W. MAUSS.

CENTRIFUGAL FILTER.

APPLICATION FILED APR. 4, 1918.

1,404,157.

Patented Jan. 17, 1922.

2 SHEETS—SHEET 1.

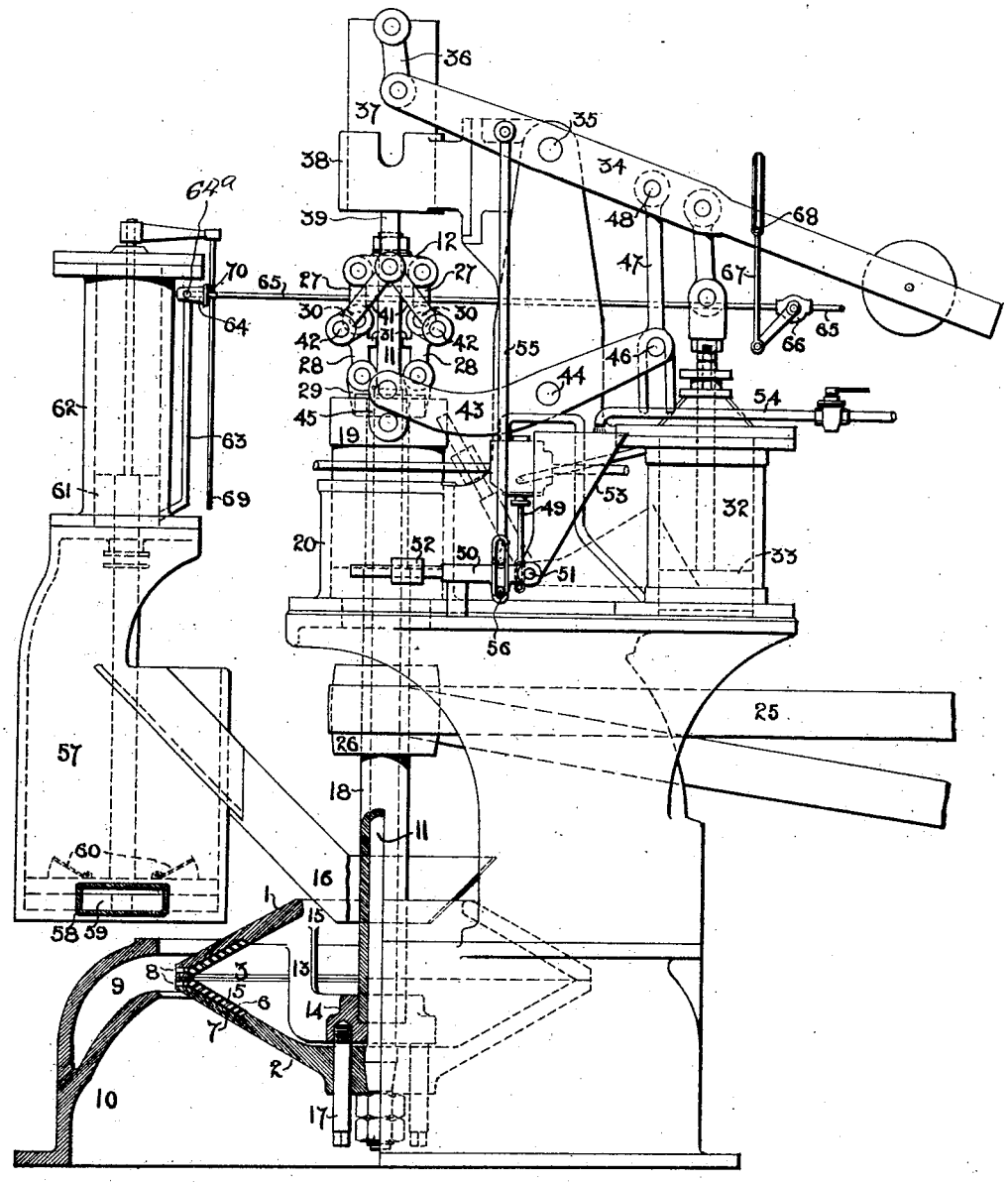


Fig I

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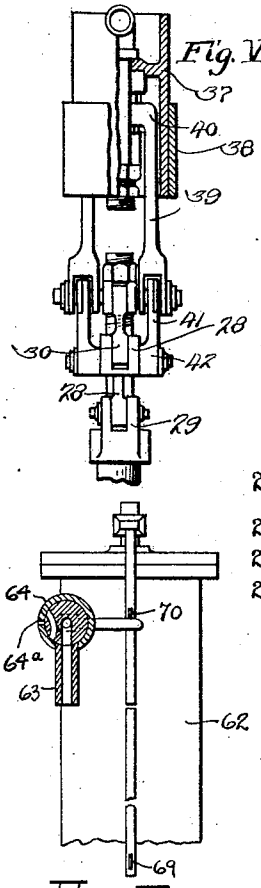


Fig. V.

Fig IV

Fig I

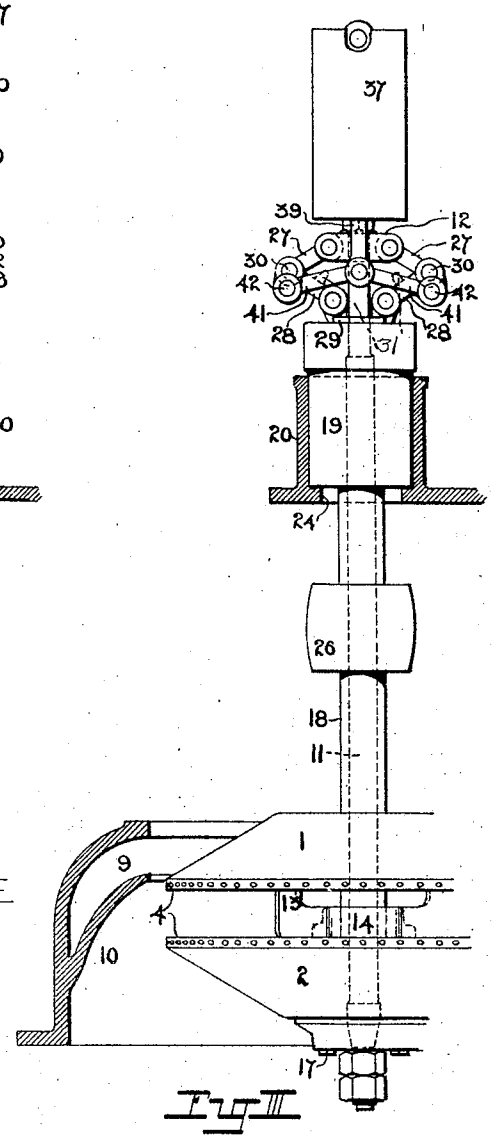


Fig II

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UNITED STATES PATENT OFFICE.

WILHELM MAUSS, OF JOHANNESBURG, TRANSVAAL PROVINCE, SOUTH AFRICA.

CENTRIFUGAL FILTER.

1,404,157. Specification of Letters Patent. Patented Jan. 17, 1922.

Application filed April 4, 1918. Serial No. 226,671.

To all whom it may concern:

Be it known that I, WILHELM MAUSS, a subject of the King of Great Britain, residing at Cullinan Buildings, Johannesburg, Transvaal Province of the Union of South Africa, have invented certain new and useful Improvements in Centrifugal Filters, of which the following is a specification.

The present invention relates to centrifugal separators and more particularly centrifugal filters, of the kind in which the filter drum is made of two sections separable on a plane perpendicular to the axis, to enable the material remaining in the drum after separation to be discharged without stopping the rotation of the drum.

The principal purpose of the invention is to provide novel means for producing relative movement of the drum sections which enables the drum sections to be securely locked together during separation and enables them to be quickly parted by a simple movement for discharging the solid matter. Another purpose is to permit the separated materials to be separately collected in a simple and effective manner.

In the accompanying drawings,

Fig. I is a general view of a machine according to this invention, with its parts in position for separating, details being in section.

Fig. II shows the more essential portions, in a different position from that shown in Fig. I, details being sectioned.

Fig. III is a view of the parts shown in Fig. II but in another position.

Fig. IV is a view of a detail.

Fig. V is a view of the toggle mechanism taken at right angles to Fig. II.

The filtering drum consists of the upper hollow truncated cone 1 and lower hollow truncated cone 2 which are oppositely disposed with their larger ends together, thus providing an annular > shaped separating chamber 3. The contacting surfaces 4 (Fig. III) are machined to make a tight joint upon being pressed together.

The walls of this chamber 3 are made pervious to the liquid which is required to be separated, by any suitable means. As shown perforated plates 5 are counter sunk in the walls of the cones and covered internally with filter cloth or screening 6. Passages 7 in the rear of the plates 5 conduct the liquid to outlet holes 8. The liquid is caught in an annular receiver 9 forming part of the base of the machine. The solid matter is discharged into a chamber 10 beneath the receiver 9. For this purpose the drum as a whole is first lowered to clear the receiver 9 as shown in Fig. II; whereafter the cones 1 and 2 are parted as shown in Fig. III, allowing the solid matter, under centrifugal action to slip from the inclined surfaces of the filter chamber 3 and pass outwardly through the annular space left between the rims of the cones.

The lower cone 2 is fixed to a shaft 11 suspended from a crosshead 12. The upper cone 1 is formed with spokes 13 and a depressed central hub 14 leaving an opening 15 at its upper end free to receive the pulp feed launder 16. Pins 17 extend from the hub 14 through the lower cone 2 and cause the two cones to rotate together, whilst allowing them relative axial movement.

The hub 14 of the cone 1 is fixed to a hollow shaft 18 suspended from a barrel 19 capable of sliding in a guide 20 on the frame. Between said barrel 19 and said shaft 18 are arranged suitable bearings 21 for allowing the shaft to rotate, and thrust bearings 22 to carry the weight of the shaft and its cone 1. There may also be a rubber cushion 23 to allow limited lateral play between the shaft 18 and the barrel 19. At the bottom of the guide 20 is a flange 24 on which the barrel 19 rests when lowered. Rotation of the drum 1, 2, and the shafts 11, 18 is effected by the belt 25 running on a pulley 26 fastened to the shaft 18.

The centrifugal force which the material under treatment exerts on the inclined surfaces of the separating chamber 3 tends to force the cones 1 and 2 apart with very considerable force. It is therefore necessary to provide means actuated from non-revolving parts of the apparatus for forcing the cones together, during separation of the liquid, with a powerful pressure and it is impracticable to transmit the required degree of pressure through bearings to the revolving parts of the machine. It is also desirable that the operations of forcing together and parting the cones should be effected expeditiously so as not to detract from the operating time of the machine. These requirements are met by a toggle device operating in conjunction with the movements of the drum between the receiver 9 and the chamber 10. Said toggle device consists of the links 27 pivoted to the cross

head 12 (to which the shaft 11 is secured) and the links 28 pivoted to a cap 29 fixed to the top of the shaft 18, the links 27 and 28 being pivoted together at 30. The toggle links are arranged to be alined when the cones 1 and 2 are together, thus locking the latter. Stops 31 on the links 28 make contact with the shaft 11 when the links 27 and 28 are alined and prevent said links from moving inwards past their dead centres.

The toggle is actuated and the drum lowered and raised by the following arrangement.

32 is a hydraulic motor cylinder having a piston 33 which is connected to the lever 34 to rock the same, the lever being pivoted to the frame at 35. Said lever is coupled by short links 36 to a barrel 37 arranged for vertical movement in the guide 38 on the frame. A yoke 39 is suspended from the casing 37 by a bearing 40 so that whilst the yoke is free to rotate with the drum, it moves up or down with the barrel 37.

At the lower end of the yoke 39 are the links 41 connected to the links 28 at 42. It will be seen that downward movement of the yoke 39 relatively to the shaft 18 breaks the toggle and causes the cones 1 and 2 to separate. 43 is a lever pivoted to the frame at 44 and connected by short links 45 to the casing 19. A pin 46 at its other end can be engaged by a slotted link 47 pivoted to the lever 34 at 48.

Movement of the motor piston 33 is governed by a piston valve 49. The piston of this valve is in turn reciprocated by the arm 50 pivoted at 51 and carrying a weight 52. Secured to the arm 50 at the opposite side of the pivot 51 is a tank 53 which the weight 52 tends to keep upright. Water is supplied to the tank 53 from a pipe 54 and when the tank is filled, it tilts over,—as indicated by dotted lines,—so discharging the water. The tank is restored to its upright position by downward movement of a slotted link 55 attached to the lever 34 and engaging a pin 56 on the arm 50.

57 is a pulp feed well to which the pulp to be treated is fed from a supply tank by way of the pipe 58. It is fitted with a lifting bucket 59 having valves 60 which close downwardly. The top of the well is open so that upon raising the bucket the pulp contained in the well is discharged into the launder 16 which conveys it to the drum 1, 2.

The bucket 59 is periodically raised by a piston 61 working in a cylinder 62. Water under pressure is supplied to the underside of the piston 61 by way of the pipe 63, cock 64 and supply pipe 65 controlled by a cock 66. The latter is actuated by a slotted link 67 and a pin 68 on the lever 34 so as to be opened at the end of the downward movement of the piston 33. Carried on the piston 61 are the tappets 69, 70 which alternately trip the cock 64 as shown in Fig. 4.

The operation is as follows—

The drum 1, 2 is kept continuously rotating at the proper speed for separation. Assuming the parts to be in the position shown in Fig. I and there to be a charge of pulp in the drum, said charge is separated by the centrifugal action, the liquid passing into the receiver 9 and the solid being retained in the chamber 3. The rate of flow of water into the tank 53 is so adjusted that when the separation is completed, said tank tilts over as indicated by the dotted lines. The valve 49 is thereby moved to admit water beneath the piston 33, which is moved up. This lowers the drum 1, 2 and with it all the revolving parts as a whole.

When the drum 1, 2 is clear of the receiver 9 the barrel seats on the flange 24 at the bottom of the guide 20 thus holding the shaft 18 and cone 1 from further downward movement. This position is shown in Fig. II. The yoke 39 however continues to descend, thus breaking the toggle 27, 28 and allowing the cone 2 to separate from the cone 1 as shown in Fig. III. The solid is thereby discharged into the chamber 10.

Upon the completion of the downward movement of the parts, the link 55 engages the pin 56 and forces down the arm 50 sufficiently to enable the weight 52 to restore the tank 53 and arm 50 to the full line position of Fig. I. The tank 53 begins to fill again for the next cycle, whilst the distributing valve 49 is restored, thereby admitting pressure liquid above the piston 33. The yoke 39 is thereby raised, the first effect of which is to bring the cone 2 up to the cone 1 and lock the cones together by straightening the toggle 27, 28. Thereafter the drum 1, 2 is fully raised; and at the last part of the upward movement the lever 43 is engaged by the link 47 whereby the weight of the revolving parts is taken by said lever and the bearing 40 is relieved of pressure. Upon completion of the downward movement of the piston 33, the cock 66 is opened and pressure fluid admitted beneath the piston 61. Said piston is thus raised and delivers a new charge of pulp from the tank 57 into the drum 1, 2. Upon delivery of the charge the cock 64 is tripped by the tappet 69 to shut off the supply of fluid and exhaust the cylinder 62. The piston 61 and bucket 59 consequently fall by gravity the rate of falling however being so regulated by constricting the exhaust port 64^a of the cock 64 that the downward movement is completed at about the time the piston 33 is again raised. At the end of said downward movement the cock 64 is tripped by the tappet 70 to reconnect the pipes 65 and 63. Filtration meanwhile continues until the tank 53 is again filled, when the cycle is repeated.

I claim—

1. In a centrifugal filter or the like a drum constructed of separable sections, and mechanism consisting of rotatable and non-rotatable parts for producing relative movement of said drum sections, said rotating parts including a toggle for multiplying the drum closing force.

2. In a centrifugal filter or the like, a rotatable drum constructed of separable sections, a toggle rotating with the drum and serving to lock the drum sections together, and means for operating the toggle.

3. In a centrifugal filter or the like, a drum composed of separable sections, means to move the drum bodily, in the direction of its axis of rotation and means actuated in accordance with such bodily movement of the drum for separating and closing the drum sections.

4. In a centrifugal filter or the like, a drum composed of separable sections, means to move the drum bodily in the direction of its axis of rotation and means actuated upon the drum moving to its closed position to lock the drum sections together.

5. In a centrifugal filter or the like, a drum constructed of separable sections, a receiver for liquid effluent and mechanism arranged to produce first bodily movement of the drum in the direction of its axis of rotation and then relative movement of one drum section to another to open the drum.

6. In a centrifugal filter or the like, a drum consisting of axially separable sections, a liquid receiver, a toggle locking the drum sections together when straight, suspending means for the drum movable through a definite space and so connected to the toggle that the weight of the drum tends to keep the toggle straight, and means to arrest movement of one drum section before completion of the movement of the suspending means, whereby continued movement of the suspending means breaks the toggle and separates the unarrested drum section from the arrested section.

7. In a centrifugal filter or the like, an axially separable drum, a liquid receiver, a motor, mechanism operated by the motor to effect relative movement of the drum and receiver, then separate the drum sections, then close the drum sections and then restore the drum and receiver to their relative operative position, and means controlling the motor to effect periodical operation thereof.

In testimony whereof I affix my signature.

WILHELM MAUSS.