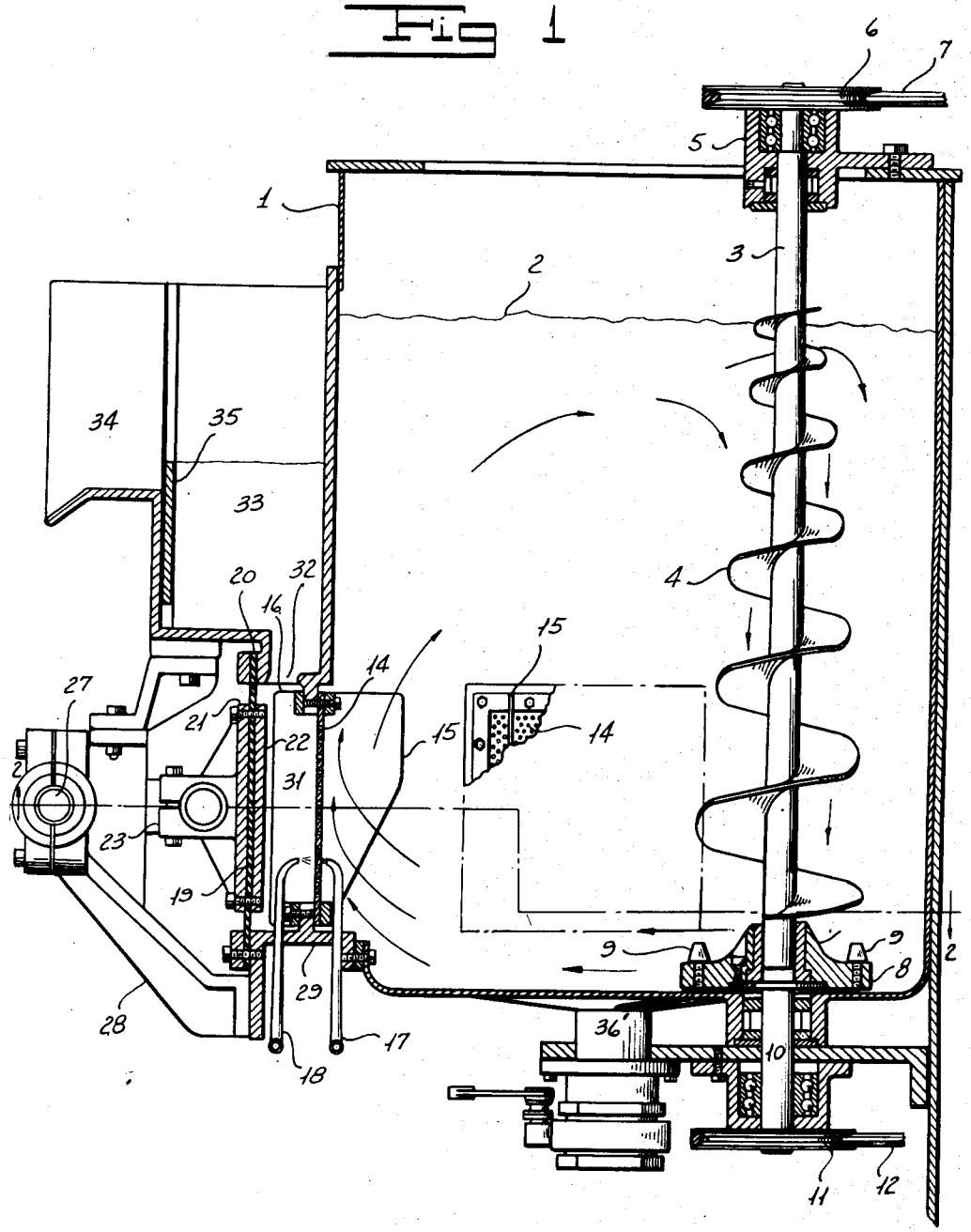
Aug. 11, 1953 M. P. CHAPLIN 2,648,261

FIBER DISINTEGRATOR AND SEPARATOR

Filed June 30, 1950 4 Sheets-Sheet 1

Fig 1



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FIBER DISINTEGRATOR AND SEPARATOR

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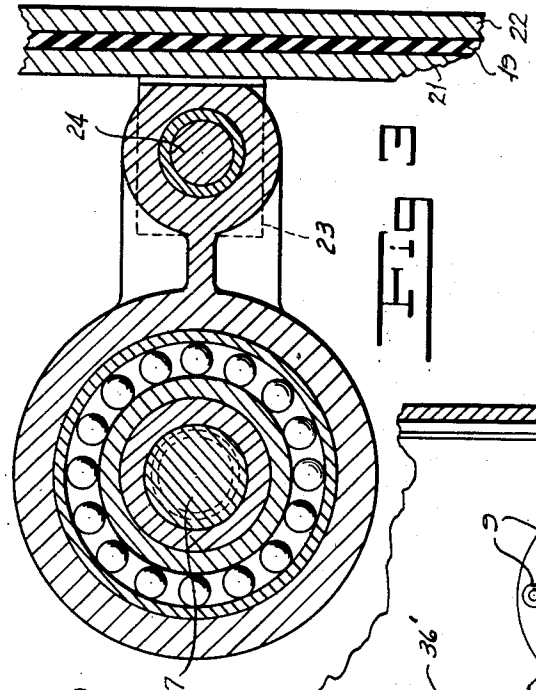


Fig 3

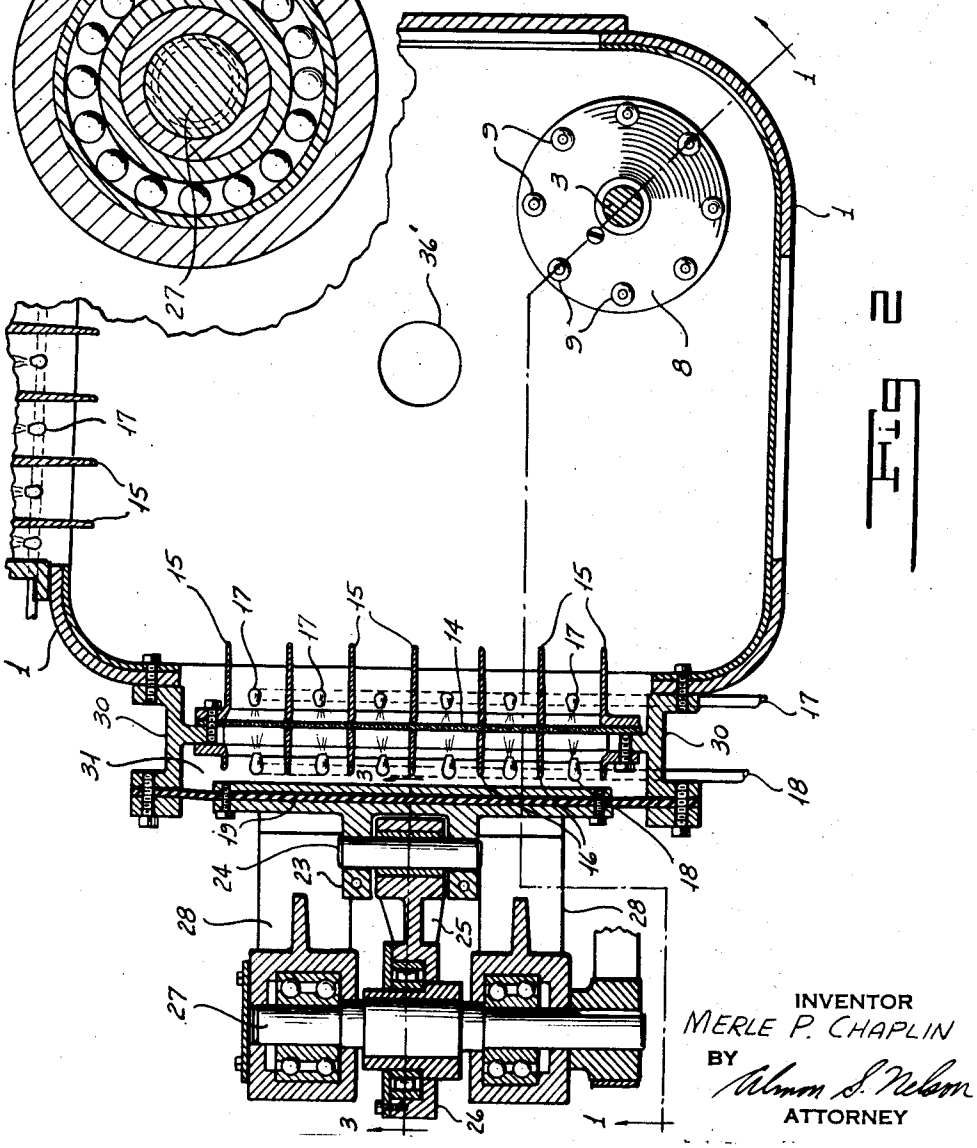


Fig 2

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FIBER DISINTEGRATOR AND SEPARATOR

Filed June 30, 1950 4 Sheets-Sheet 3

Fig 4

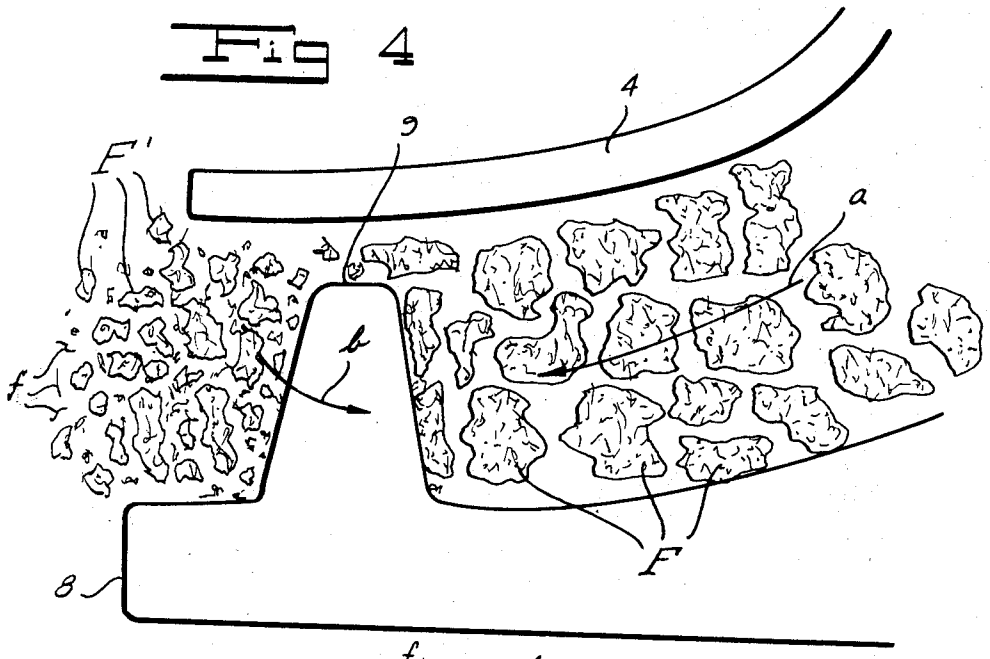
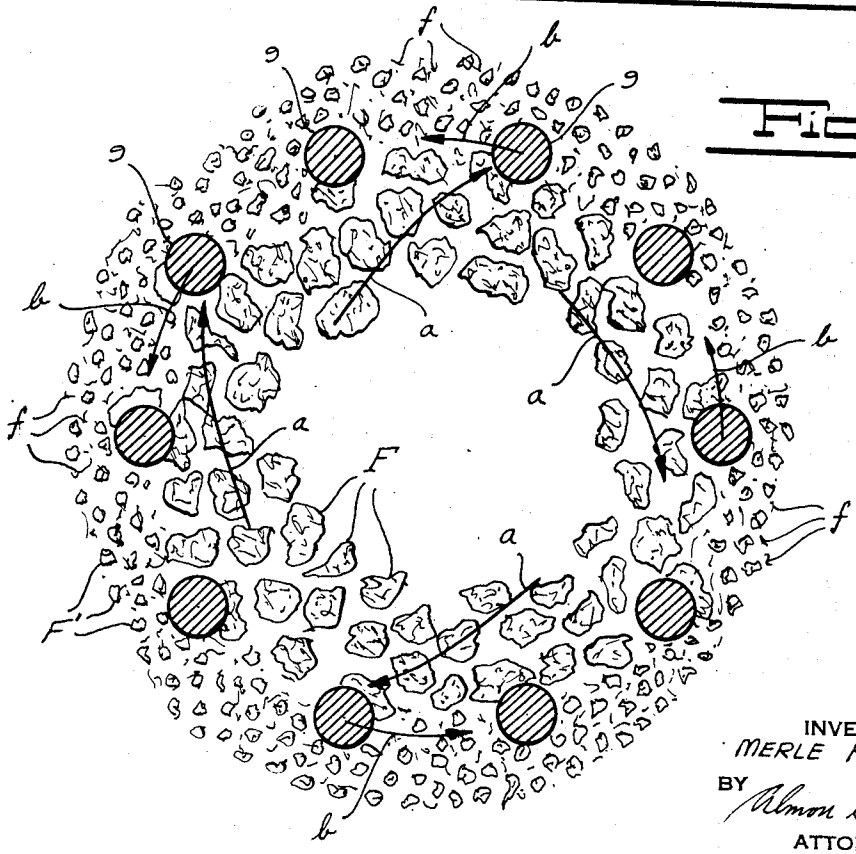


Fig 5



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FIBER DISINTEGRATOR AND SEPARATOR

Filed June 30, 1950 4 Sheets-Sheet 4

Fig 6

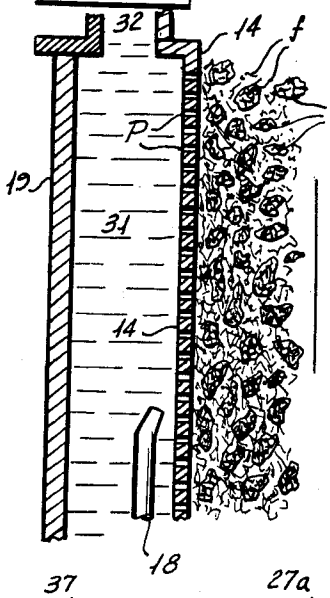


Fig 7

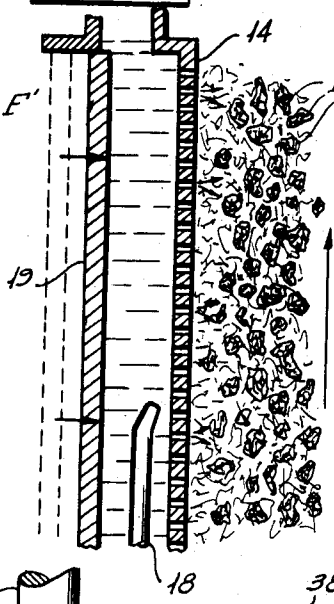
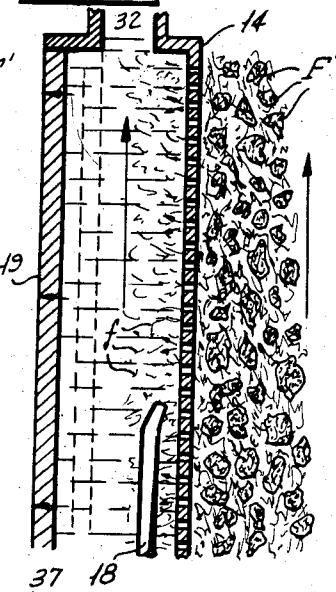


Fig 8



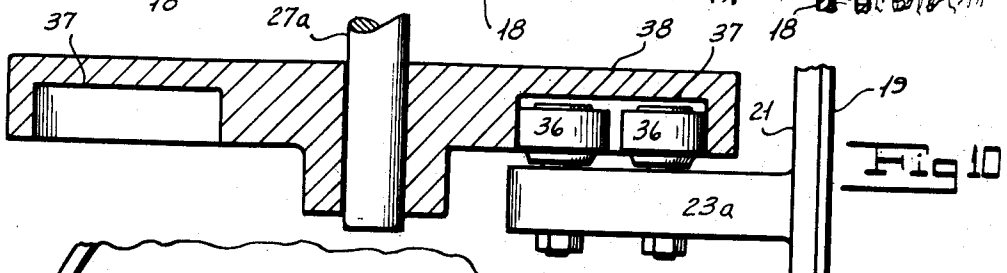


Fig 10

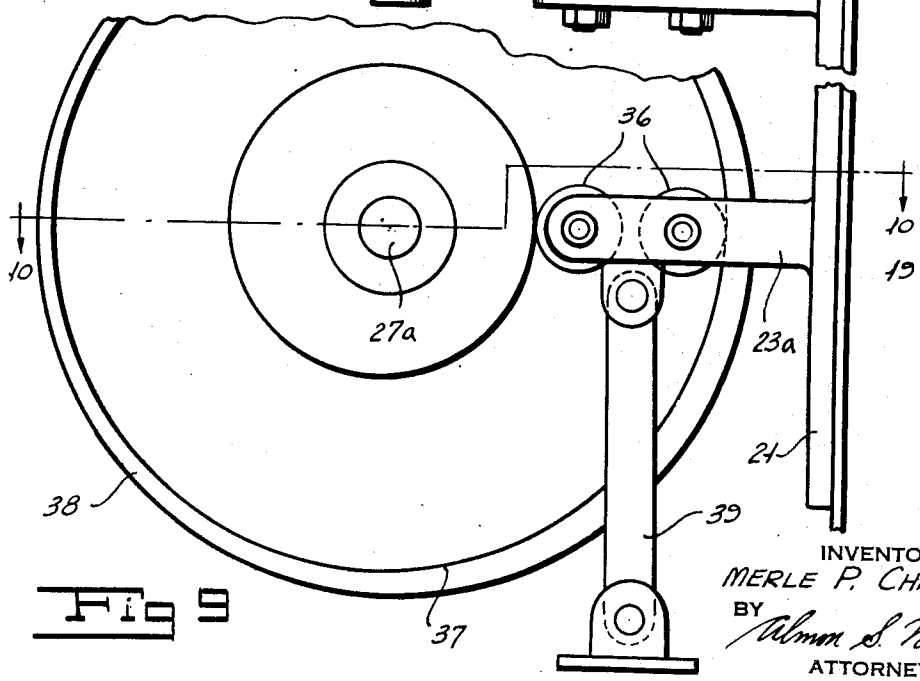


Fig 9

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2,648,261

UNITED STATES PATENT OFFICE

2,648,261

FIBER DISINTEGRATOR AND SEPARATOR

Merle P. Chaplin, South Portland, Maine, assignor to Chaplin Corporation, South Portland, Maine, a corporation of Maine

Application June 30, 1950, Serial No. 171,285

18 Claims. (Cl. 92—23)

1

This invention concerns an apparatus useful in the initial stages of preparing fibrous materials for ultimate use in the manufacture of paper, paperboard, molded products and numerous other articles.

Many of the pulp materials used in the industry reach the fabricating plant as dry fibrous materials either in the form of sheets, rolls or bales. The initial stage in preparing these materials for use is to separate the fibres one from the other in the presence of water, without materially changing the size or conditions of the fibres themselves.

Equipment now available for the preparation of such fibre stocks falls generally into two classes. First, that type of preparation machine wherein the fibrous materials are acted upon by metallic members operating in close proximity with other metallic members such as heaters, Jordans, refiners, attrition mills, etc. Second, machines which depend, for the separation or disintegration of the fibrous materials, largely on agitation or circulation of pulp materials in tanks or vats by means of propellers, discs, etc., revolving or moving within the body of pulp stock in the tank or vat.

Machines of the first type act on the fibres by a rubbing or scrubbing action between the parts of the operating mechanism and consequently break up or disintegrate the fibres themselves while separating the fibres one from the other. In the repreparation of waste paper materials for reuse, this is objectionable as the fibres of the waste paper have already been treated and processed prior to making the original sheet, and all that is desirable or necessary to do for reuse is to separate the fibres from each other without change in the fibre structure itself. Where mechanical mechanisms act on the fibres by rubbing them between abrasive or metal materials, considerable change, almost always undesirable, occurs in the fibre structures when such a method is used. Also, the preparation is usually carried out until all of the fibres have been separated one from the other, which means an extensive, lengthy, and expensive operation and much unnecessary work is done on separated fibres before the whole fibrous mass is entirely disintegrated.

With the second type of method, the materials are violently agitated by various means such as propellers, discs, vanes or similarly shaped members. These machines depend largely on the rubbing action within the mass, or the fibrous mass being violently agitated may be thrown against the sides of the tank or other members by high

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velocity jets or streams of stock which, by their passage through adjacent material, or by impact on stationary members, or both, effects such disintegration as this method will afford. Another method of impact disintegration consists in pumping a stream of pulp under high pressure through a nozzle against a target or impact surface, the principle of operation and disintegration being made much the same. To assist in the disintegration, it is frequently necessary to heat the entire mass so that the fibres and binding materials may be softened, permitting them to be more easily separated.

As in the case of the first type of method, it is necessary in methods of the second type to keep circuating or agitating the entire pulp mass in the tank or vat until all fibrous masses therein have been disintegrated, which means that other fibres which were disintegrated early in the process are repeatedly acted upon by the circulation, by the heat, and by the mechanical action or agitation, which, while not as detrimental to the fibres as mechanical action between metallic members, nevertheless is a great waste of power and degrades and injures the fibres to a considerable extent.

In order to make the apparatus more efficient in the second type method, it is customary to remove the material s soon as it has been broken up into smaller pieces, putting these pieces through a number of subsequent operations in different machines before they are suitable for use. One of these operations commonly employed after the material has been broken up into smaller pieces, is the use of metallic preparation equipment such as Jordans, refiners or attrition mills which, as in the case of the equipment of the first method, act violently on all of the fibres, whether they are fibre bundles or pieces of paper or pulp, and consequently the stock characteristics are changed and its paper or board or molding forming qualities are impaired.

Frequently, where waste paper and pulp materials are to be reutilized, the character of the materials to be pulped varies considerably in each lot, some of the materials defibring much more readily than others. If the equipment used to prepare these materials has to operate on the entire mass until the materials which are the hardest to defibre or separate are completely disintegrated, than the materials which were defibred first absorb much excess and unnecessary power and work and may be damaged by prolonged treatment.

In order to develop the high velocity of material

necessary to the second type method, either by streams or jets, or by discs, which project sheets of material through the mass of other material or against the sides of the tank or enclosure, it is necessary to utilize rotating members of large diameters in order to get the necessary peripheral speed and to project the material from these diameters with great force. Sometimes a series of propelling members, such as vanes, are affixed to a single disc, so that the mass may be thus accelerated in its speed during travel from the center to the periphery of the disc. Excessive power is required to move these large rotating members through the pulp mass and to generate the forces and speed necessary for this method of disintegration. Similarly, if the mass is projected by means of a pump through a fixed nozzle or jet, undesirably excessive power requirements are necessary to develop the requisite pressures and speed of the mass for impact disintegration.

I have given protracted study to the disintegration of paper in sheet, roll and bale forms and particularly to the defibring of waste paper for the manufacture of various articles therefrom. This study has convinced me that, in order to obtain maximum output with any particular apparatus, it is desirable that as high a percentage of fibrous material in aqueous solution be employed as practical, only sufficient water being present to enable the mass to be properly circulated through the zone of disintegration and that individual fibres, as soon as separated from the remainder of the mass, be removed from the zone of disintegration and from the tank in which such disintegration occurs, so that they are not degraded by recirculation through the disintegration zone. Under such conditions, the undefibred and undisintegrated fibrous material may be broken up by impact in an efficient manner.

I have further found it desirable to accomplish the disintegration by impact within a relatively small disintegration zone for, by so doing, the power requirements of operation are minimized and relatively small apparatus may be availed of for the attainment of a relatively large output.

I have also found it possible by the use of apparatus constituted in a particular way to act upon waste paper without pre-treatment of any kind to defibre the same within an apparatus of relatively small size and having a relatively small impact zone of disintegration, with combined circulation of the paper-water mixture through a separating zone, so that the fibres are removed from the circulatory system as soon as they are in finished condition and ready for such removal. By this procedure and through the use of such apparatus which forms the subject matter of this invention, I am able to carry out the entire defibring of paper from the initial stage of introducing the dry paper in any of the forms stated and acting thereon until such paper is entirely defibred and practically all of the separated fibres removed from the operating tank. By the use of such an apparatus, the entire operation of defibring the paper is accomplished in one machine and the stock does not have to be partially processed in one apparatus and thereafter successively moved to other apparatus to obtain the end product desired.

Actual experience has shown that apparatus made in accordance with this invention will very satisfactorily operate with a minimum of water and a maximum concentration of paper to produce maximum output of defibred pulp.

Speaking generally, apparatus according to this invention which I have found highly efficient in the preparation of pulp from waste paper stock, embodies a tank adapted to contain a pool of water. Near the bottom of this tank and rotating at high speed about a vertical axis, is an "impactor" comprising a relatively small disc of substantially frustoconical form provided with impactor knobs near its outer periphery. Waste paper stock when initially introduced into the tank has a tendency to float on top of the water in the tank. This paper stock is adapted to be fed downwardly onto and coaxial of the impactor by a spiral feeding device rotating at a relatively slow speed in a direction opposite to the rotation of the impactor. The stock thus fed to the impactor passes radially outwardly over the impactor with a swirling motion contra to the rotation of the impactor and is thus subjected to sharp impact by the knobs and is disintegrated thereby. The rotation of the impactor, coupled with the operations of the spiral feeder, effect a continuous circulation of the material in the tank so that the paper stock is repeatedly acted upon in the manner stated. However, the wall of the tank is provided in the path of such circulation with one or more screens through which individual fibres, which have been separated from the rest of the mass by impact and by virtue of such circulation, are adapted to exit from the tank as the material flows past the screen to thus eliminate, insofar as possible, the subjection of already separated fibres to further impact which would tend to break and thus degrade it.

The screen employed in this invention embodies many novel features hereinafter more fully described which render it more efficient in removing properly conditioned pulp fibres from the tank without undesirable dilution of the material remaining in the tank.

Features of the invention, other than those adverted to, will be apparent from the hereinafter detailed description and appended claims, when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate different practical embodiments of the invention, but the constructions therein shown are to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a vertical section through apparatus embodying this invention, this section being taken on the broken line 1—1 of Figure 2.

Figure 2 is a horizontal section taken in the plane of the broken line 2—2 of Figure 1.

Figure 3 is a section taken on the line 3—3 of Figure 2.

Figure 4 is a graphic illustration showing the manner in which paper stock agglomerates passing over the impactor are engaged by the impactor knobs and partially disintegrated. This view is in the nature of a vertical section, but is purely graphic.

Figure 5 is a plan view showing the manner in which the impactor knobs rotating in one direction with the impactor engage with and strike agglomerates rotating in the opposite direction to disintegrate such agglomerates and defibre the same.

Figures 6, 7 and 8 are fragmental schematic views showing how the fibres are passed through the screen and how the surface of the screen is cleared of impinging pulp agglomerates.

Figure 9 is a side elevation of a modified form

of mechanism for operating the diaphragm shown in Figures 1 and 2 of the drawings.

Figure 10 is a section on the line 10—10 of Figure 9 showing certain parts in full.

Referring to the drawings, 1 designates a stock tank which may be of any desired horizontal cross section, but is shown as substantially rectangular with rounded corners. This tank is adapted to be filled with water up to the approximate level indicated at 2 and the waste paper to be defibred is deposited therein.

Extending downwardly through the top of the tank is a shaft 3. This shaft 3 is vertical and projects to nearly the bottom of the tank. On it is mounted a continuous spiral feeder 4, the convolutions of which increase in size in the direction of the bottom of the tank. The shaft is journalled at its upper end in an appropriate bearing 5 and is adapted to be driven at a relatively slow speed by a pulley 6 and belt 7. The lower end of the propeller shaft 3 is shown as having a bearing within a coaxial impactor in the form of a disk 8 positioned coaxially of the shaft 3 and just above the bottom of the tank. The upper surface of this impactor disk is substantially frustoconical. It slopes downwardly toward its outer edge and its upper face carries a plurality of upstanding impactor knobs 9, also of substantially frustoconical form, arranged in annular series adjacent the periphery of the disc. The impactor disc 8 is carried by a shaft 10 which extends downwardly through the bottom of the tank and is driven by a pulley 11 and belt 12.

The shaft 3 rotates at a relatively slow speed, preferably in a counterclockwise direction, while the shaft 10 rotates at a much higher speed in a clockwise direction, so that these shafts rotate in opposite directions and at materially different speeds.

The spiral feeder is designed to perform its function with a minimum amount of power, and is rotated only fast enough to provide adequate circulation, and to feed the materials to be pulped through the disintegrating zone as rapidly as may be desirable. It insures that all materials in the tank, whether in the form of a bale, package, or sheet of material, are thoroughly agitated, wet, and in some cases, partly broken up into smaller pieces, and then fed in a steady stream or flow through the disintegrating zone in which the impactor is located.

Inasmuch as this feed and circulation is derived from a rotating spiral, mounted on a vertical shaft, it follows that the stock, as it is fed downwardly, takes a spiral course and, by the time that it reaches the lower end of the spiral and passes into the zone of disintegration, is not only moving downwardly, but also has a fairly rapid circular motion as it enters the zone of disintegration. This circular motion is indicated by the arrows *a* in Figures 4 and 5.

Immediately as it enters this zone, it is delivered onto the surface of the impactor disc 8 and, flowing toward the periphery of the latter, it is met by the impactor knobs, moving at high speed in the opposite direction, and in order to escape from this zone, into which it has been forced by the circulating spiral, it must pass through the path of these knobs which are rapidly rotating in the direction of the arrows *b* in Figures 4 and 5 to be thereby subjected to rapid and continuous impacts on the agglomerates F of the mass which have not been thoroughly disintegrated or separated into individual fibres, as graphically illustrated in these figures.

The action here is not dissimilar to the effect on a baseball which is thrown at high speed by a pitcher, and met at high speed by a baseball bat. The impact under these conditions is the product of the speed of the ball thrown by the pitcher, and the speed of the bat in the hands of the batter. If the bat is held stationary, the ball will travel only a short distance. Also, if the ball is at rest when hit by the bat, it will not travel nearly as far as a high speed pitched ball hit squarely. To follow the batted ball analogy somewhat further, if the ball is soft and soggy, the impact will be found to be much less and the distorted and flattened ball will travel a much shorter distance, as the product of the ball and bat speeds is partially absorbed in deformation of the ball and, if continued, will result in its ultimate disintegration, rather than in projecting the ball for long distances.

A very similar phenomenon occurs when a hard mass or agglomerate F of undisintegrated fibrous material is hit by one of the impactor knobs 9. The harder the material, the greater the impact and the more work expended on this hard mass of material to break it up. As the lumps or individual masses of material become softened and begin to disintegrate, the impact becomes less, as less work is necessary to complete their separation into individual fibres. The smaller agglomerates F′ and the individual fibres *f*, shown in Figures 4 and 5, are the product of such impact operations.

As the mass becomes completely disintegrated, the impact on an individual fibre is very small, consequently the individual fibre, after complete separation, is not injured or broken up, the ratio of impact decreasing as it passes from the hard lump stage into the completely disintegrated stage.

The spiral feeder and impactor disc produce a very strong circulation of the material in the tank and the peculiarity of this circulation, which is manifest during the operation of the apparatus, is that the spiral feeder tends to produce horizontal rotary movement of the material in the tank in one direction while the action of the impactor disc and its knobs tends to produce horizontal circulation in the opposite direction. The resultant of these two forces is a very definite upward flow of material along certain regions of the side walls of the tank and in the square tank this is along the sides opposite the shafts 3 and 10.

I utilize this phenomenon in the apparatus of this invention by providing in one or more of said side walls of the tank one or more upright screens 14. Each screen is preferably made of perforated metal and it is rigid. It is bolted across an opening in the side of the tank and spaced transversely across the screen on both the inside and outside, are upright fins, the fins 15 being on the inside of the tank and the fins 16 on the outside of the tank. These fins extend for the full height of the screen and provide, between adjacent fins, upright channels. The material entering these channels at the bottom flows upwardly therethrough against the screen and tends to deposit fine disassociated fibres against the screen. The fluid flow, moreover, is directed vertically by the presence of these fins and produces a marked flushing action over the inner surface of the screen which tends to keep agglomerated lumps from adhering to and clogging the screen. As hereinbefore pointed out the screen 14 is rigid and it is braced against vibration in a direction normal to this face by the

fins 15 and 16. However, there is positioned outside of each screen, a vibratory diaphragm 19 comprising a sheet of flexible or resilient material, such as rubber, clamped between rigid plates 21 and 22. As shown in Figures 1, 2 and 3, the plate 21 is provided on its back with lugs 23 which carry a wrist pin 24 extending through the pitman 25 of an eccentric 26. This eccentric is mounted on a shaft 27 supported on brackets 28. As the shaft 27 is rotated, from any suitable prime mover, the diaphragm is vibrated toward and away from the screen 14. The space between the screen and the diaphragm is enclosed at its bottom and sides by walls 29 and 30 to form an activator chamber 31, the upper end of which has a constricted opening 32 leading to a superimposed discharge chamber 33 provided with a draw off 34 controlled by a weir 35.

In the operation of the apparatus, the liquid level 2 of the aqueous mixture in the tank is maintained somewhat higher than the liquid and fully disintegrated fibre mixture in the discharge chamber 33 and in the activator chamber 31. This difference in pressure head tends to cause the passage of some of the water in the tank through the openings in the screen and into the activator chamber 31. Incident to this operation, small incompletely disintegrated agglomerates and some fully treated fibres tend to mat against the inside surface of the screen over the perforations, to be held there by the pressure held in the tank. The circulatory movement of the material in the tank through the channels between the vanes 15 tends to ameliorate this condition somewhat, but will not fully cure it. It is, however, effectually obviated through the action of the vibratory diaphragm 19, the operations of which are graphically illustrated in Figures 6, 7 and 8.

In practice the throw of the eccentric is relatively slight so that the vibratory movement of the diaphragm is ordinarily not more than a small fraction of an inch in a direction normal to the screen and in the construction shown in Figures 1–3, this vibratory movement is harmonic. In Figures 6, 7 and 8, which are purely graphic illustrations and not intended to show structural details, Figure 6 shows the conditions prevailing when the diaphragm 19 is in mean or neutral position with all of its parts occupying a common plane. When so positioned and at rest, it will exert no influence upon the aqueous mixture in the activator chamber 31, and more or less matting of the type referred to will tend to take place as the agglomerates F′ and fully disintegrated fibres *f* flow upwardly in the direction of the arrow past the inner surface of the screen 14.

However, if the diaphragm 19 is flexed in the direction of the screen from the position shown in Figure 6 and in dotted lines in Figure 7, to the full line position of Figure 7, some water in the activating chamber 31 will be forced by movement of the diaphragm, because of the constriction 32, to pass through the perforations P of the screen into the interior of the tank in the form of hydraulic jets, as indicated by the small arrows in Figure 7. These jets will force the agglomerates F′, as well as the separated fibres *f*, away from the surface of the screen and free the inner surface of the screen from such deposits which are carried along with the circulatory flow of the material in the tank and in due course get back to the impactor where the material is further broken up.

In the cycle of operations of the diaphragm, the diaphragm will next be moved away from the screen, i. e., from the full line position of Figure 7 and the dotted line position of Figure 8 to the full line position of Figure 8. This movement of the diaphragm away from the screen will, because of the constriction 32, cause water to be drawn from the tank 1, through the perforations of the screen into the activator chamber 31, as clearly indicated by the small arrows in Figure 8, carrying with it disassociated fibres *f* in the region of the screen perforations.

It has hereinbefore been pointed out that it is desirable to effect disassociation of the fibres from the agglomerates in the tank, under as high a concentration of the fibrous material as possible, i. e., with as little water as practical. I have found, however, that the withdrawal of the disassociated fibres through the screen is facilitated if a lower concentration of the fibres exists in the vicinity of the screen. As the machine continues to operate, the concentration of finished fibres in the activator chamber 31 and discharge chamber 33 tends to increase and my tests have demonstrated that it is of advantage to introduce against the outer surface of the screen a layer of fresh water which may be forced through the screen as the diaphragm moves in the direction thereof in order to dilute the fibrous material directly inside of the screen and to facilitate its withdrawal with entrained fibres as the diaphragm is subsequently moved away from the screen. Such water may be introduced in the form of streams fed through a plurality of inlet pipes 18 which will direct the flow of such water in the form of a layer over the outside surface of the screen.

The vibration of the diaphragm, however, is so slight and rapid that while the fresh water layer to which I have referred will facilitate the removal of the fibers, that fresh water so introduced into the tank through the screen will be withdrawn with the fibres through the screen. Consequently, this water will not serve to appreciably dilute the pulp mixture in the interior of the tank, but will nevertheless very materially assist in the removal of the separated fibres. In some cases I have found that the introduction of a thin layer of water against the inner surface of the screen through pipes 17 will give advantageous results, but ordinarily these pipes are not necessary to the removal of the fibres.

Experience with this machine has shown that, through the operation of the diaphragm and the introduction of water against its outer surface as described, remarkably high efficiency in the removal of those fibres in the immediate vicinity of the inner face of the screen results and I am thus enabled to remove a very large percentage of these fibres as soon as they become fully disassociated from the agglomerates in the tank. This is highly important from a production standpoint as it gives large production output and also saves the fibres in the tank from being repeatedly acted upon by the disintegrating apparatus within the tank and their qualty for further use impaired.

As hereinbefore pointed out, the operation of the diaphragm by the eccentric construction shown in Figures 1–3 is of a harmonic character. There are some cases wherein I have found it desirable to move the diaphragm in a non-harmonic manner. The apparatus shown in Figures 9 and 10 may be used for this latter purpose. In this showing the back plate 21 of the diaphragm is provided with a rearwardly extending bracket 23*a* on which is supported a pair

of rollers 36 in the continuous track 37 in a cam 38 adapted for rotation on a shaft 27a corresponding to the shaft 27. A link 39 serves to hold the rollers on dead centers between the diaphragm and the shaft. With this arrangement the rotation of the cam will move the diaphragm toward the screen, during, e. g., 120° of cam rotation and away from the screen during the remaining amount of e. g., 240°, of its rotation. With this arrangement, the diaphragm will exert a somewhat longer movement in a direction to withdraw fibres than in the direction of its movement to clear the surface of the screen of matting.

During the operation of the apparatus, the fibers which are fed into the activator chamber 31 are fed upwardly by movement of the material therein into the discharge chamber 33 to be fed over the weir to a point of discharge in a condition to be used in the molding of articles.

If foreign matter is deposited into the tank along with the waste paper, this foreign matter is adapted to be drawn off from time to time through a draw off outlet or sump 36' positioned in removed relation to the impactor disc and shown in the drawings as located centrally of the tank.

It will be noted from the drawings that the impactor disc, as well as the propellers, are of relatively small diameter. It is advantageous to make them so because they require less power to operate and furthermore, they produce thoroughly satisfactory circulation and disassociation of the fibres when so constituted.

In the drawings only two screens have been shown, but in practice screens may be provided at additional sides of the tank without departing from this invention and this is particularly true where the shafts 3 and 10 are arranged substantially centrally of the tank.

The foregoing detailed description sets forth the invention in its preferred practical form, but the invention is to be understood as fully commensurate with the appended claims.

In the operation of the apparatus of the present invention, certain method steps are performed which may be carried out by other forms of apparatus. These steps are novel and constitute a novel method forming part of the present invention.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A pulper comprising: a tank adapted to contain a mixture of water and paper, a rotatable feeding device extending downwardly into the tank to feed a stream of the mixture downwardly, an impactor disk subjacent to and coaxial with the feeding device and rotatable independently thereof and having on its upper face upstanding impactor knobs, means for rotating the feeding device at relatively slow speed and the impactor disk at relatively high speed in opposite directions whereby the material in the tank is caused to circulate downwardly past said impactor disk counter to the direction of rotation of said disk to cause said paper to be disassociated and to continue the circulation of said material past the walls of the tank, a screen in the side wall of the tank contiguous to the inner face past which the material is circulated, and fixed upright fins extending from the inner face of the screen to form between them upright channels to direct the circulatory flow in the tank past the screen.

2. A pulper as claimed in claim 1, wherein the impactor disk is of substantially frustoconical form and its upstanding knobs are also of frustoconical form and arranged in substantially annular sequence adjacent its periphery.

3. A pulper as claimed in claim 1, wherein the impactor disk is of substantially frustoconical form and of appreciably less horizontal dimension than one-half of the horizontal dimension of the tank.

4. A pulper as claimed in claim 1, wherein the feeding device comprises a spiral increasing in diameter in the direction of the impactor disk to substantially the radius of said disk.

5. A pulper as claimed in claim 1, wherein a plurality of water inlets are positioned adjacent the inner face of the screen to convey water from the exterior of the tank and direct it upwardly over a submerged portion of the inner face of a screen in each of the upright channels between the fins to dilute the strata of the material in the tank contiguous to the screen.

6. A pulper as claimed in claim 1, wherein water inlets are positioned adjacent the outer face of the screen to convey water from the exterior of the tank and direct it upwardly over a submerged portion of the outer surface of the screen to lower the concentration of the material contiguous to the screen.

7. A pulper comprising: a tank for containing a mixture of waste paper and water, said tank being provided therein with means for circulating said mixture past the walls of the tank, said circulating means including means for disintegrating the waste paper in said circulating mixture, an upright screen positioned in the side wall of the tank, and fixed upright fins extending from the interior face of the screen for the full height of the latter to form between them upright channels for directing the circulatory flow in the tank past the screen.

8. A pulper as claimed in claim 7, wherein a plurality of water inlets are positioned adjacent the inner face of said screen to convey water from the exterior of the tank and direct it upwardly over a submerged portion of the inner face of said screen in each of the channels between the fins to dilute the strata of the material in the tank contiguous to the screen.

9. A pulper as claimed in claim 7, wherein there is provided externally of the screen a chamber one wall of which is in the form of a diaphragm, the screen being rigid and the diaphragm being movable toward and away from the screen, and means for vibrating said diaphragm.

10. A pulper as claimed in claim 7, wherein the outer face of the screen is provided with fixed upright fins corresponding to the fins at the inner side of the screen.

11. A pulper as claimed in claim 7, having an activator chamber externally of the screen communicating with a superimposed discharge chamber through an intermediate constricted opening, one wall of the activator chamber having therein a diaphragm movable toward and away from said screen, and means for vibrating the diaphragm toward and away from the the screen.

12. A pulper comprising: a tank for containing a mixture of waste paper and water, said tank being provided therein with means for circulating said mixture upwardly past the side walls of said tank, said circulating means including means for disintegrating the waste paper in said circulating mixture, an upright screen positioned

in the side wall of the tank, and fixed upright fins extending from the interior face of the screen for the full height of the latter to form between them upright channels to direct the circulatory flow in the tank past the screen, an activator chamber disposed externally of the screen, one wall of which chamber constitutes a diaphragm movable toward and away from said screen, means for vibrating the diaphragm toward and away from the screen, fixed upright fins extending from the outer surface of the screen into the activator chamber for the full height of the screen, and water inlets extending into said chamber adjacent the outer face of said screen for conveying streams of water from the exterior of the tank and directing them over the outer surface of the screen between the latter fins.

13. A pulper as claimed in claim 12, wherein the outer surface of the screen is provided with outstanding fixed upright fins registering with the fins at the interior of the screen.

14. A pulper comprising: a tank for containing a mixture of waste paper and water, said tank being provided therein with means for circulating said mixture upwardly past the side walls of said tank, said circulating means including means for disintegrating the waste paper in said circulating mixture, an upright screen positioned in the side wall of the tank, an activator chamber disposed externally of the screen one wall of which embodies a vibratory diaphragm, said activator chamber having a constricted discharge outlet for water-fibre mixture contained therein, a water inlet extending into said chamber adjacent the exterior face of said screen for feeding a layer of fresh water over a submerged portion of the exterior surface of the screen, and means for vibrating the diaphragm to propel water from the activator chamber through the screen to free the internal surface of the screen from agglomerate accumulations thereon when the diaphragm moves in one direction and to withdraw such water through the screen with entrained separated fibres when the diaphragm moves in the opposite direction.

15. A pulper as claimed in claim 14, wherein the means for operating the diaphragm moves the same with harmonic motion.

16. A pulper as claimed in claim 14, wherein the means for operating the diaphragm moves the same with non-harmonic motion.

17. The method of separating fibres from an aqueous mixture of fibre and paper agglomerates located in a tank on the inside of an upright screen in the wall of the tank and passing said separated fibres through the screen into a body of water and fibres on the outside thereof which comprises: feeding supplemental water against the inside surface of a submerged portion of the screen, and pulsating the mixture of water and fibres on the outside of the screen to cause water from the outside of the screen to alternately pass through the screen to contact with the aqueous fiber and agglomerate mixture on the inside of the screen and return said water through the screen with entrained fibres to the outside of the screen.

18. A pulper comprising: a tank adapted to contain a mixture of water and paper, a rotatable feeding device extending downwardly into the tank to feed a stream of the mixture downwardly, an impactor disk subjacent to and coaxial with the feeding device and rotatable independently thereof and having on its upper face upstanding impactor knobs, means for rotating the feeding device at relatively slow speed and the impactor disk at relatively high speed in opposite directions whereby the paper in said mixture is disintegrated and the mixture in the tank is caused to circulate past the side wall of the tank, and a screen in the side wall of the tank contiguous to the inner face past which the material is circulated.

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