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## APPARATUS FOR CONTINUOUSLY BEATING PAPER PULP

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4 Claims. (Cl. 92—25)

This invention relates to a machine for treating paper pulp and particularly to a machine adapted to beat paper pulp. It is a common practice at present to have a beating machine comprising a roll with circumferentially spaced bars projecting from its periphery in radial planes, said bars passing close to a stationary group of spaced bars or bed plate, the paper pulp being passed between said roll and the stationary bars and thus being worked upon and beaten. This is continued and the pulp passed repeatedly between the roll and bars until the pulp is brought to a sufficiently fine and separated condition. The pulp is thus gradually beaten to the desired condition.

It is an object of this invention to provide a continuous beater in which the pulp passes continuously and successively between a series of rolls and stationary bars disposed respectively in a series of contiguous compartments, said rolls preferably being carried on a common shaft and the groups of bars cooperating therewith being successively closer to the rolls toward one end of the machine.

It is a further object of the invention to provide a method of beating paper pulp which consists in continuous moving the same and successively passing said pulp between each of a series of beater rolls and stationary bars or bed plates and bars disposed respectively in a series of contiguous compartments being located successively closer to the rolls.

It is still another object of the invention to provide a beater for paper pulp comprising a casing having a series of adjacent compartments therein, a shaft passing through said compartments, a beater roll secured to said shaft in each compartment, a group of spaced stationary bars constituting a bed plate in each compartment cooperating with the roll therein together with means for adjusting said groups of bars or rolls toward and from each other, means for delivering paper pulp between the roll and bars in each compartment and means for receiving the pulp passing between the roll and bars in each compartment and delivering it to pass between the roll and bars in the next compartment.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings, in which like reference characters refer to similar parts throughout the several views and in which:—

Fig. 1 is a vertical section taken substantially on line 1—1 of Fig. 5 as indicated by the arrows;

Fig. 2 is a view partly in side elevation and partly in vertical section taken substantially on line 2—2 of Fig. 1 as indicated by the arrows;

Fig. 3 is a partial horizontal section taken substantially on line 3—3 of Fig. 1 as indicated by the arrows;

Fig. 4 is a partial vertical section taken on line 4—4 of Fig. 2 as indicated by the arrows;

Fig. 5 is a view in front elevation of the machine; and

Fig. 6 is a horizontal section taken substantially on line 6—6 of Fig. 1 as indicated by the arrows.

Referring to the drawings, a continuous beater for paper pulp is shown comprising a casing having front and rear walls 10a and 10b respectively and end walls 10c and 10d respectively. A member 11 formed of an angle bar extends around the bottom of said casing having its vertical side secured to said walls and its horizontal side extending outwardly with its bottom flush with the bottom of said walls. Guide brackets 12 are secured to the end walls 10c and 10d and bearings 13 having hub portions 13a are slidable in brackets 12, adjustable vertically therein and held in position therein by the screws 14 and 15 which extend through the top and bottom respectively of bracket 12. A shaft 16 is journaled in the hub portions 13a of the brackets 13 and extends between the same, said shaft projecting beyond the bearing on wall 10d and having secured thereto a drive pulley 17. Casing 10 is divided into a plurality of consecutive and contiguous compartments 10e by a number of spaced vertical partitions 18. Bearing members 19 are provided through which shaft 16 extends and is journaled and these members have spaced plate portions 19a surrounding the same which are slidable on each side of and tightly engage partitions 18. This provides for some movement vertically of the bearings 19 and at the same time maintains the partitions intact. A beater roll 20 is secured to shaft 16 in each compartment 10a by any suitable means such as the key member 21. Each beater roll comprises a cylinder having secured therein and projecting radially therefrom at its periphery a series of circumferentially spaced plates or bars 22, said bars as shown extending the full width of said roll. Beneath and cooperating with each roll is a group of spaced plates or bars 23 having their top edges arranged in a circumference and being secured at their lower portions in a block 24 vertically slidable in guide members 25. Each block 24 has a depending interiorly threaded hub 24a in which is threaded

a screw member 26. Member 26 has a depending reduced portion or shaft 26a journaled in a hub portion 27a of a bracket 27 supported on a suitable horizontal floor or partition 28. Member 26 has a collar 26b engaging the top portion of bracket 27 and shaft portion 26a has secured thereto a beveled gear 29 by any suitable means such as the pin 30. Beveled gear 29 meshes with another beveled gear 31 secured in any suitable manner as by the pin 32 to a shaft 33. Shaft 33 extends horizontally to and through the front wall 10a and is journaled in a bracket 34 bolted to the outside of said front wall. Shaft 33 has a hand wheel 35 secured to its outer end shown as provided with a projecting grip handle 35a. Shaft 33 as shown is journaled in bracket 27. It will be seen that by turning hand wheel 35 screw 26 will be rotated through the gears 29 and 31 and that block 24 and bars 23 will be moved vertically toward or from the bars 22. The end compartment, shown at the left in Figs. 2 and 6, is provided with a horizontal floor 36 which extends to the block 24 so that material placed between roll 20 and end wall 10b above the wall 36 will flow or pass between the roll 22 and the bars 23 and be fed therebetween by rotation of roll 20. Roll 20 rotates in a counter-clockwise direction as shown in Fig. 1 and as indicated by the arrow in said figure. Beyond the bars 23 in the direction of rotation of roll 20 is an upwardly curved floor 37 which extends to and connects with a vertical wall or partition 38. There is a vertical partition 38 in each compartment and there is thus a chamber or passage in each compartment between said partition and front wall 10a. At the bottom of said chamber or passage in the first compartment to the left as seen in Fig. 2 there is a downwardly inclined plate or floor 39 which extends from the end wall 10c to a point in vertical alignment with partition 18. In each of the other compartments except the one on the extreme right as shown in Fig. 2 there is a downwardly inclined floor or plate 39a extending from the bottom of partition 18 in the passage between plate 38 and front wall 10a to a point some distance below the bottom of the next adjacent partition 18. A floor or partition member 40 extends between the sides of each compartment except the one at the left as seen in Fig. 2, this member forming the bottom of the casing and extending upwardly to and against the rear wall 10b and to a point level with the floor 36. The partitions 18 extend downwardly to the member 40 and forwardly to a plane in line with partition 38. Said partitions 18 also extend downwardly to a point level with the top of partition 38 at the right or front part of the casing as shown in Fig. 1. With this construction there is a passage, as stated, downward at the front or the right of each compartment as shown in Fig. 1 between wall 38 and wall 10a, which passage then extends longitudinally of said casing between partitions 39 and 39a into the next compartment. There is a passage rearward beneath partition 39a and beneath floor 28 and upwardly to the left of a vertical wall 41 which carries part of the guide members 25. These passages beneath the rolls and beneath floor 28 are open at the rear as shown in Fig. 6. A discharge conduit 43 extends from front wall 10a from the endmost compartment as shown at the right of Figs. 2 and 4. A partition or floor 44 extends from the top of member 37 in the last compartment to the right to the bottom of discharge conduit 43.

In operation, the pulp to be beaten will be placed in the first compartment at the left of the machine as seen in Figs. 2 and 6. The shaft 16 will be driven by a belt running over pulley 17 and extending to a suitable driving means. The members 24 will be adjusted so that the one in the first compartment at the left will have the bars 23 spaced farthest from the bars 22. The other members 24 will be adjusted so that the bars 23 are successively closer to the bars 22 of the rolls in each compartment toward the right so that bars 23 in the last compartment to the right will be closest to the bars 22. As the rolls are driven the pulp will first be carried between plates 22 and 23 in the first compartment and will be separated and brought to finer condition. The pulp will pass upwardly over the member 37 and downwardly at the right of partition 38. The pulp will pass downwardly and be deflected to the right by partition 39 as seen in Fig. 2. The pulp then is in line with the second compartment and will move rearwardly beneath the first partition 39a beneath member 37 and upwardly along the top of plate 40 into the second compartment from the left as seen in Figs. 2 and 6. The pulp will move upwardly and be engaged by the bars 22 of the roll in the second compartment and carried between the same and bars 23. The pulp will again pass upwardly over member 37 and downwardly in the next compartment to the right of partition 38 as shown in Fig. 1. The material will be deflected into line with the next compartment by partition 39a. The material will again pass rearwardly and at the rear of the compartment will pass upwardly and be directed between the roll and bars 23 in the third compartment. The material thus passes upwardly into each compartment after the first one to the intake side of the roll and bars therein. This action will continue until the pulp has passed between all of the rolls 20 and their corresponding bars 23 and the pulp will be successively brought to finer and better separated condition. In the last compartment after passing up over member 37 the pulp will move outwardly across the plate 44 to the discharge conduit 43 and will be discharged from the machine.

From the above description it is seen that applicant has provided a very simple and efficient method and apparatus for continuously moving and beating the pulp to the required condition. As stated, the members 23 will be adjusted to successively give the desired disintegration. It will also be noted that the shaft 16 can be adjusted vertically and all of the rolls 20 with their bars 22 thus simultaneously adjusted. The individual groups of bars will, of course, be adjusted by turning the hand wheels 35. The pulp is continuously moved and successively treated until it passes out through the discharge conduit 43. The method and apparatus thus constitute quite an advance in the art over the old method and apparatus. In the old machine the first time that the pulp passed between the roll and bed plate there would be one hundred per cent efficiency of action on the pulp. Some of the pulp would be reduced. Each successive time that the pulp passed between the beater roll and bed plate the efficiency would be decreased as some of the pulp which was already beaten would pass between the roll and bed plate. With the present apparatus there is a one hundred per cent efficiency of action continuously at each roll. It is obvious that the method and apparatus will have

a high degree of utility for the purpose intended.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the apparatus and in the steps and sequence of steps of the method without departing from the scope of applicant's invention, which, generally stated, consists in a method and apparatus capable of carrying out the objects above set forth, such as disclosed and defined in the appended claims.

What is claimed is:—

1. A continuous beater for paper pulp having in combination, a casing having an elongated chamber therein, a single shaft journaled in said casing extending longitudinally through said chamber, a series of partitions in said chamber extending transversely of said shaft and forming a plurality of consecutive and contiguous compartments, a beater roll in each of said compartments secured to said shaft, a group of bars in each compartment cooperating with the beater roll therein, means for delivering pulp to pass between the beater roll and the bars cooperating therewith in said first compartment and means forming passages for receiving the pulp passing between each roll and the bars cooperating therewith, except those in the last compartments; each of said passages leading first downwardly and longitudinally of said casing and then laterally thereof, under the beater roll and bars cooperating therewith in the next adjacent compartment to the intake side of said last-named roll and bars, means for discharging from said casing the pulp passing between the beater roll and bars in the last compartment, and means for relatively adjusting said bars and rolls so that said bars are successively closer to said rolls from the first to the last compartment.

2. A continuous beater for paper pulp having in combination, a casing, having side and end walls, bearings at said end walls, a shaft extending longitudinally through said casing and journaled in said bearings, a plurality of partitions extending between said side walls and dividing said casing into a series of contiguous compartments, a series of beater rolls secured to said shaft, one in each of said compartments, each having projecting from its periphery circumferentially spaced transversely spaced beater blades, a group of spaced stationary bars adjacent each of said rolls, means for supplying paper pulp to one end compartment to pass between the roll therein and its associated bars, means forming passages for receiving the pulp passing between each of said rolls, except the roll in the other end compartment, each of said passages leading first downwardly and longitudinally of said casing, then laterally thereof beneath the next adjacent compartment, and upwardly therein to the beater roll and the bars associated therewith in the said next compartment, and means for discharging from said casing the pulp passing be-

tween the roll in said other end compartment and the bars associated therewith, the spaces between said blades and bars being successively smaller at each roll from said end compartment to said other end compartment.

3. A continuous beater for wood pulp comprising a casing provided with a series of consecutively arranged contiguous compartments having front and rear portions, a beater roll in each of said compartments and a series of beater bars in each of said compartments for cooperating with said beater rolls, the spaces between said beater rolls and said bars being successively smaller at each roll from one end of said series to the other end, an upwardly inclined bottom wall in the front portion of each compartment adjacent to the discharge side of said beater roll therein, means forming a chamber in the front portion of each compartment for receiving pulp discharged over said inclined wall, means associated with each of said compartments, except the last in the said series, providing a passage connecting the said chamber therein to the next adjacent compartment, each of said passages extending longitudinally of said casing, underneath the chamber in the next compartment, and then rearwardly underneath the beater roll and bars of said next compartment to the intake side of said beater roll and bars in said next compartment, means for discharging pulp from the chamber of the last of said compartments, and means in the first of said compartments for delivering pulp to the beater mechanism therein.

4. A continuous beater for wood pulp, comprising a casing having end walls and front and rear walls, a plurality of spaced partition members extending between said front and rear walls and dividing said casing into a series of consecutively arranged adjacent compartments, means cooperating with said partition member for separating said compartments into front and rear portions; a shaft journaled in said end walls and extending through said compartments, beater rolls in each of said compartments carried by said shaft, beater bars in the rear portion of each compartment to cooperate with said rolls; means to rotate said shaft and rolls so that pulp in said compartments will be fed between the rolls and bars therein from the rear portion to the front portion of each of said compartments; means associated with said partition members, and with the means cooperating therewith, providing passage means connecting the front portion of each of said compartments, except the last, with the rear portion of the next adjacent compartment, said passage means each extending laterally underneath the front portion of one of said compartments, and thence rearwardly underneath the roll in the next adjacent compartment, to the rear portion thereof.

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