

Oct. 13, 1925.

1,556,926

E. B. FRITZ

HYDRATING, BEATING, AND REFINING MACHINE

Filed Nov. 20, 1924

2 Sheets-Sheet 1

Fig. 1.

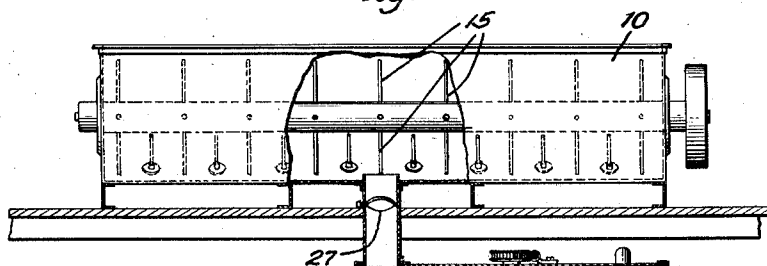


Fig. 7.

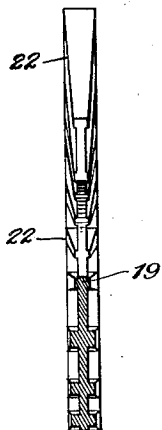
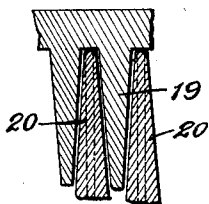
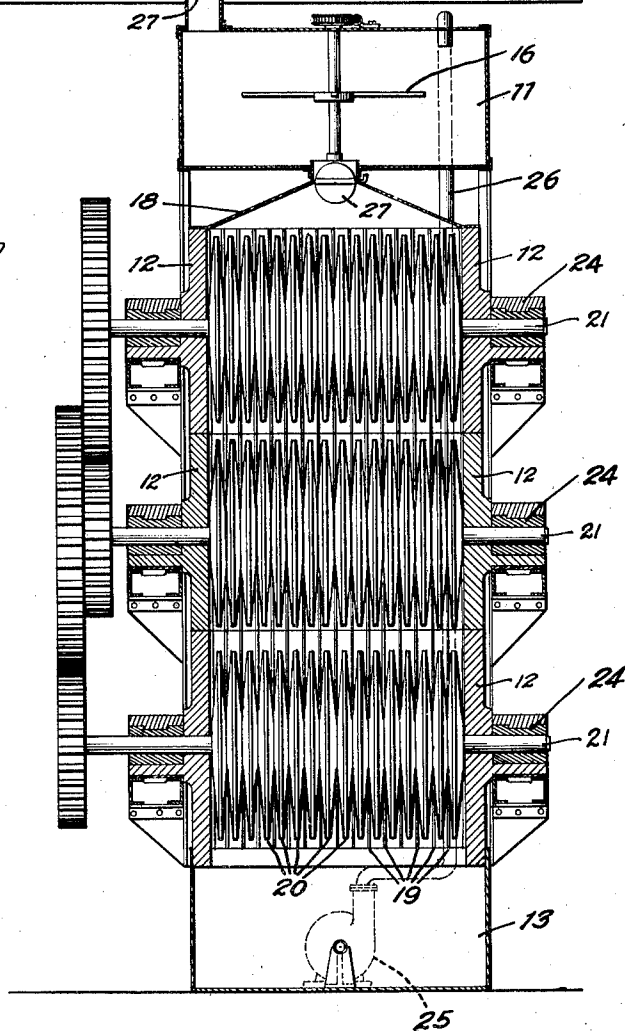


Fig. 6



Inventor
Edward Benton Fritz.
By Winfield Williams
Attys.

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2 Sheets-Sheet 2

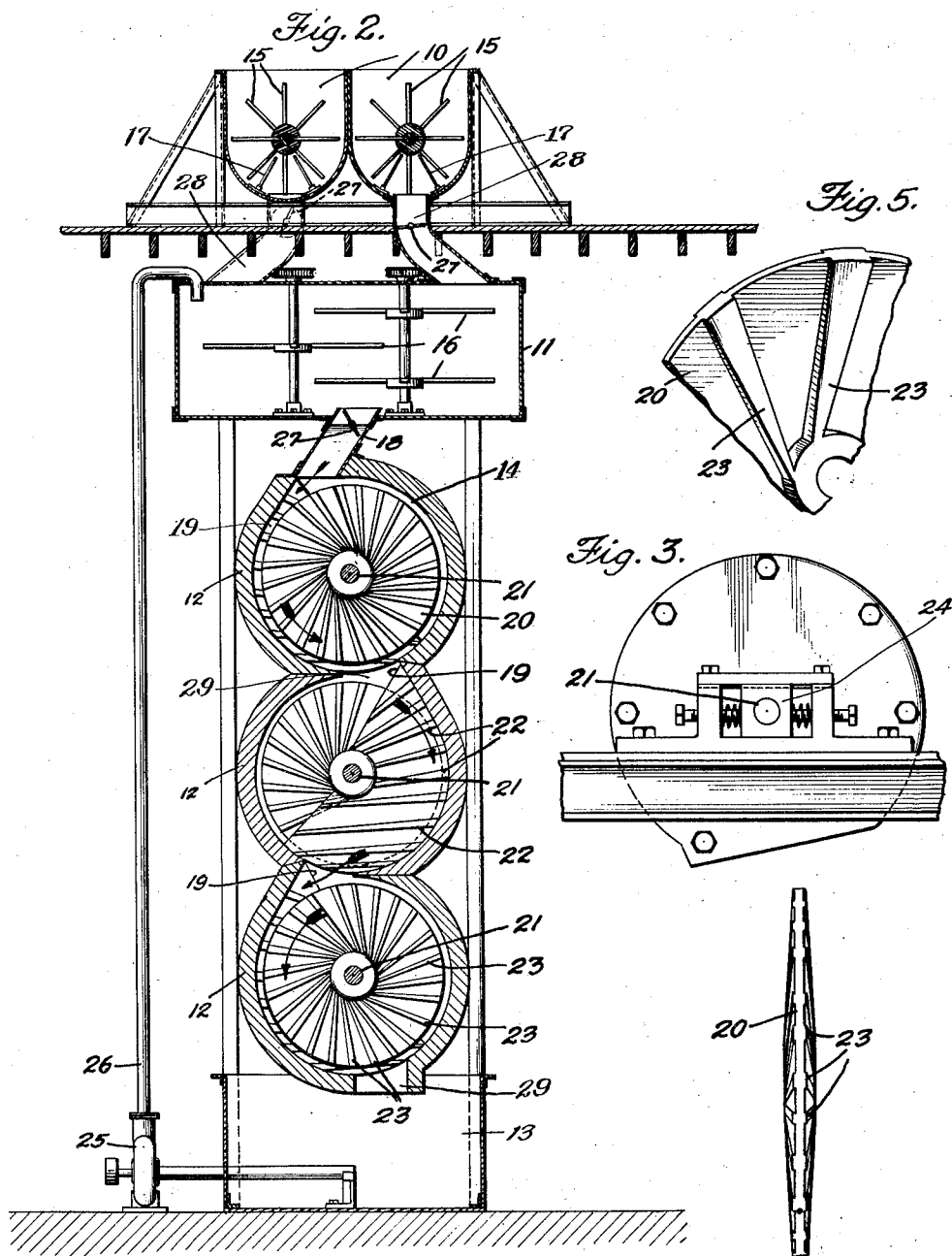


Fig. 4.
Inventor
Edward Benton Fritz
By Winfield Williams
Atty.

Patented Oct. 13, 1925.

1,556,926

UNITED STATES PATENT OFFICE.

EDWARD BENTON FRITZ, OF CHICAGO, ILLINOIS.

HYDRATING BEATING AND REFINING MACHINE.

Application filed November 20, 1924. Serial No. 751,051.

To all whom it may concern:

Be it known that I, EDWARD BENTON FRITZ, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Hydrating Beating and Refining Machines, of which the following is a specification.

This invention relates to a class of machines which are adapted to reducing paper, rags, pulp and such other material as is used in paper making to a consistency and relation fitted to prosecute the manufacture of paper or paper stock. My objects are several, as will be shown by the description and claims; but my primary objects are economy of space, economy of operation, economy of construction, economy of power, economy of time, maximum beating surface and gravity process.

In the paper making industry, in the preparation of the material for paper, there are several very important processes carried on, the central work being carried on in what is commonly known to the art as a "beater," which almost universally consists of some form of a vat or receptacle in which the material is moved around in a course practically horizontal, and which said material in the course of its travel is made to pass through a constricted aperture at the point of which aperture a revolving rotor is horizontally functioned causing the mass to slowly pass through the aperture and in passing to come into contact with beating or brushing surfaces. In this process the mass moved and operated upon—being more than 90% water—is heavy, a dead weight to lift and move, and the process is necessarily relatively slow—involving a large expenditure of power: the elements of impact, friction, resistance, and lift are practically at a maximum. In most cases separate devices are used to hydrate and primarily destroy the identity of the material before it enters the "beater"; and other devices are used to do the refining after it has been beaten in the "beater." It is also well known to the art that the devices referred to require a large base area to accommodate them. In the device herein disclosed the whole process of hydrating, beating, and refining is accomplished ready for the papermaking machine.

In applicant's device the base area is very small in comparison, the material in its process moves almost wholly by gravity and

in fact operates on the principle of the overshot wheel supplying power and thus reducing the applied power factor to a minor item, and the beating and refining factors are at a maximum and practically continuous.

This application is an improvement upon my application Serial Number 574,402 now Patent Number 1,528,201, and is based upon the fundamental principles in that application.

The accompanying drawings illustrate one form of my invention:

Fig. 1 is an elevation, with parts broken and cut away to show internal relations.

Fig. 2 is an opposite elevation practically through the center of Figure 1.

Fig. 3 is a view of a rotor adjustment.

Fig. 4 is a perspective on edge of a rotor disc.

Fig. 5 is an enlarged and somewhat exaggerated section of a rotor disc.

Fig. 6 is an inside edge view of a stationary disc, with a lower portion cross sectioned.

Fig. 7 is a diagrammatic view of the position and relation of the rotors and the discs.

As shown the mechanism consists of four major parts viz: a primary disintegrating tank 10; a reservoir 11; a housing 14 containing beaters 19, beating rotors 20 and associated parts; and reservoir 13 with associated pump 25. 10 is a tank receptacle into which is delivered water and the materials which are intended to form the mixture for making paper; horizontally rotatable therein I provide a shaft with flappers 15 radially extending therefrom adapted to manipulate the denser material and bring it into contact with strippers 17 associated with the inner surface of the tank 10 and preferably occupying the intervals between the flappers 15. I provide a conduit 28 leading from the tank 10 and opening into a reservoir 11 this conduit having in its course a gate or valve 27 to regulate the flow therethrough. Assembled in said reservoir 11 I provide one or more agitators 16 on shafts adapted to keep the mass from settling; leading from the reservoir 11 I provide a conduit 18 having an elongated opening or mouth wherethrough to discharge its contents into the upper chamber 12; I provide a housing 14 having therein a plurality of chambers 12 superimposed one

upon the other and having similarly elongated openings 29 in each chamber communicating with the one adjacent; these chambers 12 extend horizontally and are
5 circular. In each of said chambers 12 a power driven rotor 21 is functionally journaled. These rotors may be synchronized, but I preferably so associate these rotors that they will travel at different speeds. Between tank 10 and reservoir 11, and between
10 reservoir 11 and upper chamber 12 I provide means of communication 18 and 28, with gates or valves 27, for regulating the flow; the entry into upper chamber 12 being an elongated mouth, the lowest of these
15 chambers 12 has an opening to discharge its contents into a receptacle 13.

Removably attached to, or forming a part of the inner wall of chamber 12, I provide
20 semi-discs 19 having corrugations or raised abrading surfaces 22 on either face thereof, these discs 19 tapering from their outer edge inwardly; the raised abrading surfaces having a downward inclination devised to project material inward to a center and so
25 devised that the same never stand parallel to raised surfaces upon the rotors. The rotors consist of a shaft 21 and preferably assembled thereon a multiplicity of circular
30 discs 20 having raised portions 23 thereon; these raised portions 23 on the discs 20 are designed tangentially for several purposes, primarily they play the part of paddles in an overshot wheel and tend to assist in driving the rotors by the weight of the material
35 falling thereon, and secondarily they tend to throw the material outwardly against the surfaces 22 on the discs 19; in this action the material is swished and brushed backward and forward to accomplish a more perfect
40 reducing of the same. The discs 20 are assembled alternating with the semidisks 19 as shown in Fig. 7. I preferably make these surfaces with corrugations, but they
45 may be plain surfaces without departing from the principle set forth. The rotors are relatively thick at the centers and taper outwardly to their edges to function in conjunction with the opposite tapering of the
50 discs 19. I provide an adjusting means 24 in connection with the bearings of each of the rotors assembled on the shafts 21 whereby to accommodate the various grades of material and effect various degrees of refinement. The relation of the travel of the
55 material and the direction of the rotors is indicated by arrows. In the drawings I show three rotors in a like number of chambers, but the number may be multiplied without in any way departing from the principle, the basic idea being the refinement
60 of paper stock through a unitary process of superimposed chambers discharging one into the other whereby gravity plays the part of eliminating the raising or handling of

weighty material by power as in the common process. I provide a pump 25 with an outlet 26 associated with the receptacle 13 for emptying the same or it may be used as
70 shown to pump the material back into the reservoir 11 if it be desired to repeat the process, but this pump and its connections have no special limitation upon the applicant's device. The conduits 28 and 18 are
75 of no specific form except as channels of communication between the designated parts. In the bottom of the tank 10 and the reservoir 11 I provide respectively raised portions at the discharge openings to prevent any insoluble material passing into the
80 chambers 12.

It will be seen that the raw material delivered into tank 10 will be more or less disintegrated by the strippers and flappers and hydrated by the introduction of liquid,
85 any hard or insoluble material falling to the bottom: in practice I prefer to have at least two such tanks, so that while one is being filled the other may be discharged into the reservoir 11 so that the operation of the
90 rotors in beating, brushing and refining may be continuous. The reservoir 11 has agitators therein for the purpose of maintaining the consistency of the material on its course from the tanks 10 to the chambers 12.
95 The material entering the upper chamber 12 falling upon the rotors is by these thrown outwardly against the surface of the discs which in turn tends to throw the material back toward the center and downward, in
100 the process the fibers being brushed, hydrated and refined. The repetition of the process in adjacent lower chambers reduces it to the consistency desired. By having the speed of each lower rotor slightly increased over
105 its next higher rotor accomplishes the taking of a mass from the rotor above faster than a normal delivery. This device fully utilizes the economical application of gravity to the handling and refining of paper stock; economizes power; increases production; provides continuous operation, and secures progressive refinement.

It will be evident that the principles here shown are subject to various embodiments,
115 and I am limited only by the scope of my claims.

Claims:

1. In a machine of the character described, a plurality of substantially vertically aligned
120 chambers, substantially vertically aligned rotary beaters in said chambers, said chambers having curved wall portions with inwardly tapering disc segments lying closely adjacent the surfaces of said beaters, and
125 means for feeding material to the uppermost of said chambers, whereby said material is fed by gravity from each beater to the adjoining lower beater, said beaters and disc segments cooperating to beat and re- 130

fine the same into a disintegrated hydrated homogeneous mass as it travels through said machine.

2. In a machine of the character described, a plurality of substantially vertically aligned chambers, substantially vertically aligned rotary beaters in said chambers, said chambers having curved wall portions with inwardly tapering disc segments standing in spaced relation closely adjacent the surfaces of said beaters, and means for feeding material to the uppermost of said chambers whereby said material is fed by gravity from each beater to the adjoining lower beater, said beaters and disc segments cooperating to brush, beat and refine the same into a hydrated homogeneous mass as it travels through said machine.

3. In a device of the character described, a plurality of substantially vertically aligned chambers, substantially vertically aligned rotary beaters in said chambers, said chambers having curved wall portions with inwardly tapering disc segments lying closely adjacent the surfaces of said beaters, said beaters consisting of a plurality of discs assembled on a shaft with surfaces lying closely adjacent the surfaces of said disc segments, and means for feeding material to the uppermost of said chambers, whereby said material is fed by gravity from each beater chamber to the adjoining lower beater chamber, said beaters and wall discs cooperating to beat, hydrate and refine the same into a uniform hydrated mass as it travels through said machine.

4. In a machine of the character described, a plurality of substantially vertically aligned chambers, substantially vertically aligned rotors in said chambers, said chambers having curved wall portions composed of inwardly tapering disc segments standing in spaced relation closely adjacent the surfaces of said rotors, said rotors each consisting of a plurality of discs assembled on a shaft in spaced relation with surfaces lying closely adjacent the surfaces of said disc segments, and means for feeding material to the uppermost of said chambers, whereby said material is fed by gravity from each chamber to the adjoining lower chamber, said rotors and wall segments cooperating to brush, whip, hydrate and refine same into a homogeneous mass as it travels through said machine.

5. In a machine of the character described, a plurality of substantially vertically aligned chambers, substantially vertically aligned rotors in said chambers, said chambers having curved wall portions consisting of a plurality of inwardly extending disc segments intermeshing with a plurality of discs assembled on a shaft constituting the rotors, and means for feeding material to the uppermost of said chambers, whereby said ma-

terial is fed by gravity from each chamber to the adjoining lower chamber, said rotors and disc segments cooperating to brush, thrash, beat and refine the same into a homogeneous mass as it travels through said machine.

6. In a machine of the character described, a plurality of substantially vertically aligned chambers, substantially vertically aligned rotors in said chambers, said chambers having curved wall portions consisting of a plurality of inwardly tapering disc segments, said rotors consisting of a plurality of outwardly tapering disc members, said rotary discs adapted to alternate with the wall disc segments, their surfaces substantially parallel, and means for feeding material to the uppermost of said chambers, whereby said material is fed by gravity from each chamber to the adjoining lower chamber, said rotors and disc segments cooperating to beat, brush and refine the same into a uniformly homogeneous mass as it travels through said machine.

7. In a machine of the character described, a plurality of substantially vertically aligned chambers, substantially vertically aligned rotors in said chambers, said chambers having curved wall portions consisting of a plurality of inwardly extending corrugated disc segments intermeshing with a plurality of discs assembled on a shaft constituting the rotor, and means for feeding material to the uppermost of said chambers, whereby said material is fed by gravity from each chamber to the adjoining lower chamber, said disc segments and rotors cooperating to brush, beat, hydrate and refine the fibrous material into a homogeneous mass as it travels through said machine.

8. In a machine of the character described, a plurality of substantially vertically aligned chambers, substantially vertically aligned rotors in said chambers, said chambers having curved wall portions consisting of a plurality of inwardly extending tapering disc segments, intermeshing with a rotor consisting of a plurality of corrugated tapering discs assembled on a shaft, and means for feeding material to the uppermost of said chambers, whereby said material is fed by gravity from each chamber to the adjoining lower chamber said rotors and disc segments cooperating to brush, beat, hydrate and refine the same into a homogeneous mass as it travels through said machine.

9. In a device of the character described, a plurality of beater chambers one elevated above the other, rotary beater elements in each of said chambers and a supply chamber above said beater chambers having an inlet supply passage leading from the supply chamber to the beater in the uppermost of said beater chambers, each of said beater chambers having on a portion of its curved

side walls a plurality of inwardly tapering disc segments, closely conforming to the shape of said beater elements, said beater elements consisting of a shaft and assembled thereon a plurality of outwardly tapering discs, said side walls terminating in restricted openings leading to the adjoining lower chambers, whereby the material from one beater is fed directly to the next beater by gravity.

10 In a device for the purposes described a housing containing a vertical series of communicating chambers having curved wall portions, a portion of the wall of each of
15 said chambers consisting of removable inwardly tapering curved disc segments bearing an irregular surface.

11. In a device for the purposes described a housing containing a vertical series of communicating circular chambers, a portion
20 of the wall of each of said chambers consisting of removable disc segments inwardly tapering; a rotor in each chamber having removable tapering discs adapted to inter-
25 mesh with the disc segments, and means for

adjusting the spacing between the wall disc segments and the rotor discs.

12. In a device of the character described the combination of a primary receiving disintegrating tank having therein mechanical
30 means for altering the identity of fibrous material, said tank having communication with a reservoir on a lower level—said reservoir having agitating means therein, and an outlet into the upper of a vertical series
35 of chambers inter-communicating, and each chamber containing a multiplicity of fixed tapering disc segments intermeshing with a rotor having tapering discs alternating with the fixed discs, an outlet from the lowest
40 chamber, whereby material fed to the receiving tank is fed by gravity through the adjoining lower channel, said mechanically operated means cooperating with the fixed
45 means to hydrate, brush, beat and refine the said material as it travels through said machine.

Signed at Chicago, Illinois, this 12th day of November, A. D. 1924.

EDWARD B. FRITZ.