Dec. 22, 1953 R. J. SERPAS 2,663,228

PULP BEATER OR DISINTEGRATOR

Filed March 9, 1953 4 Sheets-Sheet 1

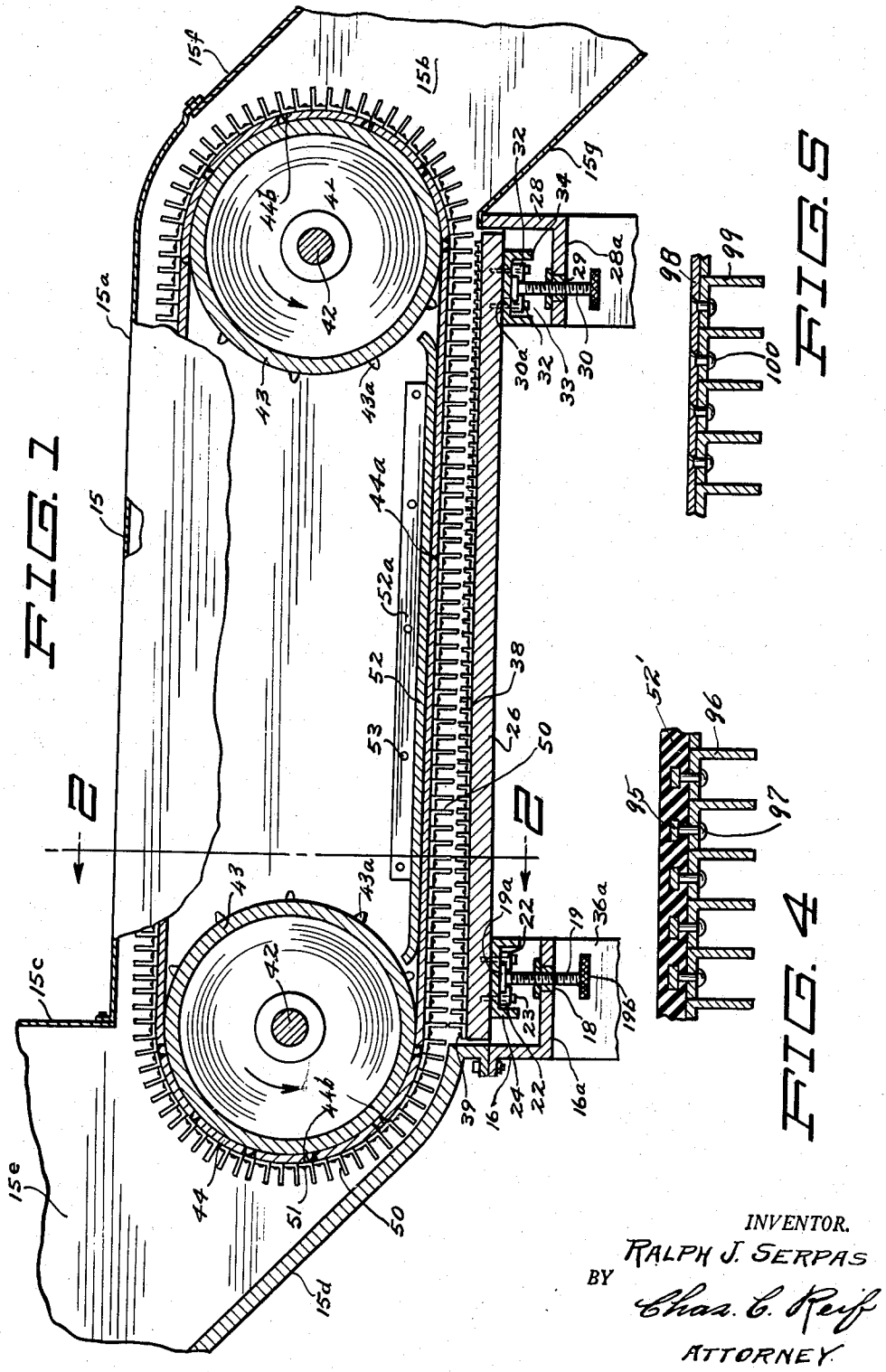


FIG. 1

FIG. 5

FIG. 4

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FIG. 2

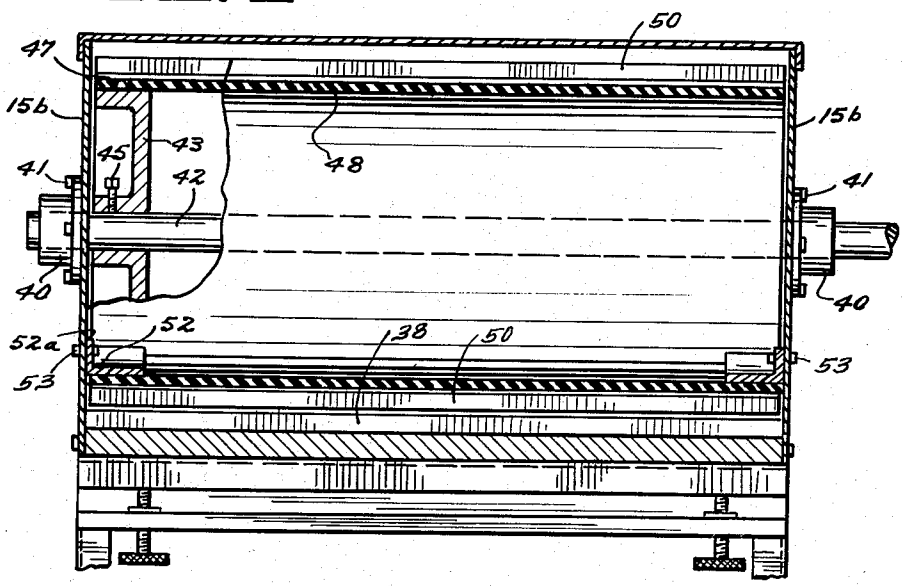
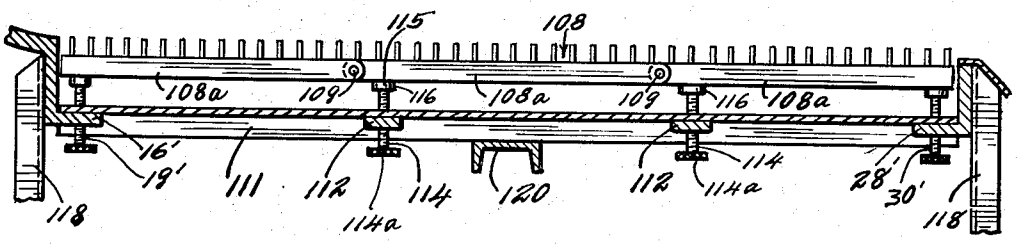


FIG. 3



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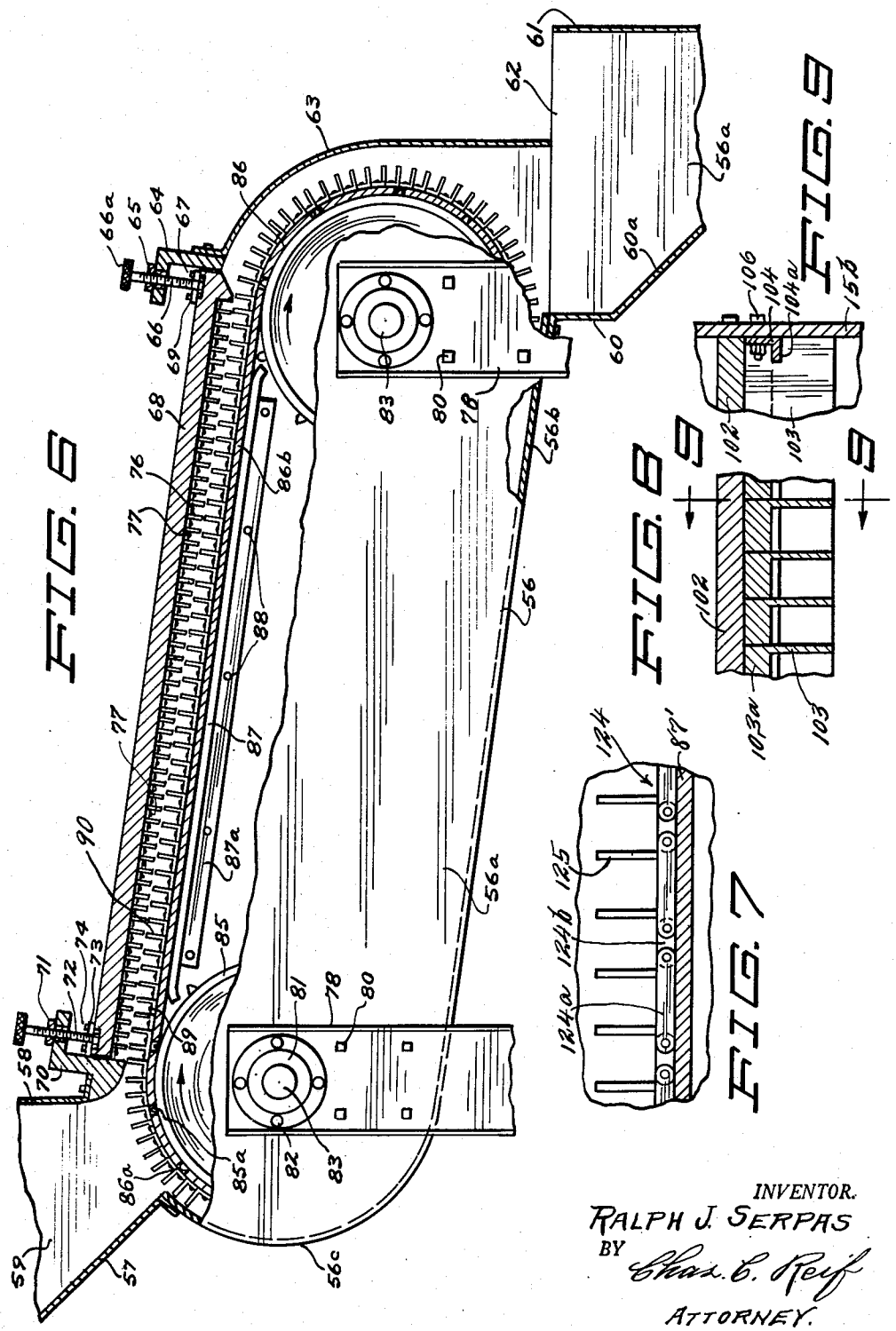


FIG. 6

FIG. 9

FIG. 8

FIG. 7

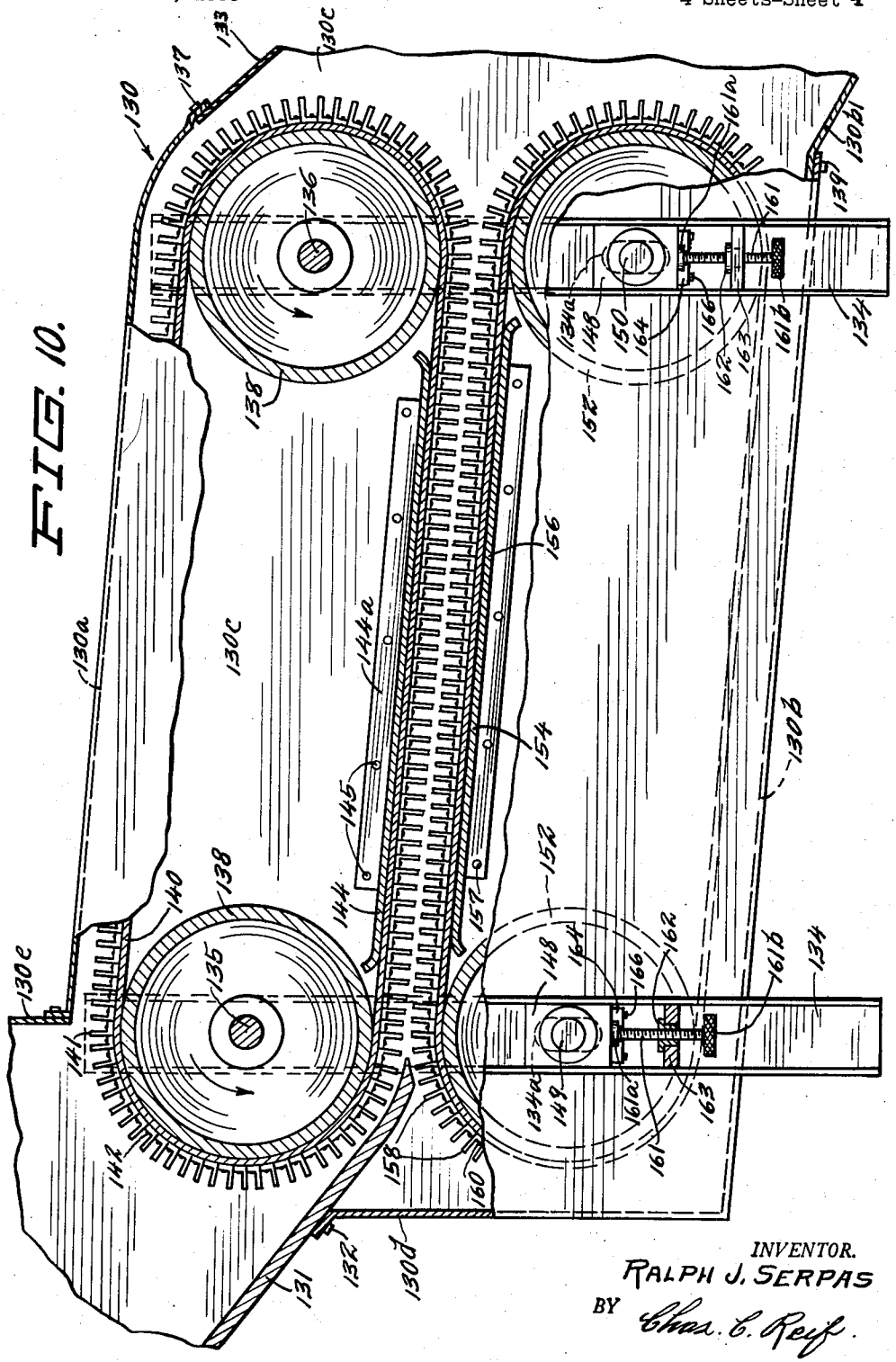
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FIG. 10.



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PULP BEATER OR DISINTEGRATOR

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11 Claims. (Cl. 92—22)

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This invention relates to the paper making art, and particularly to a machine for disintegrating, grinding or beating paper pulp. As is well known to those skilled in the art, said paper pulp originally contained large particles of material and these are beaten or disintegrated so the particles are reduced to a much smaller size.

It is an object of this invention to provide a pulp beater or disintegrator comprising a bed plate, a series of disintegrating members secured to said bed plate and upstanding therefrom, the same extending transversely of said bed plate together with an endless member of flexible material in the form of a belt or chain, said member having an elongated substantially rectilinear portion and having a series of spaced disintegrating members secured thereto, said members at said rectilinear portion moving in close proximity to the said members on said bed plate.

It is a further object of the invention to provide means for moving one or both ends of said bed plate toward and from said rectilinear portion of said endless member to bring said disintegrating members on said bed plate and endless member respectively closer together or farther apart.

It is another object of this invention to provide such a structure as set forth in the last paragraph save one, in which said rectilinear portion of said endless member may be above or beneath said bed plate. If said portion is beneath said bed plate the disintegrating members on said bed plate will extend downwardly toward said endless member.

It is still another object of this invention to provide a structure as set forth above in which said endless member may constitute a metal belt running over rollers; said endless member may constitute a link belt or a composition belt.

It is more specifically an object of the invention to provide a device for beating or disintegrating paper pulp, which device comprises a casing having a receiving chamber at one end and a discharge passage at its other end. Spaced rollers or sprockets are disposed at the ends of said chambers and an endless flexible member runs over said rollers or sprockets, the same having secured thereto series of spaced bars, said endless member having an elongated substantially rectilinear portion. A bed plate is disposed at one side of said rectilinear portion, the same having a series of bars secured thereto and extending toward said rectilinear portion, the bars on said endless member and on said bed plate having edges disposed in proximity whereby pulp from said chamber will be carried by one end of said endless member between the bars on said endless member and the bars on said bed plate and will pass out through said discharge passage.

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It is still another object of the invention to provide a device as above set forth in which said bed plate may be made in sections pivoted together at their ends together with means for moving said sections toward or from said endless member.

It is also a further object of this invention to provide a machine for beating or disintegrating pulp comprising a pair of endless belts or chains each having an elongated rectilinear portion, said belts or chains having secured thereto a multiplicity of transversely extending members or bars, said endless members being arranged with said elongated portions adjacent each other in superposed relation so that the free edges of said bars will move close to each other, together with means for delivering pulp between the bars on said pair of members whereby the pulp will be disintegrated by said bars as said endless members travel preferably at different speeds.

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. 2;

Fig. 2 is a vertical section taken substantially on line 2—2 of Fig. 1, as indicated by the arrows;

Fig. 3 is a partial vertical section similar to Fig. 1 showing a modification;

Fig. 4 is a partial vertical section through an endless member or belt used;

Fig. 5 is a view similar to Fig. 4 showing a modified structure;

Fig. 6 is a view partly in side elevation and partly in vertical section showing a modified structure;

Fig. 7 is a view similar to Fig. 4 showing a modification;

Fig. 8 is a view similar to Fig. 4 showing a further modification;

Fig. 9 is a vertical section taken on line 9—9 of Fig. 8 as indicated by the arrows; and

Fig. 10 is a view partly in side elevation and partly in central longitudinal section showing a modified form of the invention.

Referring to the drawings, a machine is shown comprising a casing 15 having a top wall 15*a* and side walls 15*b*. Top wall 15*a* at one end has secured thereto a vertical wall 15*c* spaced from which is a downwardly inclined bottom wall 15*d*. A chamber 15*e* is thus formed between the side walls 15*b* and the walls 15*c* and 15*d*. The top wall 15*a* curves downwardly at one end and has secured thereto the top wall 15*f* of a discharge passage formed by said wall 15*f*, the side wall 15*b* and the bottom wall 15*g* which extends downwardly. The bottom wall 15*d* has secured thereto a frame member 16. Member 16 has a

horizontal portion 18a having secured therein a nut 18 in which is threaded a screw 19 having at its upper end a collar 19a which is rotatable with screw 19 in a pair of members 22 secured by bolts 23 to a channel member 24. Bolts 23 extend through the flange members 22 into a bed plate 26. Screw 19 has at its lower end a hand wheel 19b.

A frame member 28 is secured to the bottom wall 15g and has a horizontal portion 28a in which is disposed a nut 29 in which is threaded a screw 30. Screw 30 has at its upper end a collar 30a rotatable in a pair of flange members 32 secured by bolts 33 to a channel member 34. Bolts 33 extend through channel member 34 into the bed plate 26. The end portions of bed plate 26 are spaced slightly from the vertical walls of members 16 and 28. The bed plate 26 has secured thereto and upstanding therefrom a series of rather closely spaced bars 38. While bars 38 could be variously formed and attached to bed plate 26 in various ways, as shown in Fig. 1, said bars constitute angle bars and have substantially horizontal flanges secured to bed plate 26 by rivets or screws 39. As shown in Fig. 1, bars 38 decrease in height from the end of bed plate 26 adjacent chamber 15e to the other end of said bed plate. Bed plate 26 moves between and is guided vertically at its sides by the side walls 15b of casing 15.

Journaled in bearings 40 secured to each side wall 15b by bolts 41 are spaced shafts 42. Shafts 42 thus extend across the chamber in casing 15 and each has secured thereto at its ends a pulley or sprocket 43. Sprocket 43 has a hub to which shaft 42 extends and said hub is secured to shaft 42 by screw 45. Preferably members 53 are provided with circumferentially spaced teeth 43a which enter spaced apertures 44b in an endless member or belt 48 which runs over the pulleys or sprockets 43. Belt 44 may be a metal belt, a composition belt with or without metal inserts or it may be a link belt. Various types of link belts are now on the market as are various types of metal and composition belts. The belt 48 per se forms no part of the present invention. Secured to the endless member 44 is a plurality of rather closely spaced bars 50. While these bars may be variously formed and attached to the belt in various ways, in Figs. 1 and 2 bars 50 are shown as angle bars having one flange thereof projecting substantially at right angles from endless member 44 and having their other flange secured to member 44 by bolts or rivets 51. As shown in Fig. 2, the bars 50 extend transversely of member 44 and have their end portions closely adjacent the side walls 15b. Member 44 has a rather elongated substantially rectilinear portion 44a which is guided by and moves in contact with the lower sides of a pair of members 52 having vertical flanges 52a secured respectively to the side walls 15b by the bolts 33. As shown in Fig. 1, the end portions of members 52 are curved slightly upwardly.

In operation, the pulp is placed in the chamber 15e. Shafts 42 will be driven from a suitable source of power and member 44 will be moved around sprockets or pulleys 43 in a counterclockwise direction. Bars 50 will move along with the rectilinear portion of said member 44 and the free ends or edges of these bars will move in close proximity to the upper free ends or edges of bars 38. The pulp will be carried along from chamber 15e by the movement of bars 50 and will pass between the ends of said bars and the ends of bars 38. The pulp will thus be greatly disintegrated and beaten and the particles thereof brought to the desired small size and the pulp after passing between the bars on members 44 and 26 respectively will be discharged through the passage 15b. By having the bars 38 decrease in height toward the discharge end of the machine there will be less pulp collected between said bars. One or both ends of bed plate 26 can be moved upwardly or downwardly to bring the free ends of bars 38 closer to or farther from the free ends of bars 50. The desired disintegrating effect can thus be had on the pulp. Bed plate 26 is moved by rotating the screws 19 or 30. The bed plate 26 will be guided at its sides by the side walls 15b. The member 44 can be moved at quite a high speed. A rapid and very efficient beating or disintegrating of the pulp is thus had and the disintegrating action extends over quite a long area in the machine. The machine is much more efficient than one where just the rotating cylinder is provided with bars which coact with bars on the segment of a cylinder. As stated, a longer beating action is secured and the distance between the beating bars can be more nicely adjusted to get the desired results.

In Fig. 6 a casing 56 is shown quite similar to casing 15, the same having side walls 56a and a bottom wall 56b. Bottom wall 56b has a semi-cylindrical portion 56c at one end to which is secured a wall 57 extending upwardly in an inclined direction. A wall 58 is spaced from wall 57, the same extending substantially vertically and with wall 57 and side walls 56a, forms a chamber 59. A wall 60 is secured to one end of bottom wall 56b, the same extending vertically and having a downwardly and rearwardly inclined portion 60a. The wall 61 is spaced from wall 60, the same extending vertically and with wall 60 and side walls 56a forming a chamber 62. A wall 63 extends vertically along one end of side walls 56 and has a curved upward portion extending vertically. A frame portion 64 is secured to the upper end of wall 63. Member 64 has a substantially horizontal portion in which is secured a nut 65 having threaded therein a screw 66, the lower end of which has a collar thereon rotatable in a recess in a bed plate 68, said collar being held in said recess by an overlying plate 69 secured to bed plate 68 by screws 67. Screw 66 has a hand wheel 66a at its upper end. A frame member 70 is secured to the lower end of wall 58, the same having a substantially horizontal portion in which is secured a nut 71. A screw 72 is threaded in nut 71 and has a collar at its lower end rotatable in a recess in bed plate 68 and retained in said recess by a plate 73 secured by bolts 74 to bed plate 68. Bed plate 68 has secured to its lower side and extending downwardly therefrom a series of bars 76. Bars 76 are spaced rather closely together and while said bars might be variously formed and secured, in the embodiment of the invention shown in Fig. 6, they are shown as angle bars having one flange engaging plate 68 and secured thereto by bolts or rivets 77. The ends of plate 68 are spaced slightly from the inner surfaces of members 70 and 64 and the sides of said plate will be guided by the inner sides of said walls 56a.

Channel members 78 are secured to the side walls 56a at each side of casing 56, there being one of the channels 78 adjacent each end of casing 56 at each of said sides. Channel 78 will be secured to walls 56a in any suitable manner as by rivets 80. Bearings 81 are secured to the

upper portions of channels 78 by the bolts 82. Shafts 83 similar to shafts 42 previously described, are journalled in bearings 81 and each has secured thereto adjacent its ends pulleys or sprockets 85 similar to sprockets 43 shown in Fig. 2. An endless member 86 runs over the pulleys or sprockets 85, the same preferably having spaced apertures 86a therein into which teeth 85a on members 85 project. Member 85 has an elongated rectilinear portion 86b, the same being guided and supported by members 87 disposed adjacent each side wall 56a and having flanges 87a secured to said side walls by bolts 88. Members 87 are similar to members 52 already described. The members 87 have their ends curved slightly downwardly. Member 86 has secured thereto a series of bars 90. While bars 90 could be variously made and secured, in the embodiment of the invention illustrated they are shown as angle bars having one flange projecting substantially at right angles to portion 86b and having another flange secured to member 86 by the bolts or rivets 89.

In operation the pulp to be beaten or disintegrated will be placed in chamber 59. Shaft 83 will be driven from some suitable source of power and the pulleys or sprockets 85 will move endless member 86 around said pulleys with said pulleys moving in a clockwise direction. The pulp will be carried by bars 90 and the pulp will be disintegrated by moving between the adjacent ends of bars 76 and 90. After passing between the bars on plate 68 and thus on portion 86b, the pulp will be discharged into the chamber 62 and directed to any suitable place.

In Fig. 4, the belt which has been referred to as 52 and 86 is shown as 52', the same being of composition form, such as a mixture of fabric and rubber. Said belt has enclosed therein transverse bars 95 and the bars 96 secured to the belt, such as the bars 59 and 90, are shown as angle bars, the same being secured to the bars 95 by bolts or rivets 97.

In Fig. 5, the traveling belt above referred to as 52 and 86 is shown as a metal belt 98 having the angle bars 99 riveted thereto by the rivets 100.

In Figs. 6 and 9, a bed plate 102 is shown and a plurality of bars 103 in the form of angle bars having extra thick flanges 103a are shown, which flanges are supported by the flanges 104a of angle bars 104 secured to the side walls 15b of the casing. The bars 104 will be secured to said side walls by suitable bolts 106. The bars 103 are thus held in rigid engagement and any one bar could be removed by loosening its angle bar 104.

In Fig. 3, the frame members 16' are shown, similar to frame members 16 shown in Fig. 1, as are also the adjusting screws 19'. A bed plate 108 is shown formed of several sections 108a which have their adjacent ends pivoted together by the pivot members 109. Bars 111 are supported on and extend between the frame member 16' and the frame member 28', which latter is similar to frame member 28 in Fig. 1. Nuts 112 will be secured to the bars 111 in which screws 114 are threaded. Screws 114 have hand wheels 114a at their lower ends and are revolubly mounted at their upper ends in member 116 secured to certain of the sections 108a. Supporting members 118 are shown secured to frame members 16' and 28' and will form the supports for the machine. A channel member 120 is shown extending below and between the bars 111 and the same will be connected to said bars.

With the construction shown in Fig. 3, the bars 119 secured to the sections 108a, which bars will be similar to the bars 50 and 90 shown in Figs. 1 and 6, can be moved toward or from the bars on the traveling belt. It may be desirable to have the bars at one or both ends of the bed plate or at an intermediate portion thereof brought closer to or moved farther from the bars on the traveling belt.

In Fig. 7, a partial section similar to Fig. 6 is shown. A guide member 87', similar to the guide member 87 in Fig. 6, supports an endless belt or chain 124 to which are secured the bars 125 functioning the same as the bars 90 in Fig. 6. The belt 124 is made up of spaced links 124a to which the bars 125 are connected and also by shorter links 124b pivoted to and connecting the links 124a.

In Fig. 10 another modification of the invention is shown. Referring to said figure, a casing 130 is shown having a top wall 130a, a bottom wall 130b, side walls 130c and a front wall 130d. A vertical wall 130e is shown in part. A plate or wall 131 is shown secured to the upper end of front wall 130d by bolts 132. It will be seen that walls 130c, 130e and member 131 form a chamber or hopper for the pulp to be disintegrated. A rear top wall 133 is secured to an offset portion of top wall 130a by a bolt 137. An extension 130b1 of bottom wall 130b is provided secured to said bottom wall by a suitable bolt 139. Members 134 shown in the form of channels are secured to the exterior of the side walls 130c and form supports for the device. Bearings are provided in the members 134 for a pair of spaced shafts 135 and 136. Rollers or sprockets 138 are secured to shafts 135 and 136 and an endless belt or chain 140 runs over the members 138. Member 140 can be either a metal belt, a link belt or a composition belt. Member 140 has secured thereto a multiplicity of bars 141 and while these bars can be variously made and secured as set forth above, in the embodiment of the invention shown in Fig. 10, they are in the form of angle bars which have one of their flanges secured to belt 140 by bolts or rivets 142. Belt 140 has an elongated rectilinear portion which moves along a guide plate 144. Guide plate 144 is shown as having flanges 144a which will be secured to the side walls 130c by suitable bolts 145.

Movable bearings 148 are disposed in the channel members 134 below the bearings for shafts 135 and 136 and said bearings 148 have journaled therein shafts 149 and 150. Rollers or sprockets 152 are respectively secured to shafts 149 and 150 and these are identical with the members 138. Another endless belt 154 runs over the members 152 and will be similar to the belts 44, 86 and 140. Belt 154 has an elongated rectilinear portion which runs in contact with a guide member or plate 156 which has flanges 156a at its sides secured to the side walls 130c by suitable bolts 157. It will be seen that plates 144 and 156 have their ends curved away from their respective belts. Belt 154 has secured thereto a multiplicity of bars 158 which like bars 141 extend transversely of the belt and these are shown as angle bars having one of their flanges secured to belt 154 by suitable bolts or rivets 160. It will be seen that the bars 141 and 158 have free edges and when said belts 140 and 154 move along the guide plates 144 and 156, said free edges are close together. The bearings 148 can be vertically adjusted by screws 161 threaded into nuts 162 secured at bars 163 in turn secured in the channel

members 134 in any suitable manner, as by welding. Screws 161 have collars 161a at their upper ends which are rotatable in flanged members 164 secured to the bearings 148 by bolts 166. Screws 161 also have handwheels 161b at their lower ends. It will be seen that bearings 148 can be moved upwardly and downwardly by rotating screws 161 and shafts 149 and 150 will move in elongated slots 134a in the members 134. The sides of the belts 140 and 154 and the ends of the bars 141 and 158 move closely adjacent the side walls 130c of the casing 130.

In operation, the pulp to be beaten or disintegrated will be placed in the chamber or hopper having the bottom plate 131. The belt 140 will be traversed by driving one or both of shafts 135 and 136 to rotate members 138, as indicated by the arrows. Belt 140 will thus travel about members 138 in a counter-clockwise direction. One or both shafts 149 and 150 will be driven and belt 154 will be traversed about members 152 which will rotate in a clockwise direction. Belt 140 will be traversed more slowly than belt 154. The pulp will be fed between the bars on the respective belts and will be engaged by the bars 141 and 158 and will be brought to the desired condition. It will be seen that belt 154 can be raised and lowered by rotating the screws 161. The free edges of bars 141 and 158 can thus be brought to the desired distance apart to give the best results. The relative speeds of belts 140 and 154 will be varied to give the best action on the pulp. In some cases it might be desirable to traverse the belts 140 and 154 in opposite directions.

From the above description it will be seen that I have provided a very novel and efficient form of pulp beater or disintegrator. As stated, the endless belts carrying the disintegrating bars can be moved at comparatively high speed. A large area is covered by the bars on the bed plate and endless belt and the machine thus has a large capacity. The bars on the bed plate and endless belt can be nicely adjusted to give the desired disintegrating action. The action of the relatively moving bars as above described separates the fibres of the pulp as well as disintegrating the pulp. This separation of the fibres and disintegration of the pulp assists in the hydration of the pulp. It will be apparent that the device has a high degree of utility.

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

What is claimed is:

1. A machine for beating paper pulp having in combination, a bed plate, spaced members secured to said plate and extending across said plate, an endless flexible member having an elongated rectilinear portion movable substantially parallel to said bed plate, spaced second members secured to said endless member and extending transversely thereof and movable in close proximity to said first mentioned members, means for moving said endless member, and means for directing pulp between said first mentioned members and second members.

2. The structure set forth in claim 1, the distance between the adjacent portions of said spaced members on said plate and said spaced members on said flexible member increasing toward one end of said bed plate.

3. The structure set forth in claim 1, said spaced members being in the form of bars, said bars on said endless member and bed plate having respectively edges disposed in proximity.

4. The structure set forth in claim 1, and stationary members for guiding said elongated portion of said endless member rectilinearly.

5. A machine for beating paper pulp having in combination, a bed plate, a series of spaced upstanding members secured to said plate and extending transversely thereof, spaced rollers adjacent the end of said bed plate respectively, an endless flexible member of considerable width running over said rollers and having a rectilinear portion of considerable length movable in proximity to said bed plate, a series of spaced second members secured to said endless member, extending transversely thereof and moving in proximity to said first mentioned spaced members, means for moving said flexible member, and means for directing pulp between said bed plate and endless member.

6. The structure set forth in claim 5, and means for moving one end of said bed plate toward and from said endless member.

7. The structure set forth in claim 5, and means at each end of said bed plate for moving the same toward and from said endless member.

8. The structure set forth in claim 1, said rectilinear portion of said endless member being disposed above said bed plate.

9. A machine for beating paper pulp having in combination, a bed plate, a series of spaced bars secured to said bed plate upstanding therefrom and extending transversely thereof, rotatable members adjacent the ends of said bed plate, an endless member running over said rotatable members and having an elongated rectilinear portion extending substantially parallel to said bed plate, a series of bars secured to said endless member and movable in proximity to said bars on said bed plate, a chamber at one end of said endless member for containing pulp, a discharge passage for pulp at the opposite end of said endless member, and means for moving said endless member.

10. The structure set forth in claim 1, said bed plate comprising sections pivotally connected at their ends, and means for moving said sections toward and from said endless member.

11. A machine for beating or disintegrating paper pulp having in combination, a pair of endless members, spaced rotating members over which said endless members respectively travel, said endless members each having an elongated rectilinear portion, which portions of said respective endless members are adjacent each other in superposed substantially parallel relation, each of said endless members having secured thereto a multiplicity of bars extending transversely thereof, said bars having free edges and said edges on said respective rectilinear portions being disposed closely adjacent each other, and means for delivering pulp between said bars.

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