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C. N. WAITE.

DEVICE FOR SEPARATING MATERIALS HELD IN SUSPENSION BY LIQUIDS.

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FIG. I.

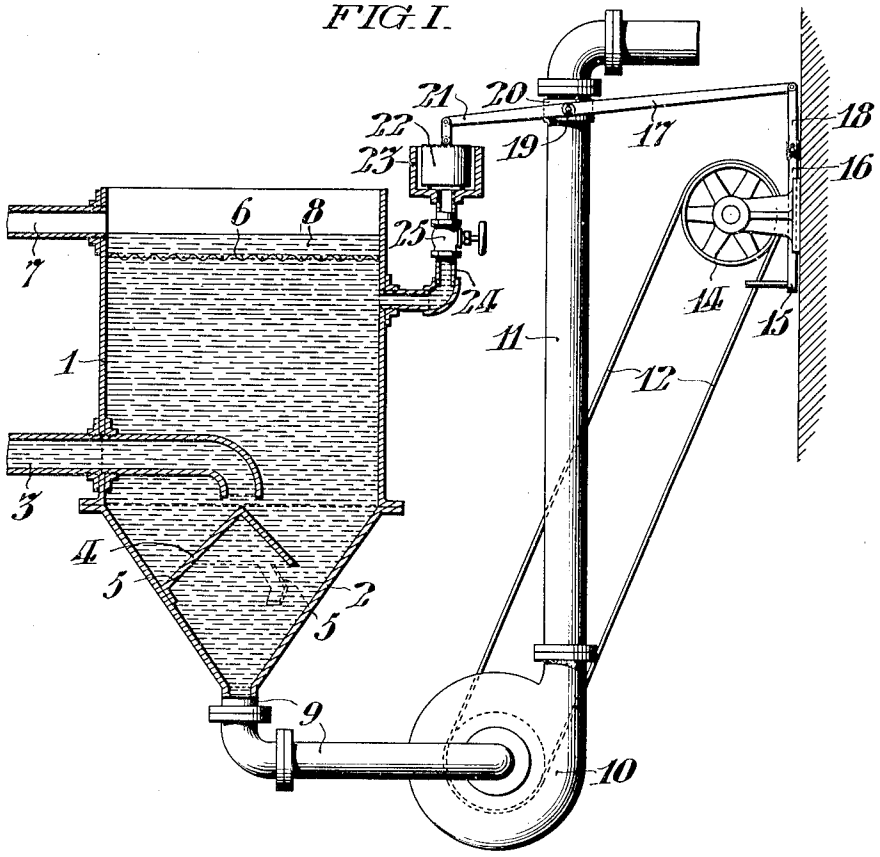
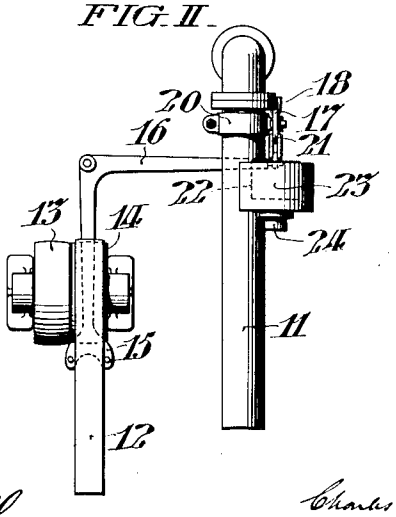


FIG. II.



WITNESSES:

Clifton C. Callowell

John C. Bergner.

INVENTOR:

Charles N. Waite.

By Paige Paul & Healy

Attorneys

UNITED STATES PATENT OFFICE.

CHARLES N. WAITE, OF WILMINGTON, DELAWARE.

DEVICE FOR SEPARATING MATERIALS HELD IN SUSPENSION BY LIQUIDS.

No. 872,033. Specification of Letters Patent. Patented Nov. 26, 1907.

Application filed April 7, 1906. Serial No. 310,420.

To all whom it may concern:

Be it known that I, CHARLES N. WAITE, of Wilmington, Delaware, have invented certain new and useful Improvements in Devices for Separating Material Held in Suspension by Liquids, whereof the following is a specification, reference being had to the accompanying drawings.

The primary application of my invention relates to the devices known as pulp-savers, the object of which is to remove the solid and flocculent material from the so called "white water" of paper mills, and I will therefore explain the invention in connection with an apparatus specifically addressed to that purpose.

In the accompanying drawings, Figure I, represents a vertical section through the main portion of the apparatus showing adjacent parts in side elevation. Fig. II, is a fragmentary elevational view of the controlling mechanism looking toward the right in Fig. I.

The apparatus comprises a receiving tank 1, the lower portion of which is preferably tapered as indicated at 2. The pipe 3, for the admission of the "white water", enters the tank laterally and discharges downwards centrally therein at about the level where the taper of the bottom begins. Beneath the discharge orifice a distributer 4, preferably conical may be arranged, said distributer being conveniently supported by means of legs 5, secured to the sides of the tank.

Some distance below the top of the tank is a transverse screen 6, of wire gauze or other suitable material, which for use with ordinary "white water" should be of about seventy mesh. A discharge pipe 7, is arranged above the screen preferably at such a level as to maintain a substantial depth of water thereover as indicated at 8, thus affording a back flow downwards through the screen under the conditions hereinafter set forth.

At the apex of the tapered bottom of the receiving tank, is an outlet pipe 9, for the collected residue of separated material, which pipe is provided with a centrifugal pump 10, whose delivery pipe 11, leads to any convenient point. Said centrifugal pump is actuated by means of the belt 12, arranged in the ordinary relation to fast and loose pulleys 13, and 14. A belt shifter 15, is actuated by means of a bell crank lever 16, which in turn is controlled by means of a lever arm 17, through the link 18, said lever arm may be conveniently fulcrumed at 19, upon a collar 20, secured to the vertical leg of the discharge pipe 11. The other end 21, of the lever 17, is connected with a float 22, which is disposed within a small secondary tank 23, supported above the level of the receiving tank 1 and communicating therewith by means of a pipe 24, whose orifice is some distance below the level of the diaphragm 6. This pipe is controlled by means of a valve 25, which can be set so as to reduce the effective area of the pipe to any desired degree.

The operation of the device is as follows:— Assuming that the "white water", containing the pulp to be separated, is delivered through the pipe 3, in a substantially regular stream, and at a moderate rate, the effect of the distributer 4, is to cause the settling of the solid and flocculent material in a quiet and uniform manner, without serious disturbance of the material previously deposited. As the "white water" rises in the receiving tank, it reaches the diaphragm 6, and the suspended portions of the flocculent material are caught by the wire gauze and remain on the under side thereof. The water which filters through the wire gauze is comparatively free from the solid material and flows out through the pipe 7. As however, the operation progresses, the meshes of the diaphragm 6, become clogged by the accumulation of the flocculent material upon the under side, and when this clogging has extended entirely across the diaphragm, the efficiency of the apparatus of course becomes impaired, as substantial outflow can no longer take place, and the inflow continues. The effect is to create a pressure in that portion of the receiving tank which is beneath the diaphragm 6, and this pressure causes the water to rise through the pipe 24 (the valve 25 being set to leave any desired area of opening) into the secondary tank 23, where it accumulates and raises the float 22. During all this time, the belt 12, has been upon the loose pulley and the pump 10, has been idle. The rise of the float however actuates the lever 17, and bell crank 16, so as to shift the belt 12, from the loose pulley onto the fast pulley. Thereupon, the pump 10, is actuated to withdraw the separated residue of material from the bottom 2, of the tank 1. As this action progresses, the level of the liquid contents of the receiving tank

falls, and a back flow of water takes place from above the screen, which will wash the material downwards and clear the meshes of the gauze, since the clogging material is practically all upon the lower side.

Owing to the fact that the orifice controlled by the valve 25, is properly set to prevent the rapid outflow of water from the secondary tank 23, the pumping out of material from the receiving tank 1, and consequent relief of pressure, will not be immediately attended by the complete discharge of the water in the tank 23, so that the float 22, may remain in the position corresponding with the actuation of the pump for some little time after the water level has fallen in the tank 1. Ultimately, however, the pressure beneath the diaphragm being relieved, the secondary tank 23, will discharge itself, and thereupon, the float 22, will sink to the bottom and reshift the belt onto the loose pulley, so as to stop the pump and permit the apparatus to resume its first mentioned operation. Obviously, the withdrawal of the residual material may also be effected by manual shifting of the belt 12, at any time it is found desirable. The main purpose, however, of the above described adjuncts is to permit the automatic operation of the apparatus, not merely in order to discharge the accumulated material, but to maintain the conditions which are efficient for separation.

From the principle of operation above described, it will be observed that it depends upon the presence, in the receiving tank, of an element, (which may broadly be termed a screen) through which the liquid passes to the point of overflow, and upon the fact that when this screen becomes clogged, it can be cleansed by a back-flow of liquid, automatically controlled. In the embodiment above described, the pressure created in the region below the screen is utilized to initiate the automatic operation, but obviously the essence of the invention does not depend upon such a method of affording the desired control, and hence I do not limit my broad claim to the described organization. I would also state that the screen element shall be as extended as possible, and therefore it is shown as composed of gauze across the entire area of the tank. It is, however, obvious that a portion of it might be solid, the only essential condition being that the screen shall be efficient to prevent substantial escape of recoverable material, and shall be accessible to the back flow of liquid when clogging takes place.

Having thus described my invention, I claim:—

1. In a separating device, the combination with a tank; of a screen dividing said tank; an inlet pipe for unseparated materials, arranged on one side of said screen; an outlet for separated residue arranged upon the same side of said screen; an outlet for strained liquid, arranged on the opposite side of said screen; means for effecting the discharge of the separated residue; and means responsive to abnormal increase of pressure beneath the screen for actuating the controlling mechanism of said discharging means.

2. In a separating device, the combination with a receiving tank; of a screen dividing said tank; an inlet pipe for unseparated materials, arranged below the screen; an outlet for separated residue, also arranged below said screen; an outlet for strained liquid arranged above said screen; a pump connected with the outlet for separated residue; actuating mechanism for said pump; a secondary tank arranged at a higher level than the normal water level of the main tank; a float arranged in said secondary tank; and means operatively connected with said float for controlling the actuating mechanism of the pump.

3. In a separating device, the combination with a receiving tank; of a screen dividing said tank; an inlet pipe for unseparated materials, arranged below the screen; an outlet for separated residue, also arranged below said screen; an outlet for strained liquid arranged above said screen, and adapted to maintain a body of liquid at the maximum water level of the receiving tank; a pump connected with the outlet for separated residue; actuating mechanism for said pump; a secondary tank arranged at a higher level than the normal water level of the main tank; a float arranged in said secondary tank; and means operatively connected with said float for controlling the actuating mechism of the pump.

In testimony whereof, I have hereunto signed my name, at Philadelphia in the State of Pennsylvania this 28th day of March 1906.

CHARLES N. WAITE.

Witnesses:
JAMES H. BELL,
E. L. FULLERTON.