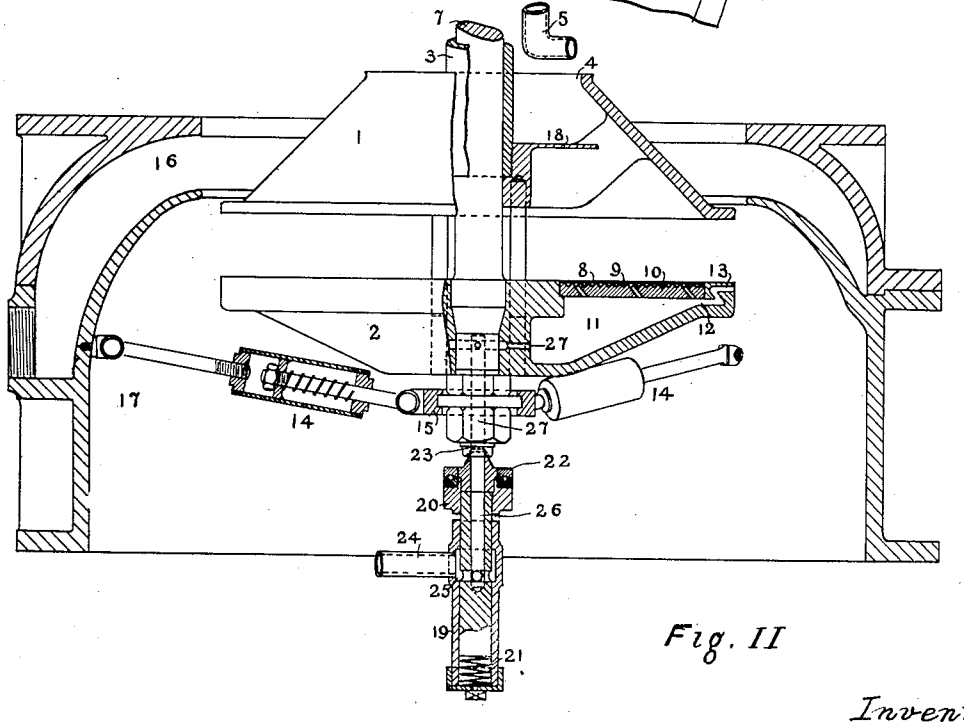


Fig. II

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CENTRIFUGAL SEPARATION.

1,355,559. Specification of Letters Patent. Patented Oct. 12, 1920.

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To all whom it may concern:

Be it known that I, WILHELM MAUSS, a British subject, of 72 Cullinan Buildings, Main and Simmonds streets, Johannesburg, Transvaal Province of the Union of South Africa, have invented certain new and useful Improvements in Centrifugal Separation, of which the following is a specification.

The present invention relates to the separation of solids from liquids. Centrifugal separators are known in which the drum is formed of conical or similar sections which can be parted to discharge the solid matter. One of said sections is provided with a filter surface transverse to the axis of rotation; and in the process of separation the solid matter progressively deposits from the outer part of the drum inwardly while the liquid segregates as an inner layer which passes off through the filter surface.

The purpose of the present invention is to maintain the filter cloth freely permeable to the liquid, independently of the nature of the mixture treated. The invention is thus of special applicability to the treatment of slimy materials which are difficultly filterable and are commonly treated by decantation and filter pressing, and also of mixtures which are for all practical purposes unfilterable; a particular application of the invention being the treatment of sugar juice direct from the cane mill, thus avoiding the loss by inversion which occurs in the usual slow gravity decantation step.

The invention is illustrated in the accompanying drawings in which—

Figure I shows a centrifugal drum partly in section.

Fig. II shows the same with the drum sections separated.

Fig. III is a detail plan of Fig. I.

The drawings show a centrifugal drum consisting of the separable sections 1 and 2. 1 is a hollow cone secured to a hollow shaft 3. It is formed with a central aperture 4 to admit the feed pipe 5, and to permit the escape of unseparated material if the drum is overfed. The other section of the drum consists of a plate 2 adapted to inclose the larger end of the cone and to form with it a separating chamber 6. Said plate is fast to a shaft 7 which passes through the hollow shaft 3, and the drum as a whole is rotated by appropriate means.

Stretched upon the plate 2 and forming one boundary of the separating chamber 6 is a filter cloth 8 or other material pervious only to the liquid constituent of the material under treatment. This cloth is arranged horizontally or approximately so, so that adhesive material readily slips from it under centrifugal force, while such force has little tendency to lift the cloth from the plate.

Beneath the cloth the surface 9 of the plate is corrugated and provided with passages 10 for conveying liquid. These passages open into a chamber 11 from which lead radial passages 12, the outer ends of which are turned back in approximately Z form at 13 before emerging at the edge of the plate. This recurved or Z shaped portion of the channel forms a trap in which liquid is collected to form a complete or partial seal for the purpose indicated below.

Undue gyration of the drum is prevented by spring arms 14 connected to a ring 15 within which the shaft 7 is rotatable.

16 is a receiver for liquid effluent and 17 a receiver for the solid material which is left in the drum after the separation is completed.

During the separation period the drum is positioned with its liquid effluent orifices 12 opposite the receiver 16 as shown in Fig. I. When the discharge of the liquid is completed the drum is lowered bodily and the sections 1 and 2 are parted as indicated in Fig. II so discharging the solid into the receiver 17. The drum is thereafter raised and closed and separation is resumed. Suitable mechanism for effecting these movements of the drum is described in detail in application for Letters Patent No. 14,785 of 1917, and need not be referred to here.

The discharge end of the feed pipe 5 is arranged close to the inner surface of the cone 1, tangentially to the drum and in the same direction as the rotation of the drum as shown in Fig. III.

Within the drum and beneath the feed pipe 5 is arranged a circular baffle 18 which prevents material dropping from the feed pipe directly onto the filter cloth 8.

19 is a valve casing carrying a piston valve 20 which is forced upwardly by a spring 21. The valve is provided at the top with a rotatable nozzle 22 which can seat in and revolve with a seating 23 in the lower end of shaft 7. 24 is a pipe supply-

ing steam, air or water under pressure to the chamber 25 within the valve casing; which chamber is closed by the valve 20 when the latter is raised as in Fig. I. When the drum 1, 2 descends the shaft 7 seats on the nozzle 22 and forces down the valve, so causing the pressure fluid to pass from the chamber 25 through the ports 26 in the valve and passages 27 in the drum to the chamber 11 beneath the filter cloth 8.

The process is carried out as follows:—

The drum being in rotation and positioned opposite the liquid receiver 16, as in Fig. I, the material to be separated is fed from the pipe 5 tangentially and in the direction of rotation onto the inner surface of the cone 1. It thus passes down over the cone surface to the outer part of the separating chamber 6 without passing over the filter cloth 8.

The material is fed at such a limited rate that by the time it has reached the outer unoccupied part of the separating chamber it has become separated and the solid deposits itself at once on the walls of the chamber 6 or on the deposit 28 already formed, leaving the liquid as a radially inward stratum 29. This liquid being in contact with the clean filter cloth 8 passes through the same and is discharged through the passages 10 and 12.

The unseparated material is fed continuously at this rate, the solid material constantly accumulating in the outer part of the chamber and the clear liquid zone being constantly advanced inwardly so that the liquid passes through successive clean sections of the filter cloth, which are afterward covered by the solid deposit.

As soon as the filter cloth is substantially covered with deposit, feeding is stopped; any excess material fed in being discharged from the opening 4 which is of slightly greater radius than the inner edge of the filter cloth. The drum 1, 2, is then lowered and opened and the accumulated solid thereby discharged into the receiver 17.

As the drum descends and opens, fluid under pressure is passed from the supply 24 into the chamber 11 and is blown through the filter cloth 8 from the underside, so cleaning the same. The partial or complete stoppage of the traps 13 by liquid held therein by centrifugal force, or even the limited size of the passages themselves, causes sufficient fluid pressure to be maintained in the chamber 11 to enable the cloth to be effectively blown through. Steam is used for the purpose in preference to other fluids to avoid drying the filter cloth. Subsequently the drum is raised and closed and feeding is resumed.

I claim—

1. A process of centrifugal separation of solids and liquids, which consists in progressively depositing mixed solids and fluids near the circumference of the interior of a centrifugal drum having a filtering surface, revolving said drum to cause the solids to progressively advance on to the filtering surface while the liquids drain through the filtering surface, and preventing unseparated material from coming into contact with the filter surface.

2. In the process as claimed in claim 1, the step which consists in feeding the mixture at a limiting rate on to a wall of the drum remote from the filter surface, whereby separation is substantially completed before the constituents reach the filter surface.

3. In the process as claimed in claim 1, the step which consists in periodically passing fluid inwardly through the filter surface to clean the same.

4. In the process as claimed in claim 1, the steps which consist in feeding the mixture at a limited rate on to a wall of the drum remote from the filter surface, and periodically passing fluid inwardly through the filter surface to clean the same.

5. A centrifugal separator comprising a drum having an inner conical surface and a filter surface arranged perpendicular to the axis of the conical surface, a separating chamber inclosed by said surfaces, and feeding means arranged to feed exclusively onto said conical surface.

6. Apparatus as claimed in claim 5, in which the mixture is fed tangentially in the direction of rotation of the drum.

7. In a centrifugal separator as claimed in claim 5, a baffle arranged between the feeding means and the filter surface to prevent feed material from directly reaching the latter.

8. In a centrifugal separator comprising a drum provided with a filter surface arranged for liquid normally to pass outwardly through it, means for producing an inward flow of cleaning fluid through the filter surface to clean the same.

9. A centrifugal separator as claimed in claim 8, in which a trap outlet for liquid is arranged beneath the filter surface to enable fluid pressure to be set up beneath the filter surface.

10. A separator as claimed in claim 8 in which the drum is movable bodily, and in which such bodily movement of the drum causes the admission of pressure fluid beneath the filter surface.

11. In a centrifugal separator, a drum provided with a filter surface substantially transverse to the axis of rotation, and said drum being formed with a central opening of somewhat greater radius than the inner boundary of the filter surface.

12. A centrifugal separator comprising a rotatable drum formed of two hollow-cones having their bases abutting, a filter surface

arranged in the drum substantially transverse to the axis of rotation, and dividing the interior of the drum into a plurality of chambers, means for feeding the material to be separated on to the inner surface of one of the cones, and a fluid outlet provided in the other cone.

13. A separator of the kind defined in claim 12, in which the cones are relatively movable axially.

14. A separator of the kind defined in claim 12 having means for admitting cleaning fluid to the interior of the cone having the fluid outlet.

15. The process of centrifugal separation which consists in progressively depositing the solid constituent of a mixture in the outer part of a centrifugal drum having a filtering surface disposed materially normally to the axis of rotation of the drum, and causing the liquid to be segregated as an inner layer which passes through the filter surface while preventing unseparated material from coming into contact with the filter surface.

16. In a centrifugal separator, a drum having a conical surface and a filter surface forming between them an outwardly tapered chamber and feeding means arranged to feed exclusively onto said conical surface.

In testimony whereof I affix my signature.

WILHELM MAUSS.