G. C. HOWARD.

PAPER PULP REDUCING AND WASHING MACHINE.

APPLICATION FILED SEPT. 3, 1912.

1,121,837. Patented Dec. 22, 1914.

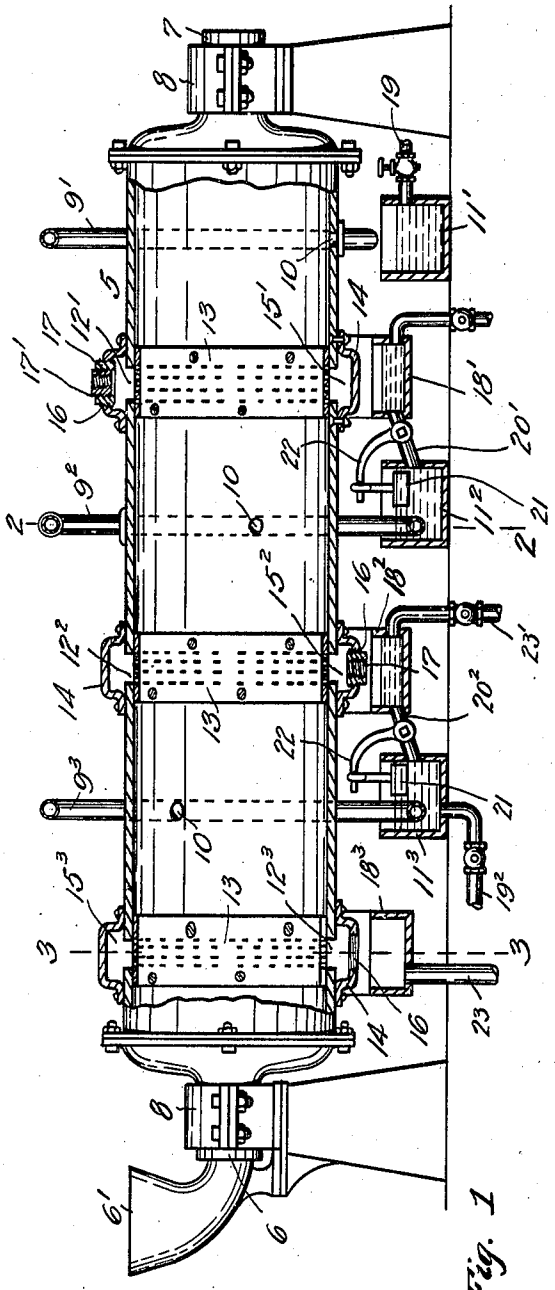

Fig. 1

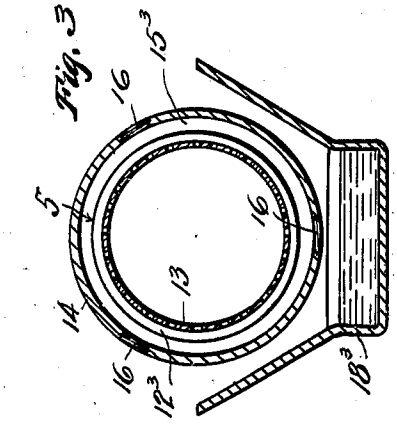

Fig. 3

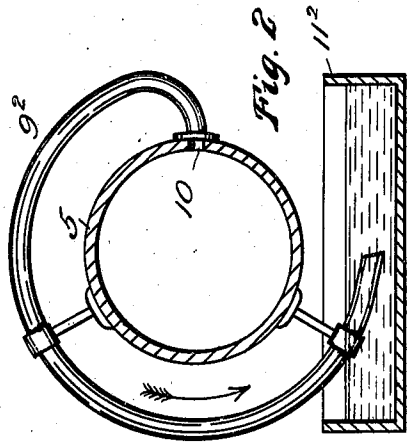

Fig. 2

WITNESSES:

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PAPER-PULP REDUCING AND WASHING MACHINE.

1,121,837. Specification of Letters Patent. Patented Dec. 22, 1914.

Application filed September 3, 1912. Serial No. 718,306.

To all whom it may concern:

Be it known that I, GUY C. HOWARD, a citizen of the United States, residing at Everett, in the county of Snohomish and State of Washington, have invented certain new and useful Improvements in Paper-Pulp Reducing and Washing Machines, of which the following is a specification.

This invention relates to apparatus for reducing and washing paper pulp material and, more especially, to improvements in apparatus described and illustrated in patent application Serial No. 660,423, filed November 15, 1911.

The object of my improvement is the perfecting of apparatus of this character to render the same more efficient in operation.

The operation performed by the devices which constitute this invention may be in the nature of washing for the recovery of chemicals which are utilized in the art for "cooking" paper stock, as when making "soda pulp"; or it may combine washing and disintegrating operations, as in manufacture of "kraft" pulps, where both a mechanical comminution of the material and the cleaning of the same to recover the chemicals are required.

The invention consists in the provision of devices whereby water is both added to and discharged from a tube mill or washer intermediate the feed and delivery ends thereof and in such a manner that the general flow of the water through the mill is in a direction contrary to the travel of the material.

In the accompanying drawings, Figure 1 is a view shown partly in side elevation and partly in longitudinal section of a tube mill with my invention applied thereto. Figs. 2 and 3 are transverse sections taken through 2—2 and 3—3, respectively, of Fig. 1.

The reference numeral 5 designates a power driven rotary drum having hollow trunnions 6 and 7 which are journaled in bearing boxes 8. The material to be treated is supplied from a hopper 6′ through the trunnion 6 and is eventually delivered through a discharge opening provided in the trunnion 7. When a mechanically effected disintegrating action upon the material treated is to be accomplished within the drum, the latter would be supplied with balls or pebbles of suitable size.

Intermediate the length of the drum are devices wherewith liquid such as water or chemical solutions may be supplied and withdrawn therefrom. The means illustrated in Figs. 1 and 2 for supplying water into the drum consists of a plurality of water elevators comprising tubes 9′, 9^2 and 9^3 which (like that described in the aforementioned patent application) are fixedly connected to and coiled about the drum. An end of each of these tubes communicates by an opening 10 in the drum shell with the interior of the same; while the other ends of the tubes are arranged to serve in their successive revolutions as scoops for dipping water from tanks 11′, 11^2 and 11^3 provided below the drum. In alternate relation with the water supply openings 10, the drum is provided with water discharge openings 12′, 12^2 and 12^3. For each of such openings is provided a perforated plate or screen 13. Disposed preferably upon the outside of the drum and spanning said water discharge openings are belt plates 14 which are formed to provide annular chambers 15′, 15^2 and 15^3 which communicate with the interior of the drum through the respective water discharge openings. In the peripheral wall of each of these chambers are provided drain holes 16 which may be regulated as to their effective sizes by the use of removable bushings, such as 17 and 17′. Vessels 18′, 18^2 and 18^3 are located below the several discharge openings 12′, 12^2 and 12^3 for collecting liquid which is drained from the various chambers 15′, 15^2 and 15^3. Water, or water tinctured with chemicals, is primarily delivered by a supply pipe 19 to the tank 11′ and from which it is conveyed by the elevator 9′ into the drum and in proximity to the end thereof from which the treated material is discharged. The water thus delivered into the mill, excepting the small quantity which accompanies the material as discharged, flows toward the head end of the mill and escapes principally through opening 12′ and chamber 15′ into the vessel 18′. From the latter, water is conducted by a pipe 20′ into tank 11^2, from which it is returned by elevator 9^2 into the drum and advanced toward the head end of same. The water thus reintroduced escapes through the openings 12′ and 12^2 into vessels 18′ and 18^2 and that which is entrained in the last named vessel is conducted by pipe 20^2 into

tank 11^3 whence it is restored to the drum through the office of the elevator 9^3. The water thus supplied to the drum flows through openings 12^2 and 12^3 into vessels 18^2 and 18^3. The major portion of the water accordingly travels by a succession of steps from tank 11′ near the discharge end of the drum to the vessel 18^3 which is located within a short distance of the drum end through which material is fed to the mill.

By adjusting the sizes of the drain holes 16 by bushing the same it is obvious that the flow of water between any of the water inlets and the water discharge may be regulated to vary the character of the work performed. The amount of water supplied into the drum by the various elevators is best controlled by individually regulating the heights of water within the respective tanks 11′, 11^2 and 11^3 to afford predetermined amounts of water being transmitted through the respective elevators. An advantageous manner of regulating the height of water in the tanks is through the agency of a float 21 within each tank and which is operatively connected with the lever handle 22 of a valve provided in the associated pipe. A supplementary water supply pipe, as at 19^2, may be utilized at any point throughout the system as, for example, into the tank 11^3.

23 represents a discharge connection for the terminal tank 18^3, although valved outlets, as 23′, may be employed for withdrawing the water from the system intermediate its length for the recovery of chemicals therefrom if sufficiently concentrated.

Among the advantages of the present invention, is the provision of apparatus whereby a tube mill, or washer, may be operated with a minimum of water and with a corresponding economy in the recovery of chemicals employed in the operation of the same and which is principally due to the provision of means whereby the water is intermittently used in a progressive travel between the discharge and feed ends of the mill. Furthermore, by the peculiar arrangement and disposition of the elements of the invention, a mill is in effect divided into a series of zones in which ensue circulatory water courses and mill liquors of various densities being extracted or a single strong liquid may be withdrawn from near the feed end of the mill and resulting in the material being at its discharge from the remote end in a practically clean state. The operation is continuous and is performed while the pulp is adjusted and mixed through the rotation of the mill.

While I have described a paper pulp mill or washer, it is to be understood that the invention is not confined to such applications as it may be effectively used in analogous operations as for example in the extraction of soluble saccharine matter from sugar beets, or in the extraction of tannin from bark.

What I claim, is:—

1. In a mill of the character described, a rotatable drum having an interior chamber provided with means for feeding material thereinto at one end, and a discharge therefor at the opposite end, a device for supplying liquid to said chamber in proximity to said discharge end of the drum, means for withdrawing said liquid from the chamber intermediate said supply device and the feed end of the drum, means wherein said withdrawn liquid is caused to flow exteriorly of the drum toward said feed end of the drum, and a second supply device adapted to re-introduce said liquid intermediate said withdrawing means and the feed end of the mill.

2. In a mill of the character described, a rotatable drum having an interior chamber provided with feed and discharge openings for material at opposite ends, a plurality of devices for supplying liquid to said chamber intermediate said ends, means interposed between said supply devices for discharging said liquid, and means exterior of said drum whereby the liquid is conveyed from the respective discharge means to an adjacent supply device.

3. In a mill of the class described, comprising a rotatable drum, a plate rigidly secured to said drum affording an annular chamber about the drum, a screen rigidly connected to said drum having perforations communicatively connecting the interior of the drum with said chamber, and an outlet for said chamber.

4. The combination of a rotatable drum provided with an opening for the feeding of material into one end and an opening for the delivery of the same from the opposite end, said drum being provided with openings for the discharge of liquid intermediate the aforesaid openings, means for receiving the liquid thus discharged, and means for returning such liquid into the drum.

5. A rotatable drum provided with openings at its opposite ends through which material to be treated is respectively fed into and discharged from the drum, in combination with means whereby a liquid may be introduced into the drum in proximity to the discharge opening thereof and then be caused to travel in a direction opposite to the course of said material and finally be withdrawn from the drum adjacent to the feed openings of the same.

6. The combination with a rotatable drum provided with an opening at one end wherethrough material is fed into the drum, a discharge opening for the material at the opposite end of the drum, and a series of

liquid discharge openings provided intermediate the aforesaid openings, of means whereby the liquid escaping from the various liquid discharge openings, is returned progressively into the drum and delivered in proximity to the respective liquid discharge openings.

7. The combination with a rotatable drum provided with openings at its opposite ends for the supply and withdrawal of material to and from the drum, and having a plurality of openings for the discharge of liquid intermediate the ends of the drum, of vessels for receiving the liquid discharged from the respective water-discharge openings, and a tank connected with one of the aforesaid tanks, and means whereby the liquid is conveyed from such supplementary tank into the interior of the drum and thence be returned through the liquid discharge openings to said vessels.

8. In a mill of the class described, a rotatable drum having an interior chamber, a plate secured to and revoluble with the drum affording a chamber exteriorly of the drum, a screen interposed between said chambers, an outlet for said exterior chamber, a receptacle for receiving the matter discharged from said outlet, and means whereby said discharged matter may be reintroduced within the mill.

9. In a mill of the class described, a rotatable drum having an interior chamber provided with a feed opening at one end and a discharge opening at the other, a plate secured to and revoluble with the drum for affording a chamber exteriorly of the drum, a screen interposed between said chamber to permit the passage of fluids, an outlet for said exterior chamber, a receptacle for receiving said fluids from said outlet wherein said fluids are conveyed longitudinally of the mill toward said feed end of the mill, and means positioned between said outlet and said feed end of the mill for reintroducing said fluids within the interior chamber.

10. In a mill of the class described, in combination with a drum having an interior chamber therein wherein the material under treatment is introduced at one end of the mill and discharged at the opposite end, of means for introducing an auxiliary supply of water within said chamber and causing said water to flow axially of the mill in a direction opposite to the course of said material.

11. In a mill of the class described wherein the material to be treated is caused to progress continuously through the mill from one end to the other, a plurality of devices for supplying water to the mill, a plurality of means whereby said water is discharged from the mill, said supply devices and discharge means being alternately positioned longitudinally of the mill, and a receptacle exterior of the mill for receiving the water from said discharge means and delivering same to the respective supply device.

12. In a mill of the class described, wherein the material to be treated is caused to progress continuously through the mill from end to end, of means whereby water is alternately introduced and withdrawn from said chamber a plural number of times, the general course of said water being contrary to the direction of travel of said material.

Signed at Everett, Washington, this 26 day of August, 1912.

GUY C. HOWARD.

Witnesses:

PIERRE BARNES,

J. V. WOODWARD.