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PAPER PULP RECOVERY APPARATUS

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This invention relates, generally, to a novel means for recovering pulp from the waste water discharged from paper making machines, or for recovering other substances suspended in a liquid where such operation is desired in connection with any other kind of apparatus, or in any other industry.

For example, in the operation of paper making machines, wherein water is used to flow pulp to and upon the wire belt or other paper forming element, said water, both in draining away from the wire or other forming element and when removed by suction-boxes, carries with it a considerable quantity of pulp, and various attempts have been made to recover, or, in other words, to prevent loss of, the free pulp discharged with the waste water; such as by providing boxes or tanks called save-alls into which the waste water containing pulp is collected, and from which only a part of such pulp charged waste water may be directly recirculated through the paper machines, the remainder being wasted. It is the object of this invention to provide an improved save-all apparatus into which the waste water containing free pulp is collected, and through which it is passed in such a manner that substantially all of its pulp content may be precipitated and separated therefrom, and the separated pulp removed and returned to beaters, Jordans or back to the pulp chests of paper machines, and the clear water returned back to the clear water chests of paper machines, thus economizing both pulp and water.

This invention has for a further object to provide a novel construction of save-all apparatus in which the flow of waste water containing pulp is so controlled that substantially all agitation is eliminated whereby the contained pulp particles or fibers may settle or precipitate to the bottom of the main tank of the apparatus, to be continuously removed by a novel mechanical scavenging conveyor to a pulp sump, while only clear water is discharged from said main tank; the separated pulp being finally removed from the sump by pumping the same therefrom for delivery as may be desired to beaters, Jordans or pulp chests of paper machines.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

With the various objects of my invention in view, the same consists in the novel paper pulp recovery apparatus or save-all or the like hereinafter set forth; and, furthermore, the invention consists in the novel arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, all of which will be hereinafter more fully described, and then finally embodied in the claims appended to this specification.

While the objects of this invention as above stated, as well as the subsequent description of the same, deal with a pulp saving and water clarifying apparatus for use, more particularly, in the paper manufacturing industry, it will be understood that my invention is not intended to be thereby confined to such specific use, but rather it is intended that my invention, as described and claimed, shall cover any industrial use to which the apparatus may be put in carrying on an operation of separating suspended substances from a liquid and at the same time clarifying such liquid.

The invention is clearly illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of the novel paper pulp recovery apparatus or save-all made according to and embodying the principles of this invention; and Figure 2 is a longitudinal vertical section through the same, taken on line 2—2 in said Fig. 1.

Similar characters of reference are employed in all of the above described views, to indicate corresponding parts.

Referring now to said drawings, the reference character 3 indicates a tank or vat made of any suitable material and of suitable depth and length; preferably, the tank or vat possesses a depth of five to six feet, a width of eight feet or more, and a length of one hundred to one hundred and fifty feet, although these illustrative dimensions are subject to such variation, as may be deemed advisable.

The said tank or vat is provided at one end with an intake chamber or section 4, separated from the main body of the tank or vat by a series of transversely disposed.
vertically staggered baffles 5, over and under which the pulp charged waste water, delivered to said intake chamber or section 4, flows on its way into the main interior of the tank or vat 3. A suitable conduit 6 leads from the paper making machines to the intake chamber or section 4, for delivering the waste water collected from the paper making machines. The discharge end 7 of said conduit may be of any suitable form, but is preferably submerged in the water delivered into said intake chamber or section 4 so as to reduce the agitation of the entering water as much as possible. Formed in connection with the bottom of said intake chamber or section 4 is a sump 8, provided in a wall thereof with a clean-out opening 9 normally closed by a water-tight gate 10 of any suitable construction. The purpose of said sump 8 is to collect sand and particles of foreign substances which are carried into the intake chamber or section 4 by the waste water delivered thereto. Such sand and foreign substances being comparatively heavy, will gravitate into the sump and will thereby separate themselves from the waste water and its pulp content before the latter enters the main body of the tank or vat 3. The sump may be periodically cleaned out by removing the gate 10 to give access thereto.

It is highly desirable that the pulp bearing waste water, delivered from the intake chamber or section 4, should enter the main interior of the tank or vat 3 with as little agitation as possible, so that a gentle, slow and quiet flow of the water through the main interior of the tank or vat 3 may be attained, particularly avoiding eddies and comparatively rapid currents in the depths or body of the water passing through the main tank or vat 3. To prevent undue agitation by the entering water, the receiving end of the main tank or vat 3 is provided with a catch-basin 11 supported by cross-bars 12 passing transversely from side wall to side wall of the tank or vat 3. This catch-basin 11 is of comparatively shallow depth and is of less width than the width of the tank or vat 3, the same being aligned with and having one side in contact with the lip 13 of the outer baffle of the series of baffles 5, so that water flowing over the latter will first enter the catch-basin 11, and then gently overflow the remaining three sides of the latter into the main interior of the tank or vat 3, thereby being delivered at the upper level of the water flowing through the tank or vat with a minimum of consequent disturbance of the lower levels or depths of said water flowing through the tank or vat 3.

With the like object of preventing undue agitation of the water in the main interior of the tank or vat 3, at and adjacent to the point of discharge of water from the latter, while at the same time drawing off clear water from the upper levels thereof, I provide, adjacent to the opposite end of the tank or vat 3, an over-flow basin 14 supported by cross-bars 15 passing transversely from side wall to side wall of the tank or vat. This overflow basin 14 is of comparatively shallow depth, and is of less width than the width of the tank or vat, the same being located with its lips or margins slightly below the level of the water flowing through the tank or vat 3, so that the clear water from the upper level of the latter will overflow into basin 14, to be thence discharged through a conduit 16 connected in communication with the interior of said basin so as to lead therefrom outwardly through the side of the tank or vat 3, and thence to such place as it may be desired to deliver clear water substantially free from pulp, as e.g., to the clear water cheats of paper machines.

Spaced longitudinally distant from the catch-basin 11 is a deflecting baffle 17 extending diagonally across the tank or vat 3 with its lower edges submersed slightly below the surface level of water flowing through said tank or vat 3. The purpose of this deflecting baffle 17 is to catch and deflect grease, scum or floating substances which separate from the water flowing through the tank or vat and which rise to and collect upon the surface thereof. The scum, etc., thus caught by the baffle 17 is deflected and directed thereby to flow off through a discharge vent or opening 18 provided in a side wall of the tank or vat 3, being thence conducted by a chute 19 or conduit to a suitable place of disposal.

Arranged to operate in connection with the main interior of the tank or vat 3 is an automatic pulp conveyor or scraper which moves the pulp that has been settled or precipitated out of the water to the bottom of the tank or vat 3, and thus conveys and deposits the same in a pulp collecting sump 20, which is provided in the bottom of the tank or vat 3 at its discharge end. Said conveyor or scraper mechanism comprises a lower course of longitudinally spaced apart shafts 21, which are journaled to extend transversely from wall to wall of the tank or vat 3, and upon which are mounted, adjacent to each side of the tank or vat, sprocket wheels 22; and, in like manner there is provided an upper course of similarly longitudinally spaced apart shafts 21', which are journaled to extend transversely from wall to wall of the tank or vat 3, and upon which are mounted, adjacent to each side of the tank or vat, sprocket wheels 22'. Running over the vertically opposed sets of lower and upper sprocket wheels 22 and 22', at each side of the tank or vat, are endless conveyor chains 23, to which are connected,
so as to be moved by the chains, and so as to extend transversely therebetween at suitable intervals, a series of scraper blades 24. A suitable means for driving the conveyor means thus provided may be afforded by mounting a drive pulley 25 on one of the shafts 21', which may be driven by a belt 26 from any desired source of power, or the conveyor means may be driven in any other manner or by any other power transmission means found convenient or desirable.

The operation of the conveyor means is such that its lower course so moves adjacent to the bottom of the tank or vat 3, that the scraper blades 24 travel along the bottom toward the discharge end of the tank or vat 3; thus propelling the pulp, which has settled or precipitated out of the water to the bottom of the tank or vat, onward toward and finally into the collecting sump 20, as will be clearly understood from an inspection of the drawings. It will be understood that the conveyor means moves at a very slow speed, so as not only to give ample time for the pulp particles to settle out of the water to the bottom of the tank or vat 3, but so as to also prevent, by its movement, undue agitation of the water likely to disturb the settled pulp to such an extent as might cause the same to rise from the bottom of the tank or vat and again intermingle with the water.

The pulp which has been deposited in the collecting sump 20, may be withdrawn therefrom for delivery to pulp beasters, Jordans or directly back to pulp chest of paper machines, by means of a suitable pump 27 having its intake pipe 28 communicating with the interior of the collecting sump 20. The pump 27 may be of any suitable type, although I have found in practice that a rotary pump, such as indicated in the drawings, is very satisfactory, and may be conveniently driven by an electric motor 29 and belt or similar transmission 30, or by any other suitable power transmission means.

In operation, the waste water, accompanying which is a considerable quantity of pulp, is first delivered into the intake chamber or section 4, at which place any accompanying heavy foreign substances are separated therefrom by gravitation into the sump 8. The series of baffles 5 serve to retard the water and subdue the agitation thereof before the same is admitted into the main interior of the tank or vat 3, which effect is further aided by the catch-basin 11, so that the pulp bearing water is quietly introduced to the interior of the tank or vat 3 at the surface of the water level therein, so as to permit the slow steady and comparatively unagitated flow of the pulp bearing water through the length of the tank or vat 3. The pulp bearing water thus moving slowly and quietly through the interior of the tank or vats affords the necessary conditions where-
flow basin to receive clear water from the upper water surface level of said tank, a clear water discharge conduit communicating with said overflow basin, a traveling conveyer means cooperating with the bottom of said tank for moving pulp settled out of the water and depositing the same in said pulp collecting sump, and means for discharging pulp from said pulp collecting sump.

In testimony that I claim the invention set forth above I have hereunto set my hand this 6th day of October, 1924.

SIDNEY MITCHELL.