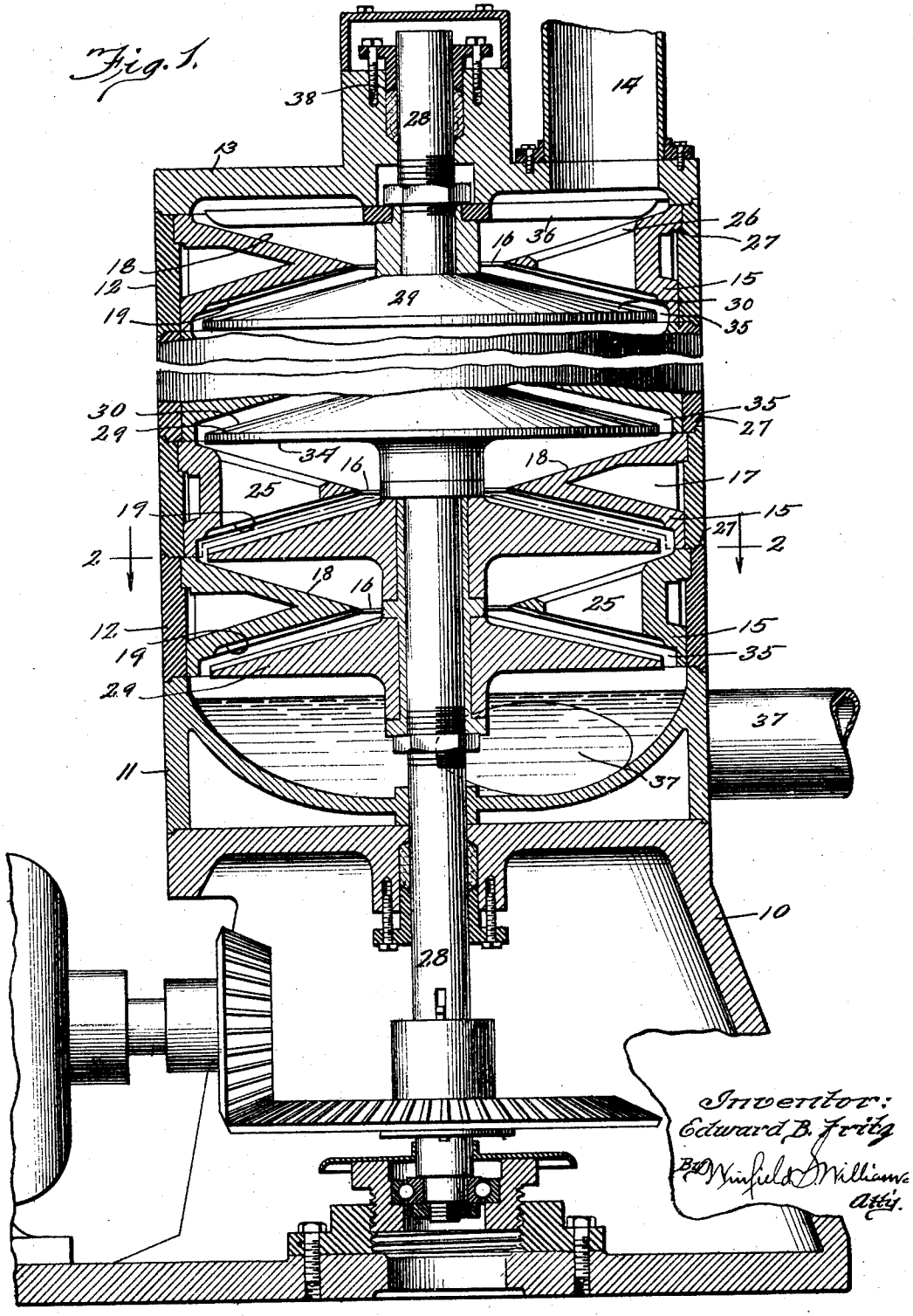
June 13, 1933. E. B. FRITZ 1,913,540

PULP FIBERING AND HYDRATING MACHINE AND PROCESS

Filed Dec. 31, 1930 3 Sheets-Sheet 1

Fig. 1.



June 13, 1933. E. B. FRITZ 1,913,540

PULP FIBERING AND HYDRATING MACHINE AND PROCESS

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Fig. 2.

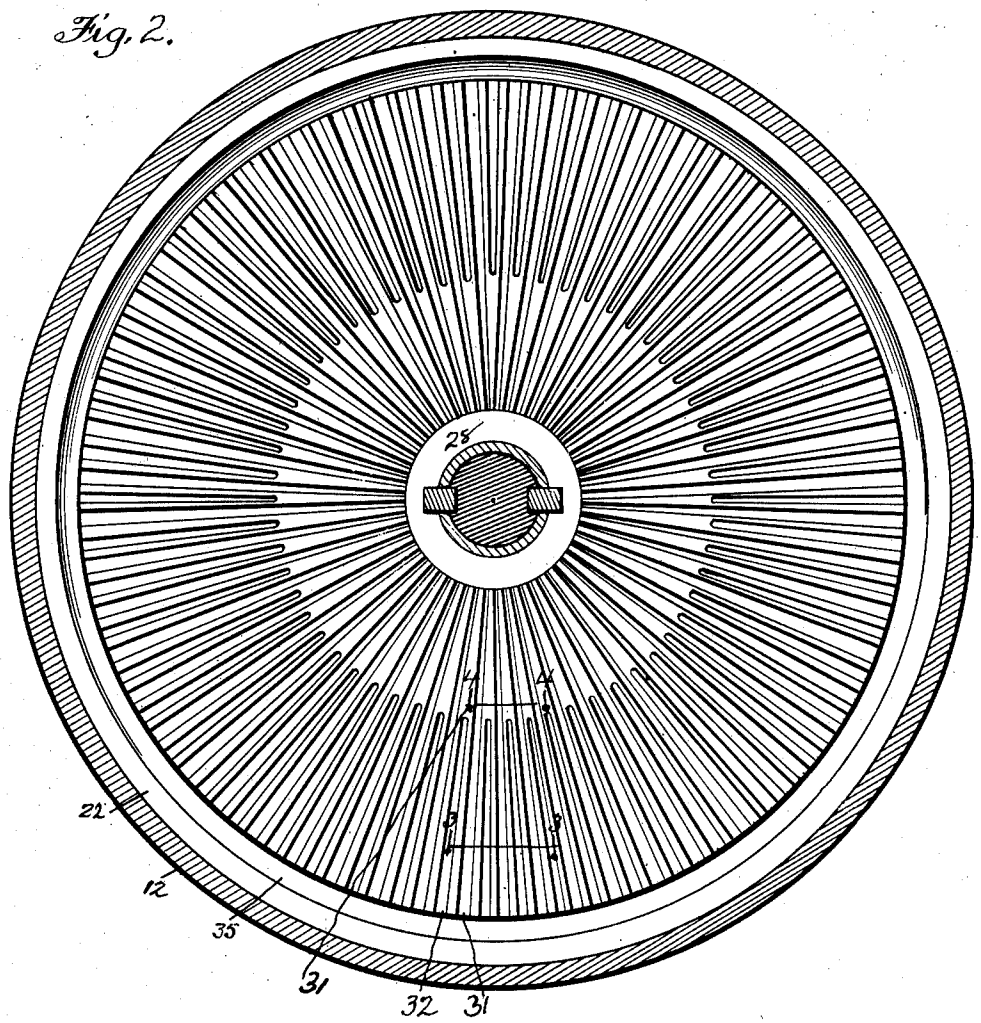


Fig. 3.

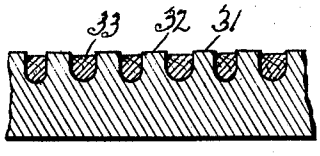
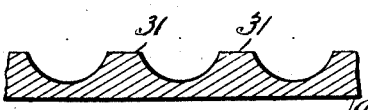


Fig. 4.



Inventor
Edward B. Fritz,
By Winfield & Williams
Atty.

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Fig. 5.

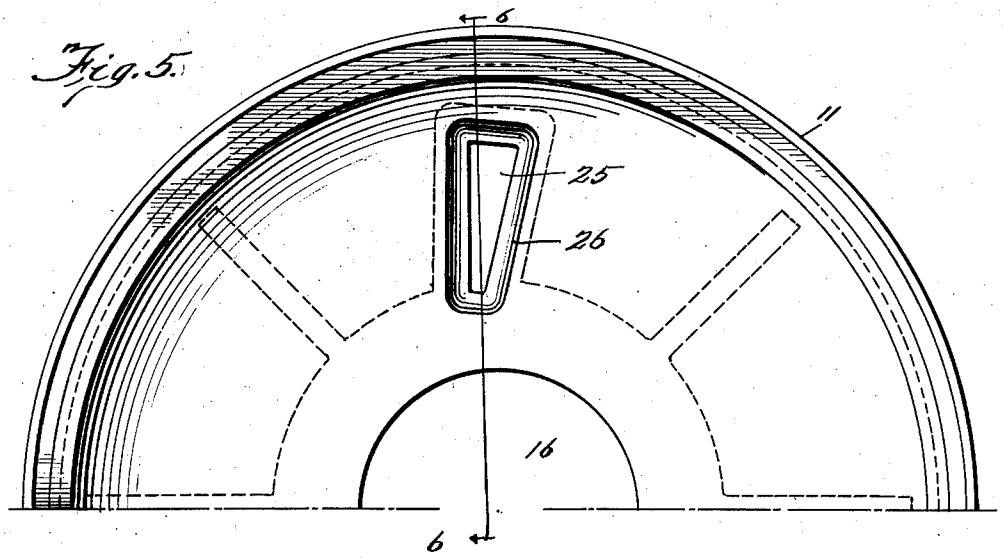


Fig. 6.

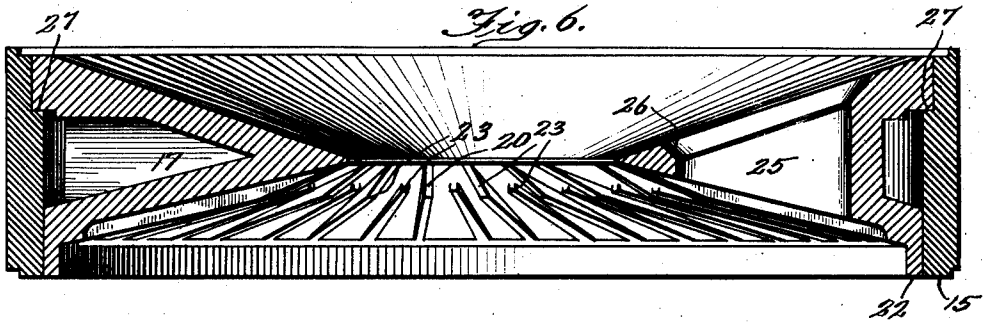


Fig 7

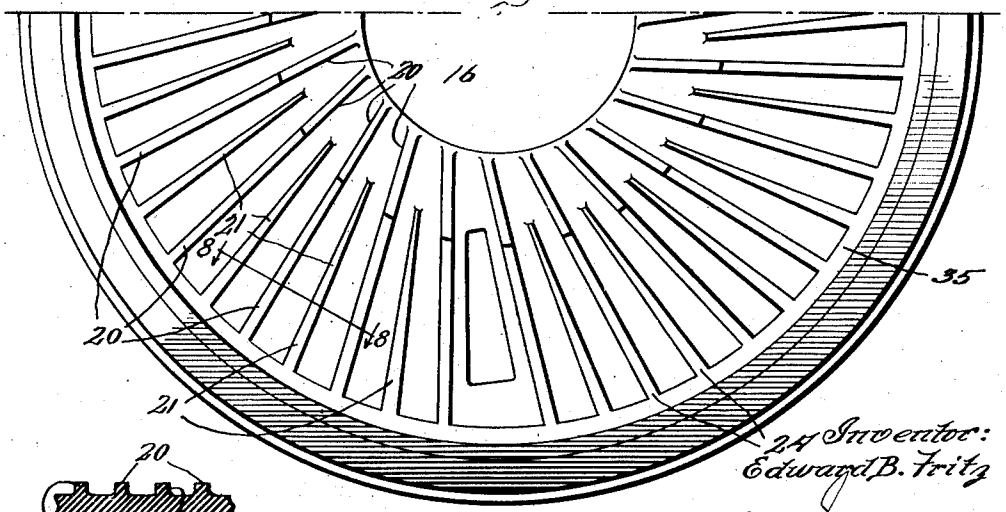


Fig. 8.

Inventor:
Edward B. Fritz
By Winfield S. Williams
Atty.

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UNITED STATES PATENT OFFICE

EDWARD B. FRITZ, OF CHICAGO, ILLINOIS

PULP FIBERING AND HYDRATING MACHINE AND PROCESS

Application filed December 31, 1930. Serial No. 505,684.

This invention is an improvement upon my former U. S. patents numbered 1,528,201; 1,556,926; 1,558,927: and the fundamental principles included in said patents are basically included in this application. The principles included and claimed in my application Number 383,273, filed Aug. 3, 1929, are also included herein.

The fundamental principle is a process of reducing fiber content material to individualized fibers and the simultaneous hydrating of the said fiber reductions to a condition in readiness for the standard paper making machine. In my former patents I have presented the inventive idea of a machine, which was adapted to receive various fiber content materials to be treated, the said materials having various densities, the same being acted upon during the travel through the machine, a primary pressure on the material being sustained: the treatment while passing through the said machine being adapted to individualize the fibers from the material treated, preserving their identity and continuity while the same are being hydrated. In each of the said inventions there is primarily included economy of operation as well as speed of production.

In the commonly known art of paper making, the general method utilized is some form of device which operates to obtain fibers in such a form as can be used in the making of paper; but this ordinarily consists in breaking fibers into smaller and smaller particles and ultimately in largely destroying the identity of the fiber as concerns its length as well as its strength. In the present application I use the words fibering and fibrating. These words are not in the accepted standard dictionaries, and hence I connote a meaning which is definite to what I am claiming herein. In the commonly known art of paper making it is sought to reduce certain classes of material to constituent fibers which upon being hydrated are adapted to be converted into paper of various characters: of necessity it is of superior advantage to preserve as far as possible length and unity of fiber for the quality of the final product. Hydration is one result, but it is not the major result of the machine and process: it is an incidental but necessary result.

In the manufacture of paper various materials containing fibers are used; such as rags, jute, wood, plants, old paper stock, straw, etc. Whether it be wood, plant or rag, the commonly known process of primary treatment is to obtain from the various materials the fibrous portions and deliver the same in a form commonly known as pulp. Taking the material at this stage it is common to handle the same in the type of machine known as a Beater, or the Jordan. In each of this type of machine the material is primarily treated on the principle of passing it through some form of metal members where the principle of a knife blade comes substantially in contact with an opposition knife blade and the fibers are broken and thereby reduced to a condition such as is desired for making into paper. In other words, it is a system of breaking up the fibers and treating them in a watery fluid until the said broken up fibers are sufficiently hydrated to make them adaptable to the process of paper making. By fibering I desire to connote the process by which pulp of various compositions is disintegrated and the individual fibers integrated, their individualizing being the major motive. And in the same treatment, the process of brushing the fibers contained in the pulp in such a manner that the fibers are not broken but brushed to an individuality which maintains the integrity of the fiber as to character and length, while continuously hydrating the individual fibers in readiness for paper making.

In the treatment and process herein set forth and claimed there is no metal contact in the treatment of the pulp material whereby the character of the fiber is endangered. In the commonly known process the knives upon the moving body are operated in conjunction with knives upon the stationary body in such a manner that the fibers are broken into small bits so that their indentity is largely destroyed to accommodate the paper forming processes subsequent thereto.

Further, in the said machines the movement of the knives on the one member in relation to the knives of the other member have a tendency to generate much heat, and the said heat being communicated to the material being treated tends to scorch and burn the fibers resulting in a depreciation of and injury to the product.

The accompanying drawings illustrate a form of my invention, in which

Fig. 1 is a sectional elevation of a portion of my machine, showing the internal movements and relations.

Fig. 2 is a cross-section along lines 2—2 of Fig. 1.

Fig. 3 is an enlarged broken section of a rotary disc, indicated by the arrows 3—3.

Fig. 4 is an enlarged section of a rotary disc at a point substantially indicated by the arrows 4—4.

Fig. 5 is a half portion of stationary disc, showing the upper side thereof.

Fig. 6 is a cross-section of a stationary disc and wall formation taken along a line 6—6 of Fig. 5, as though the line were projected clear across the disc.

Fig. 7 is a half portion of the stationary disc shown in Fig. 1, and shown in Figs. 5 and 6, the under surface of the disc being indicated in its position in housing.

Fig. 8 is an enlarged section across the portion of the disc indicated by arrows 8—8.

As shown the device comprises a circular housing inclosing a circular chamber, the said housing consisting of a series of unit members superimposed, each member adapted to substantially fit into its adjacent member and form a circular vertical chamber, the said unit members—except the lowermost and a cap member—being substantially duplicates, so that any desired multiplication of activity can be attained upon a single base and operated with one power. A base 10 is provided, which contains a power transmitting mechanism and a means for elevating the operating mechanism to vary the character of the product operated on in the machine. Primarily mounted upon said base is a sectional member 11 of the chamber; this said member 11 is internally saucer-shaped substantially on three sides thereof, the curvature to the fourth side blending into an opening 37 which is projected outwardly in a direction tangential to the circular contour of the member. Mounted upon this member 11 are a series of circular forms 12 adapted to—when placed one upon another—form a practically water-tight compartment. On the top-most of the sectional members 12 there is provided a cap 13 having therein an opening 14 for the delivery into the said chamber of material to be operated upon, and a bearing 38 for a shaft 28. Assembled in each of said sections 12, there is mounted a circuiar disc member 15; a member 12 and a member 15 forming a unitary part of the structure, demountable as a unit. Each of the disc members 15 is substantially V shaped in half cross-section, being wide on its outer periphery and tapering to a point a spaced distance from the center, so that the said discs 15 are funnel-shaped on the upper and lower sides, with a central aperture 16 for the free rotation of a shaft 28, also for the passage of material being acted upon; there being also an aperture 25 to be described hereinafter. I preferably make the V enclosure 17 hollow as shown except as hereinafter limited. The upper surface 18, of each of the said stationary discs is preferably smooth, and the under surface 19, bears projections in the form of bars or corrugations. These bars or corrugations serve two definite purposes among others, which are: they form baffles, and they form channels for the projection of the treated material, shooting the same downwardly and spreading the material over the surface of a rotating disc distributing the material as it is treated, in proportion to its advancement on the increasing surface of the rotating disc. These baffle bars are projected somewhat radially but definitely in the direction of the travel of the rotating discs. These baffle bars 20 and 21 have their highest point of elevation 23 slightly removed from the edge of the aperture 16, so that the material as it descends through the aperture 16 has a certain amount of freedom after which it is caught by the rotation of the rotor and shot through the channels formed by the said baffle bars; the said baffle bars decreasing in elevation until they fade out into the surface of the disc at the clearance point 35. There is provided a series of long bars 20 with a series of shorter bars 21 alternating with the long bars and located in the wider spaces occasioned by the radial separation of the long bars. The highest surface elevation of the baffle bars 20 and 21 is in a plane corresponding to the plane of the highest elevation of bars on the rotating discs to be described hereinafter. The fading out points are indicated at 24. In each of the stationary discs 15 I provide an aperture 25 transverse thereof, and at a point between the central aperture 16 and the peripheral wall, and in the assemblage of the machine I provide that these apertures 25 shall be at different points in the circuit so that they will not be in a direct line of descent; I provide these as excess flow and breathing points, for in the operation of such a device there develops a certain amount of free air and this provision enables that air to be passed upwardly and avoid any congestion or clogging, or excess accumulation of air to affect the process. In the operation of this device the material operated upon consists of fibrous ma-

terial and water for flowing and hydrating; and the same produces air-pockets, the machine being adapted to continuous feeding and continuous delivery. These said apertures 25 conserve a further purpose, which is to assist in carrying off any tendency to heat development or accumulation. The material delivered into the machine, as shown and claimed is normally under gravity pressure but the material may be delivered under a pressure in excess of the normal pressure of gravity. In our original application, as shown in our former patents herein referred to, the supply was placed at such an elevation as would normally produce a pressure greater than the normal weight of the material as it would appear in the machine. The aperture 25 is provided with a flared entry 26, to obviate any sharp edges to obstruct the flow of material therethrough.

In each of the sections above the section 11, I provide a channel with a shoulder 27 in which to demountably seat the stationary disc 15.

Fixedly attached to the shaft 28 are a series of rotatable discs 29, these are spaced apart and positioned so that a rotating disc alternates with a stationary disc and cooperates therewith. On the upper surface 30 of each rotating disc there is provided a series of ribs or corrugations extending from a point adjacent the shaft to the periphery, there being a series of long ones 31, the same being spacedly divided by a series of short ones 32, beginning at a point where the radial division of the long ones is increased sufficiently to advantageously accommodate the short ones, the principle being that the operative surface is increased as the material moves outwardly under the centrifugal action of the rotating discs and a larger surface is presented. I preferably place between the long ribs and the short ribs wood members 33 whose elevation is slightly less than the surface elevation of the described ribs. The under surface of the rotating discs 29 are preferably flat providing a large space for the reception of the material as it comes from the rotating discs. This area being enlarged it assists the downward draft of the material. A clearance space 35 is provided between the circumferential edge of the rotating disc and the supporting wall of the stationary disc 15, for the free passage of the material downwardly around the edge of said disc.

The baffle bars on the stationary discs and the bars on the rotating discs though traveling in the same plane never come in contact with each other, and by arrangement of the said baffling surfaces never cross each other in parallel lines. The material being operated upon is buffeted against the projecting surfaces and between the two series of movements is brushed until the fibrous portions are integrated and simultaneously hydrated. The device accomplishes the process of reducing material, integrating the individual fibers and hydrating the same during this process without bringing any of the fibers into a position where the operating factors in the device will break the fibers, there being no metal or other contacts through which the material is passed to destroy the individuality of the fiber.

Fixedly attached to the shaft 28, at the upper part of the chamber and above the uppermost stationary disc, I provide a distributing member 36, which consists of a pair of arms extending outwardly and coming into contact with the material delivered into the housing through the aperture 14, the purpose of this distributor being to carry the material delivered in the machine in a manner to relieve the incoming material from clogging and to provide a better distribution to the operative factors of the machine.

This process of disintegrating fiber-containing-material as herein set forth and integrating the fibers thereof, overcomes completely the heating and burning of the fiber. In the ordinarily known process common to the art, the said processes are based upon a substantial contact of operating surfaces which generate heat and in the breaking of the fibers the heat developed in the process communicates itself to the fiber, which is ordinarily quite subject to heat which burns the fiber portion of the product, decreasing its commercial value to the extent of that heat. The process herein evidenced, and the machine claimed for doing the same, accomplishes the very reverse which is the cooling of all the material and the machinery by reason of the fluid portions passing therethrough and no metal or operative parts coming into any relation which would tend to produce friction and consequent heating and burning.

I do not limit myself to the detail herein shown and described; and only to the extent that I am limited by the scope of my claims.

I claim:

1. A machine for disintegrating fibrous pulp individualizing the fibers and silmultaneously hydrating the same preparatory to paper making, comprising a circular housing with horizontally positioned stationary circular discs vertically positioned with relation to each other and substantially uniformly spaced apart, each of said stationary discs having a plurality of apertures vertically transverse thereof.

2. A machine for disintegrating fibrous pulp individualizing the fibers and simultaneously hydrating the same preparatory to paper making, comprising a circular housing with horizontally positioned sta-

tionary circular discs vertically positioned with relation to each other and substantially uniformly spaced apart, said stationary discs having a plurality of apertures vertically transverse thereof, the upper and lower surfaces of said discs being conically inclined from a point adjacent the circumference to an apex spacedly removed from the centre thereof, constituting the said discs a substantially V shaped formation in cross section.

3. A machine for individualizing fibers and simultaneously hydrating the same preparatory to paper making, said machine comprising a circular housing with horizontally positioned stationary circular discs therein uniformly spaced apart, said stationary discs having a plurality of apertures vertically transverse thereof, the upper and lower surfaces of said discs being conically inclined from a point adjacent the circumference to an apex somewhat removed from the center thereof, constituting the said discs a substantially V shaped formation in cross-section, the lower side of each of said stationary discs bearing bars forming radially directed channels.

4. In a machine for reducing material containing fibers to individualized fibers and simultaneously hydrating same; a housing inclosing a chamber, said housing being composed of sectional units demountably assembled vertically in association with each other, each sectional unit above the lowermost chamber unit having, and adapted to support, therein a horizontally positioned disc member, each of said horizontal discs having a central aperture adapted to permit the functioning of a vertical shaft therethrough and with spaced clearance adjacent said shaft for the downward passage of material operated upon; a secondary aperture vertically transverse of each of said discs, each of said discs having upon the under surface thereof a series of bars extending in a radial direction from the center outwardly.

5. In a device for the purposes described a chamber enclosing housing mounted on a base, said housing consisting of a primary unit and mountably assembled thereon a series of demountable units each having a circular wall portion with means thereon for supporting a stationary horizontal disc member, so devised that a plurality of units can be mounted and form a substantially fluid tight chamber, each of said discs enclosed by the said housing wall having a central aperture for the admission of a vertical shaft, also having an aperture transverse thereof located between the central aperture and the periphery of the disc.

6. In a device for the purposes described a chamber constituted within a series of demountable sections, the lowermost of said demountable sections having an internal wall formation substantially saucer-shaped on three sides thereof, the wall of the fourth side curving into an opening through the wall of the section, the said outlet opening in the wall of the section being tangentially projected therefrom, whereby the material being delivered therefrom may be delivered with a minimum of resistance to its flow when being forcibly propelled from the said chamber.

7. In a machine of the character described a vertical chamber having associated with the internal walls thereof a plurality of spaced apart inwardly tapering disc members, each of said discs being apertured in the center for the free movement of a shaft, said shaft being vertically functioned and rotatable, bearing fixedly attached thereto a spaced apart series of discs adapted to alternate with the stationary discs, each of the said stationary discs having transverse thereof an aperture between the central aperture and the circumference.

8. A machine for individualizing fibers and simultaneously hydrating same preparatory to paper making, comprising a circular housing enclosing a chamber; the said housing consisting of a series of units mounted one upon the other, each unit adapted to carry a horizontal circular disc member therein, the said units when assembled presenting the said horizontal disc members as substantially uniformly spaced apart vertically; a vertical shaft rotatably assembled in the center of said chamber bearing a spaced apart series of discs rotatable with said shaft, each said rotatable disc adapted to alternate with a stationary disc, the upper surface of each roatable disc being corrugated and adapted to travel spacedly apart from, and in the same plane with a surface of a stationary disc, the inclination of the adjacent planes being downward and outward from a projected central point, the stationary discs having apertures transverse thereof for the free passage of material, air and heat therethrough, and the rotating discs being of lesser diameter than the diameter of the housing providing a clearance space between the perimeter of the rotating disc and the inner wall of the housing.

9. In a machine for the purposes described, a circular housing enclosing a chamber, a spaced apart series of stationary discs supported, and held in position, by the members composing the housing, each of said stationary discs being funnelshaped on the top and bottom, and the said bottom bearing channelling bars; a vertically positioned rotor centrally located in the chamber and comprising a shaft with discs thereon, said discs spaced apart and adapted to alternate with the stationary discs, the upper surface of the rotary discs corrugated

and adapted to work in cooperation with the channelled surface of a stationary disc, the corrugations on the rotary disc and the channels on the stationary discs being projected at different angles so that the corrugations on one disc never cross a channel bar on the opposite disc at the same radial angle.

10. In a machine of the character described for disintegrating pulp material containing fibers and hydrating the said fibers to a consistency adapted for paper making, a vertical chamber comprising a series of sectional members each said sectional member carrying a disc conically shaped top and bottom and having a central aperture and an aperture between the central aperture and the disc periphery, both apertures transverse of the disc, the bottom surface of each said disc bearing bars extending from the central aperture to a point adjacent the periphery.

11. In a machine of the character described for disintegrating pulp material containing fibers and hydrating the said fibers to a consistency adapted for paper making, a vertical chamber comprising a series of sectional members each said sectional member carrying a disc conically shaped top and bottom and having a central aperture and an aperture between the central aperture and the disc periphery, both apertures transverse of the disc, the bottom surface of each said disc bearing bars extending from the central aperture to a point adjacent the periphery. A rotor centrally functioning in said chamber comprising a vertical shaft and discs fixed thereon, each said disc member of the rotor adapted to alternate with a stationary disc assembled in the chamber, the said rotor discs having their upper surfaces outwardly and downwardly inclined from adjacent the shaft to the circumference, each said upper surface bearing bars in relief outwardly directed from a point adjacent the shaft to a point adjacent the periphery, the inclination of the bar surface of each said rotor disc being in the same plane as the inclination of a bar surface of a stationary disc and adapted to cooperate therewith.

12. In a machine of the character described a housing consisting of a demountable series of individual units forming an enclosed chamber, each of said demountable units above the lowermost being duplicates and containing means for supporting a stationary demountable disc; said disc being conically shaped top and bottom, the conical planes forming an apex at an aperture in the center thereof; each of said discs having an aperture transverse thereof situated between the central aperture and the circumference of the disc; the underside of each disc bearing raised portions adapted to carry material centrifugally when acted upon by a rotor; a rotor centrally located in the chamber consisting of a vertically mounted shaft bearing discs spaced apart and each adapted to coact with a stationary disc; the surface of each rotor disc adjacent a stationary disc surface bearing elevations, said elevations having an inclination parallel to the inclination of an adjacent elevated surface of the stationary disc, the elevations on the stationary and rotor discs so devised that there shall never be any alignment of the elevations on a stationary disc with the elevations on its coactive adjacent rotor disc.

13. The process of reducing pulp material containing fibers to a homogenous mass made ready for paper making consisting of passing continuously through a machine containing vertically positioned alternating stationary and rotating discs the said material and an amount of water such as may be found efficient in varying requirements to flow the pulp material and to hydrate the fibers individualized by said machine, the primary principle of the process being the provision of a moving surface bearing corrugations coacting with a stationary surface bearing channelling bars, the said adjacent surfaces being so positioned that the material passing therebetween and therealong is brushed by the said cooperating centrifugal and gyratory surfaces in such a manner as to individualize the fibers and substantially maintain the integrity of each individual fiber, and in the process of individualizing the fibers to hydrate the same, there being no contact relation of the metal members whereby to cut or break the individual fiber.

14. In connection with a machine of the class described the process of introducing simultaneously at an elevation pulp material having a fibrous content with a certain amount of water; and the passing of the mixture (through a continuous series of downward movements) between stationary and rotating discs, said discs having surfaces adjacent each other so devised as to swirl and centrifugally throw the fibrous material against baffling surfaces, the said baffling surfaces being constructed at angles to each other such that cooperating corrugations and baffles never cross each other at the same angle but coact in a manner to brush the fiber contents of the material into individualized fibers and beat the said fibers so as to hydrate the same while maintaining their integrity.

15. In a device of the character described, a base portion containing a driving and adjusting means; mounted upon said base a circular chamber with a top enclosure; an inlet at the top of said chamber and an outlet adjacent to the bottom of said cham-

ber; a series of spaced apart stationary discs, vertically related in the said chamber; a shaft centrally located and operable in the said chamber, the lower end of said shaft passing through an aperture in the base of the chamber and resting upon a rotatable bearing assembled in the said base; assembled on said shaft within said chamber a spaced apart series of rotatale discs so positioned upon said shaft that each of said discs coacts with a stationary disc; outlet from said chamber tangentially projected in the direction in which the rotating member revolves.

16. In a device of the character described, a saucer shaped formation in the bottom unit of the chamber created by the housing, the said saucer shaped formation extending substantially around three sides of the chamber, the fourth side being conformed to flow into a tangentially formed outlet, whereby when the material operated upon has reached the bottom of the chamber its momentum will have the tendency to rapidly force the finished material out through the outflow member.

17. In a device of the character described a vertical circular chamber mounted upon a base, a cap enclosing the chamber, on the inner walls of said chamber annular means for supporting a series of stationary discs spaced apart vertically in said chamber, each of said discs being characterized by a plurality of corrugations extending superficially therearound on one face of each disc, the said corrugated face being on an under side of each of said stationary discs; an aperture centrally transverse of each disc of a diameter sufficient to provide for the operation therein of a shaft and clearance enough to accommodate the passage of material being operated upon; centrally located in said housing a vertical shaft rotatably mounted having fixed thereto rotating discs spaced apart vertically, the upper surface of each of said rotating discs bearing corrugations adapted to coact with the corrugations on the under side of an adjacent stationary disc, each stationary disc alternating with a rotating disc; an aperture in the cap of the housing wherethrough to deliver material at the highest point of machine activity, an outlet in the lowest member of the housing portion adapted to secure the passage of material from the said machine in the direction of the travel of the rotors.

18. A device of the character described, characterized in that a pair of arms are attached to the shaft and at a point above the highest of the stationary discs, adapted to act as a spreader of the material delivered through the inlet in the top.

Signed at Chicago, Ill., December 24, 1930.

EDWARD B. FRITZ.