March 31, 1931. G. H. ELMORE ET AL 1,798,459

WASHER

Filed Aug. 17, 1929 2 Sheets-Sheet 1

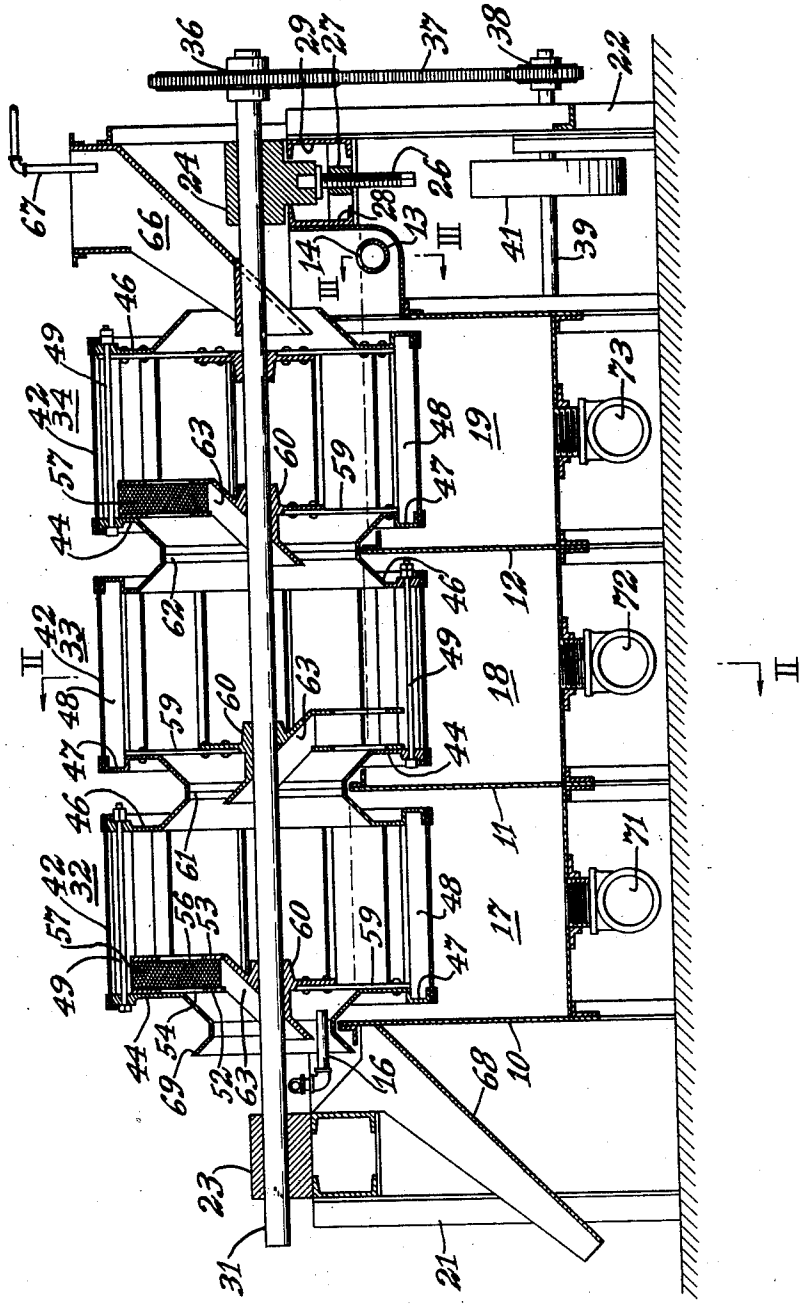


Fig. 1

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Fig. 4

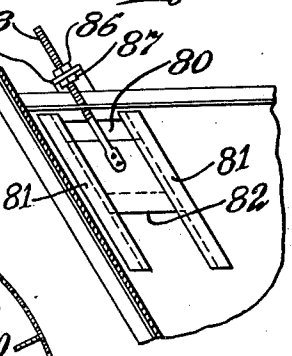
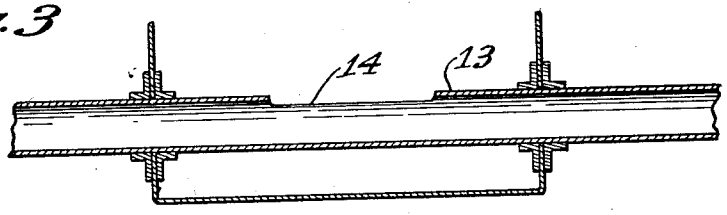


Fig. 2

Fig. 3



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UNITED STATES PATENT OFFICE

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WASHER

Application filed August 17, 1929. Serial No. 386,652.

Our invention relates to washers of that type employed in the washing of various materials employed in industrial processes, such as sand, pulp, rubber, etc., and has for its object the provision of apparatus of the character designated which shall be simple of design, economical of manufacture and extremely efficient in operation.

A further object of our invention is to provide a washer of the rotary drum type wherein the material is introduced at one end of the apparatus and discharged at the other after successive washings and wherein the wash liquid is caused to flow in a direction counter to the general direction of movement of the material being washed.

A further object of our invention is the provision of a washer embodying a plurality of rotary drums in which the material is successively treated and discharged from the apparatus, together with a tank for the wash liquid embodying a plurality of compartments in which the several drums dip during rotation, together with means for a flow of wash liquid through the several compartments in a direction counter to the general direction of material being treated.

Briefly our invention comprises a plurality of rotary drums having perforated circumferential walls and joined together at their ends by constricted openings. Material is fed into a drum at one end of the apparatus and each of the drums is provided with a scoop which terminates in a chute leading into the next adjacent drum, and to the exterior of the end drum, whereby material delivered into the drum at one end of the apparatus is successively transferred to the several drums and finally discharged from the drum at the end opposite the feed end of the apparatus.

The drums are mounted on a common shaft arranged above a tank for wash liquid. The tank for the wash liquid is divided by partitions into compartments, one compartment for each drum, and the partitions being arranged at different levels which are successively lower from the material discharge end of the apparatus to the feed end whereby the wash liquid overflows from one compartment to the other. The wash liquid is fed into the compartment at the material discharge end of the apparatus and in which the water level is the highest. Thus the material being discharged is treated by the clean incoming wash liquid, which liquid overflows into the next compartment and from that compartment to the next to be finally discharged from the tank. We thus provide a counter flow of wash liquid with respect to the material being washed. In addition the level of the wash water as it flows from compartment to compartment and to the final discharge may be varied as desired.

Apparatus embodying features of our invention is illustrated in the accompanying drawings, forming a part of this application, wherein

Fig. 1 is a horizontal sectional view through the apparatus;

Fig. 2 is a sectional view along the line II—II of Fig. 1;

Fig. 3 is a sectional view along the line III—III of Fig. 1; and

Fig. 4 is a detail view showing means whereby the wash liquid level may be varied in the several compartments.

Referring to the drawings for a better understanding of our invention, our improved apparatus comprises a tank 10 for wash liquid, which tank is provided with partitions 11 and 12 and with an overflow 13. The overflow 13 is in the form of a pipe extending through the end of the tank and provided at one side with a slot 14. The pipe 13 may be turned to change the elevation of the slot 14 and thereby vary the level of the overflow from the tank. Wash liquid is introduced into the tank through a conduit 16. The apparatus so far described accordingly comprises a tank divided into compartments 17, 18 and 19. The partition 11 is made higher than the partition 12 and the partition 12 may be higher than the overflow 13 whereby wash water introduced by the conduit 16 flows into the compartment 17 and overflows into the compartments 18 and 19 and out through the overflow 13.

At the ends of the tank 10 are provided pedestals 21 and 22 at the upper ends of which

are bearings 23 and 24. The bearing 24 may be held in position by means of a jack screw 26 mounted in a threaded member 27 and held between channels 28 and 29 supported by the pedestal 22. By this means its position may be readily adjusted.

Mounted in the bearings 23 and 24 is a shaft 31 having secured thereto drums 32, 33 and 34. The drums 32, 33 and 34 are so located that their lower sides are immersed in the compartments 17, 18 and 19, respectively. The shaft 31 is driven through a sprocket 36 and a chain 37 from a driving sprocket 38, the latter being mounted on a shaft 39 driven through a pulley 41 from any suitable source of power not shown.

Each of the drums 32, 33 and 34 is provided with a perforated circumferential wall 42 so that the wash liquid may freely enter the drum. The ends of each of the drums are formed by castings 44 and 46 provided with pockets 47 in which are fitted agitator bars 48. As may be seen from Fig. 2, the bars 48 have their web portions extending radially with respect to the drum so as to successively raise material being treated and allow it to drop back into the wash liquid. The ends 44 and 46 of the drums are held together by means of bolts 49 extending from end to end thereof and which also serve to hold the bars 48 in place.

Formed at the left hand end of each of the drums 32, 33 and 34, as seen in the drawings, is a scoop comprising spaced parallel wall members 52 and 53 provided with holes 54 and 56 in the sides thereof. Inserted between the wall members 52 and 53 is a curved perforated plate 57 forming the body of the scoop. The members 52 and 53 are provided with radial arms 58, 59 and 65 which support the end walls of the drums. A hub portion 60 of the scoop is keyed to the shaft 31. Each of the end walls of the drums 32, 33 and 34 is outwardly dished and open so that the three drums, when assembled on the shaft 31, are joined by constricted passages, 61 and 62, and the outer ends of the drum 32 and 34 are left open. Forming a part of each of the scoops and joining the inner wall member 53 is a diagonally extending chute 63 which projects through the end of its associated drum so that material picked up by each scoop in rotation is delivered into the next adjacent drum and is finally discharged from the end drum 32.

Supported from the pedestal 22 adjacent the drum 34 is a feed chute 66 through which the material to be washed is fed. At 67 is shown a conduit through which liquid may be supplied if needed to facilitate the feeding of the material into the drum 34. Suitably supported at the other end of the machine is a discharge spout 68 positioned to receive material discharged from the drum 32. The end wall 44 of the drum 32 may be provided with an outwardly flaring portion 69 to aid in the discharge of the material. Sludge collected in the compartments 17, 18 and 19 may be discharged through discharge conduits 71, 72 and 73.

The operation of our improved washer is as follows: Wash liquid is fed into the compartment 17 through the conduit 16 which, as is noted, is directed into the interior of the drum 32. After filling the compartment 17, the wash liquid overflows the partition 11 into the compartment 18 and thence over the partition 12 into the compartment 19 and out through the discharge 13. The discharge 13 may be turned to vary the height of the opening 14 and thus vary the level of water in the compartment 19. Material to be washed is fed in through the chute 66 into the drum 34 where it is successively raised by the bars 48 and dropped back into the wash liquid in the compartment 19. As the material accumulates in the drum 34 it is picked up by the scoop 57 and when raised to the upper portion by rotation of the drum slides through the chute 63 into the drum 33 where it is subjected to similar treatment in the wash liquid in the compartment 18 from whence it is discharged into the drum 32. In the drum 32, the material is given its final washing in the relatively clean incoming wash liquid in the compartment 17. The thoroughly washed material is discharged through the discharge spout 68.

We have found that it may be desirable, when washing certain kinds of materials, that the water levels in the compartments 17, 18 and 19 be lower relative to the drums than those shown and that they be made regulable. We accordingly provide means whereby such regulation may be obtainable. Referring to Figs. 2 and 4, we provide each of the partitions 11 and 12 (only one of which is shown) with an opening 80 and secure guides 81 on each side of the opening. Fitting over the opening and in the guides 81 is a plate member 82 forming a valve. Secured to the valve 82 is a threaded stem 83 which extends upwardly through a suitable clip 84 secured to the upper part of the partition 11. Adjusting nuts 86 and 87 on the stem 83 serve to adjust the position of the valve 82.

With the arrangement just described the valves 82 may be closed off entirely to cause the wash liquid to overflow the partitions, or may be opened to provide a lower adjustable level for the liquid in the compartments.

From the foregoing it will be apparent that we have devised an exceedingly simple washing apparatus in which the material is successively washed in progressively cleaner wash liquid and finally discharged. The extremely simple provision of the counterflow of wash water insures that the finally discharged material will be thoroughly clean.

While we have shown our invention in but one form, it will be obvious to those skilled in

the art that it is not so limited but is susceptible of various changes and modifications, without departing from the spirit thereof, and we desire therefore that only such limitations shall be placed thereupon as are imposed by the prior art, or as are specifically set forth in the appended claims.

What we claim is:

1. In an apparatus of the character described, a plurality of co-axially arranged rotary drums open at the ends, means defining connecting passages between the drums, means for feeding material to be washed into one of the end drums, means for successively transferring material from said end drum to the succeeding drums and finally to a discharge at the other end, a tank for wash liquid in which the drums are partly immersed, and means for effecting a flow of wash liquid through the tank from the material discharge end of the apparatus toward the material receiving end thereof.

2. In an apparatus of the character described, a plurality of co-axially arranged rotary drums open at the ends, means defining connecting passages between the drums, means for feeding material to be washed into one of the end drums, means for successively transferring material from said end drum to the suceeding drums and finally to a discharge at the other end, a tank for wash liquid, partitions in the tank defining compartments in which the several drums are partially immersed, and means for effecting a flow of wash liquid through the tank from compartment to compartment and finally to discharge from the material discharge end of the apparatus to the material receiving end thereof.

3. In an apparatus of the character described, a plurality of co-axially arranged rotary drums open at the ends, means defining connecting passages between the drums, means for feeding material to be washed into one of the end drums, means for successively transferring material while being washed from said end drum to the succeeding drums and finally to a discharge at the other end, a tank for wash liquid, partitions in the tank defining compartments therein, in which the several drums are partially immersed, said partitions being successively lower from the material discharge end of the apparatus toward the material receiving end thereof, overflow means for the tank at the material receiving end thereof, and means for continuously delivering wash liquid into the compartment at the material discharge end of the apparatus.

4. In an apparatus of the character described, a plurality of co-axially arranged rotary drums open at the ends, means defining connecting passages between the drums, means for feeding material to be washed into one of the end drums, means for successively transferring material from said drum to the succeeding drums and finally to a discharge at the other end, a tank for wash liquid, partitions in the tank defining compartments therein in which the several drums are partially immersed, said partitions being successively lower from the material discharge end of the apparatus toward the material receiving end thereof, adjustable overflow means for the tank at the material receiving end thereof, and means for delivering wash liquid into the compartment at the material discharge end of the apparatus.

5. In a washer, an elongated tank, partitions therein defining a plurality of separate compartments for wash liquid, the tops of the partitions being at progressively lower levels from one end of the tank to the other, means for introducing wash liquid into the higher level compartment end of the tank to overflow into the next lower compartment, means for withdrawing wash liquid from the lower compartment end of the tank, a plurality of connected rotary drums each dipping into the liquid in one of the compartments, and means incorporated in the drums for progressively transferring material being washed from drum to drum from the lower level compartment end of the machine toward the higher level compartment end thereof.

6. In a washer, a plurality of co-axially arranged drums, a tank, partition means in the tank defining compartments for the several drums, means for feeding material to be treated into a drum at one end of the machine, means for successively transferring the material from drum to drum and discharging it at the other end of the machine, and means for effecting a flow of wash liquid through the tank counter to the direction of movement of the material being washed.

7. A washer comprising a plurality of co-axially arranged rotary drums, constricted connecting means between the drums, a perforate circumferential wall around each drum, means for delivering material to be washed into an end drum, scoops secured to an end wall of each drum to lift and discharge material into the next adjacent drum and from the other end drum, a tank, partitions in the tank defining a plurality of compartments at different levels, means for mounting the drums to rotate with the lower portion of each drum in a compartment, and means for effecting a flow of wash liquid through the compartments in a direction counter to the axial direction of movement of the material.

8. In a washer embodying a plurality of co-axially arranged rotary drums through which material to be washed is successively transferred and treated, a tank for wash liquid, means for mounting the drums to rotate partially immersed in the tank, and

means for effecting a flow of wash liquid through the tank in a direction counter to the direction of movement of the material being washed.

9. A washer comprising a tank, a plurality of partitions mounted in the tank to provide separate compartments therein, a drum in each compartment, means for rotating the drums, means for automatically conveying material being washed from one drum into an adjacent drum, and means for subjecting said material to a counter flow of liquid.

10. A washer comprising a tank, a plurality of partitions mounted in the tank to provide separate compartments therein, said partitions being of different heights to provide different liquid levels in the several compartments, a plurality of co-axially arranged drums mounted for rotation with a drum partially immersed in each compartment, means provided within each drum for conveying material therein to an adjacent drum, and means for effecting a flow of wash liquid through the compartments.

11. A washer comprising a tank, a plurality of partitions mounted in the tank to provide separate compartments therein, said partitions being of different heights to provide different liquid levels in the several compartments, a plurality of coaxially arranged drums mounted for rotation with a drum partially immersed in each compartment, means provided within each drum for conveying material therein to an adjacent drum, means for effecting a flow of wash liquid through the compartments in a direction counter to the direction of movement of the material through the drums, and means for varying the liquid level in the compartments.

In testimony whereof we, GUY H. ELMORE and RICHARD W. RIGLER, affix our signatures.

GUY H. ELMORE.
RICHARD W. RIGLER.