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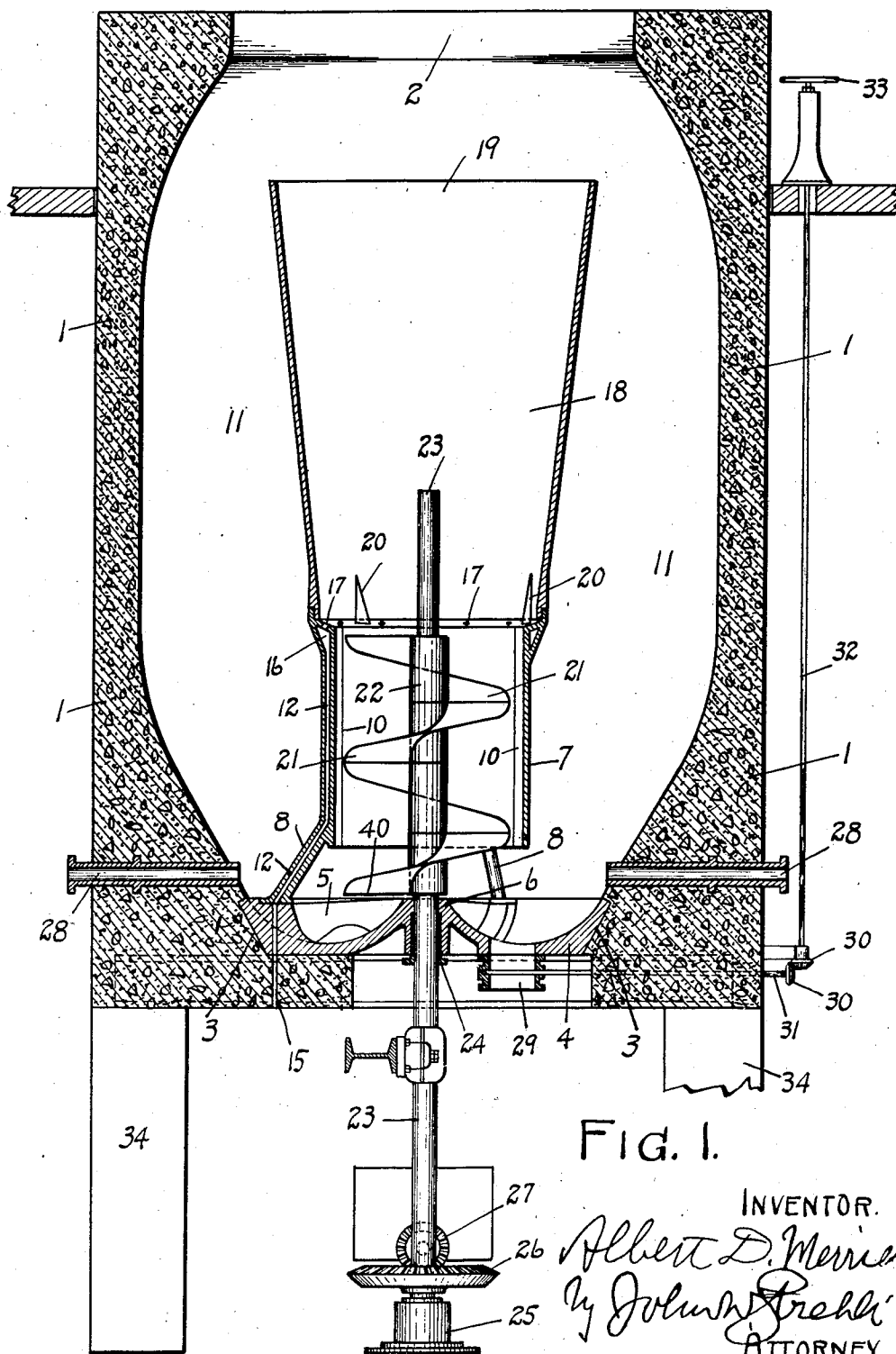
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A. D. MERRILL

METHOD AND APPARATUS FOR BLEACHING PULP

Filed March 9, 1925

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

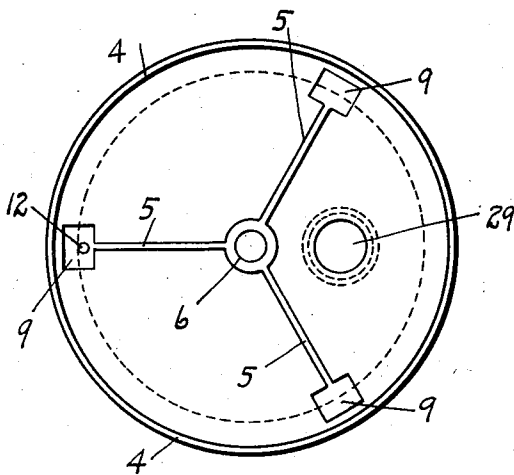
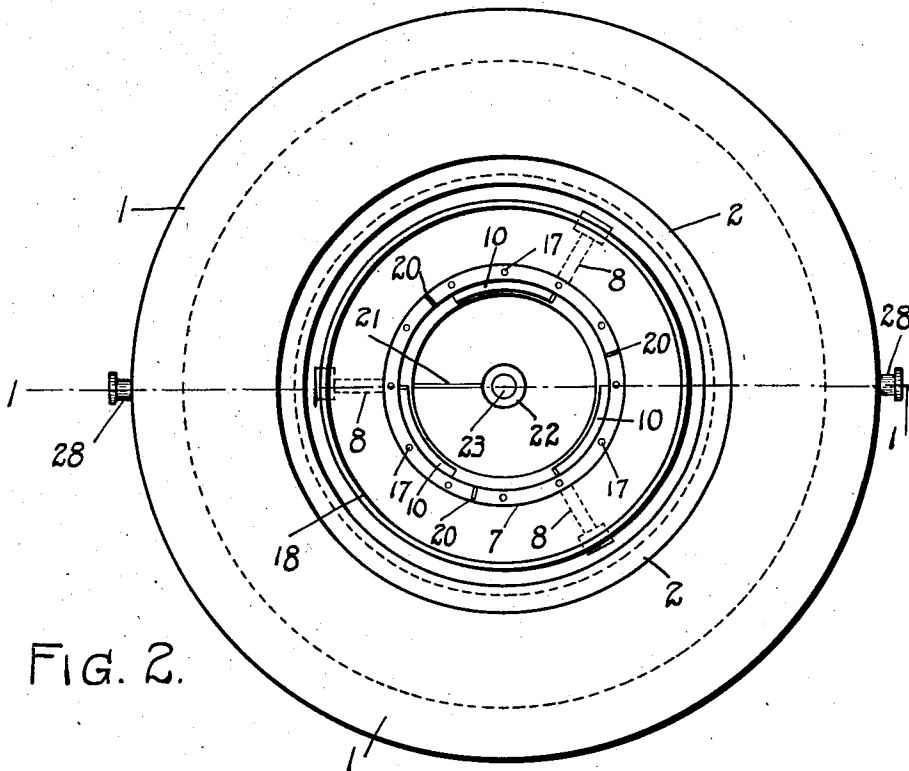


FIG. 3. *Albert D. Merrill*
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METHOD AND APPARATUS FOR BLEACHING PULP

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3 Sheets-Sheet 3

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Patented June 9, 1925.

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UNITED STATES PATENT OFFICE.

ALBERT D. MERRILL, OF WATERTOWN, NEW YORK, ASSIGNOR TO THE STEBBINS ENGINEERING & MFG. CO., OF WATERTOWN, NEW YORK, A CORPORATION OF NEW YORK.

METHOD AND APPARATUS FOR BLEACHING PULP.

Application filed March 9, 1925. Serial No. 14,102.

To all whom it may concern:

Be it known that I, ALBERT D. MERRILL, a citizen of the United States, residing at the city of Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Methods and Apparatus for Bleaching Pulp, of which the following is a specification.

The object of my invention is to bleach cellulose and other paper fibres, by method and apparatus which will bleach all the fibres evenly and uniformly by using a minimum amount of bleaching fluid, a less amount of steam, maintaining a quick operation, thus saving time, and operating upon a dense mass of pulp, approximately in plastic mass; all the bleached pulp delivered being of a uniform standard texture, each fibre having strength and vitality.

My method and apparatus can be employed as an independent batch system or as a continuous system.

The salient feature of my system enables me to move the pulp as a dense mass upwardly in a vertical line, allowing the bleaching liquor to thoroughly penetrate and bleach the mass uniformly, thus bleaching all the fibres and each fibre to the desired bleaching effect.

The various features of my invention and their advantages will readily become apparent from reading the following specification.

In the accompanying drawing forming part of this specification:

Fig. 1, is a longitudinal section on the line 1—1 of Fig. 2.

Fig. 2, is a plan view of the apparatus,

Fig. 3, is a plan view of the lower plate or basin only,

Fig. 4, is an enlarged section of the impeller casing and the lower plate or basin, taken on the line 1—1 of Fig. 2, and

Fig. 5, is a section taken on line 5—5 of Fig. 4.

The apparatus for carrying my method into operation consists of an outer cylinder 1, preferably made of concrete and usually lined on its inner surface in an approved manner.

It is cylindrical in shape on the inside, and narrows or is contracted at its mouth 2, at the top, and also at its lower extremity 3, in which end I place the lower plate or basin

4, having a curved rounded out trough shape, said basin carrying vanes 5, radiating outwardly from its center 6, and are preferably shaped as shown in Fig. 3, they may be made separately or integral with the basin 4. I may use as many vanes as I desire and find practical.

The basin 4 and its vanes are preferably not movable and I may use them as found suitable.

On the basin 4, I support an impeller casing 7, through medium of the legs 8, which rest in the recesses 9 in the basin 4.

On the inside of this casing 7, I provide the diagonal spirally inclined vanes 10, there being three in the present instance, although I may use as many as found practical under varying conditions.

At one side of the impeller casing 7, I provide an air duct or passage 12, which passes through one of the legs 8 as shown in Fig. 4, then passes through the basin 2 at the point 13, and then through the concrete base at 15, and at the top of the impeller casing this air passage is formed as an annular compartment, and said compartment is provided with small vents as 17, through which the air can reach the interior and mix with the pulp and bleaching fluid.

On the top of the impeller casing 7 and connected thereto in any desirable way, I provide an uptake 18 which flares upwardly, it being widest at its mouth 19, being somewhat of an inverted truncated cone shape.

The impeller casing and the uptake may be considered as one element and be called an inner cylinder, spaced from the outer cylinder or tank.

At the top of the impeller casing I also provide a number of small guide vanes 20 which assist in a straight-upward travel of the pulp and liquor as it leaves the impeller casing.

The impeller is marked 21, and is of any approved form, however, being shown spiral, the impeller preferably cast with a hub 22, similar to the hub of a pulley, and it is mounted on the shaft 23, which extends downwardly through the basin 4 at its center 6, at which point I provide a stuffing box and gland 24, the shaft then continuing on down to its lower bearing 25.

On the shaft 23, I mount, at its lower extremity, a large gear 26 which is revolved by a drive gear 27 to which motion is imparted in any suitable way, which shaft 23
 5 rotates or revolves the impeller, or this impeller shaft may be connected to a speed transformer of any suitable or desirable design.

At the lower part of the cylinder 1, and
 10 through the concrete, I pass pipes as 28, through which water is admitted to partially dilute the pulp so that it can be dumped, for which purpose I provide a dump valve 29, operated by bevel gear 30, turning the
 15 gear shaft 31 through medium of turn rod 32 extending up to the hand turning wheel 33.

The whole is supported on legs 34 or in any desired way.

20 The impeller casing 7 is preferably of the same diameter throughout and the impeller is of nearly the same extent, allowing for the vanes 10, so that it does not strike said vanes. The convolutions of the impeller
 25 may be of any shape or contour. The vanes 10 in the impeller casing and the vanes 5 in the basin 4 may be of any shape or contour desired or found practicable.

The pulp or cellulose and the bleaching
 30 agent can be placed into receptacle 1 in any desired manner, preferably through the mouth or opening 2, and when properly filled the shaft 23 is put in motion. This revolves or rotates the impeller 21 and thus
 35 the revolving impeller through its convoluted blades carries and forces the pulp upwardly through the impeller casing 7, the pulp and bleaching agent passing up into the uptake and as the pulp passes up
 40 through the uptake 18, it reaches the mouth 19 of said uptake and is forced over the peripheral upper edge of said mouth and falls down by gravity through space 11 between the uptake and the wall of the receptacle or tank 1, dropping onto the bot-
 45 tom and into the basin 4, and between the vanes 5 thereof, filling the whole bottom.

It will be seen that the lower blade 40
 50 of the impeller 21 extends below the impeller casing some distance. The revolving rotary motion given to the pulp by the impeller rotating would be transmitted to the pulp mass, but it is impeded by the vanes 5 in the basin 4, and the mass of pulp and
 55 bleaching agent become a mass surging in vertical radial planes at the bottom of tank, and as the impeller continues to revolve and the heavy pulp continues to fall to the bottom, the mass has no avenue of escape,
 60 except by going up through the impeller casing and as it passes through said impeller casing, the vanes 10 in said casing again retard its tendency for rotation and impede it and again the pulp mixture must
 65 move upwardly in a straight line, which it

does, passing up into the uptake 18 and out of the peripheral mouth thereof to again gravitate to the bottom to again be re-forced upwardly in a straight line.

The vanes 20 assist in keeping the pulp 70 in a straight or vertical line of ascension, and inasmuch as air is forced through the air passage 12 up into the pocket 16 escaping through the vents 17, the upwardly moving pulp is kept in a straight line and
 75 assisted in reaching the top, the air traveling through the pulp and tending to mix the pulp and bleaching liquor.

The stock is kept in circulation in this way until the bleaching action is completed 80 and the bleach liquor exhausted in the batch method, and in the continuous method, the pulp is carried into the other tanks when partially bleached, by means of a worm conveyor at the top of the tanks, or by any
 85 other method, not shown.

It will be understood from the above description that the vanes 5 at the bottom of the tank prevent rotation of the stock in the bottom of the tank, and the vanes 90 10 in the impeller casing prevent the heavy pulp stock from assuming a rotating motion. The vanes 10 are pitched substantially perpendicular to the plane of the periphery of the impeller and are fastened
 95 to or cast integral with the impeller casing. They extend from the bottom of the impeller casing to the top thereof.

The extension of the vanes 10 above the
 100 impeller are pitched at an angle to the vertical, varying between 30 degrees and 80 degrees, depending on the pitch or lead of the impeller and the speed at which the impeller travels, so that the reaction of the stock or pulp forced by the impeller strikes
 105 these vanes 10 and rebounds or reacts in a vertical direction. This agitation thoroughly mixes the pulp and bleaching agent.

It will be noticed from the drawing and it is a fact, that the impeller is raised off
 110 from the floor or bottom of the bleaching tank 1, and should be made as shown, and that the bottom impeller blade should be placed above the extreme bottom of the bleaching tank. However, I do not confine
 115 myself to the exact statements just set forth above as the parts may be varied to suit particular case of pulp bleaching.

It will be readily understood from the above description that the revolving or
 120 rotating impeller has a tendency and does impart a rotary action to the pulp mass at the bottom of the tank or receptacle, however, I employ means for transforming this rotary action and tendency and impart an
 125 upward vertical action to the pulp, negating said rotary action. I also accomplish a more thorough and intimate mixture of the cellulose and bleaching agent thereby.

It may be stated that I provide a method 130

of forcing the pulp off of the impeller by rotary force and against the impeding vanes to force a more intimate mixing of the bleaching agent with the pulp mass.

5 Systems for bleaching dense masses of pulp form agglomerations or nodules of cellulose fibre. In my system this tendency to form nodules is prevented at its source. In some bleaching systems there is a tendency towards hydration of the cellulose fibre, with a consequent loss in fibre, but, due to my method and construction, this hydration is maintained at the lowest possible point.

15 In my method and apparatus I can handle and bleach pulp having a density of from 12 to 25%, but I do not claim this broadly as it has been done for many years, but what I claim is my method and apparatus for handling the pulp and pulp liquor as herein described.

20 Instead of using a basin and vanes at the bottom as herein described, I may form and shape the bottom of the tank or cylinder itself, so that it will do the work of the basin set forth herein.

25 It is perfectly obvious that changes and modifications may be made in my invention without departing from the spirit and principle thereof and I claim all such modifications and changes which will fall within the scope of this specification and claims, which sets forth a preferred method and means, the method and construction herein set forth being a preferred one.

30 What I claim as new and my invention and desire to secure by Letters Patent is:—

1. In pulp bleaching, the method of moving a mass of pulp and bleaching agent by imparting to the bottom of said mass a slight initial rotary movement, then impeding said rotary movement of the mass, and then transforming said rotary moving mass into an upwardly vertical moving mass.

2. In pulp bleaching, the method of moving a mass of pulp and bleaching agent by imparting to the bottom of said mass a tendency to rotate, then impeding said mass in its tendency to rotate, and then transforming said impeded mass into an upwardly vertical moving mass.

3. In pulp bleaching, the method of moving a mass of pulp and bleaching agent by imparting to the bottom of said mass a tendency to rotate, then impeding said mass in its tendency to rotate, and then transforming said impeded mass into an upwardly vertical moving mass, then repeating said method until the pulp mass is partially or entirely bleached.

4. In pulp bleaching, an outer and an inner cylinder spaced apart, means for moving a pulp mass combined with bleaching agent up through the inner cylinder and

allowing said pulp mass to fall over the top thereof and gravitate to the bottom of said outer cylinder, said means for moving said pulp mass upwardly in the inner cylinder being of a rotary character, means at the bottom of said outer cylinder for impeding any rotary action in the pulp mass and forcing it to move up vertically into the inner cylinder and means in the inner cylinder for impeding any rotary action therein of said pulp mass and forcing said pulp mass through said inner cylinder in an upwardly vertical direction.

5. In pulp bleaching, a main tank, an inner uptake tank, arranged centrally within said main tank, said uptake tank provided with an impeller screw and being widest at its top and spaced from the top of the outer tank, and a series of pulp impeding vanes at the bottom of the outer tank.

6. In pulp bleaching, a main tank, an inner uptake tank, arranged centrally within said main tank, said uptake tank provided with an impeller screw and being widest at its top and spaced from the top of the outer tank, a series of pulp impeding vanes in the lower part of the inner uptake tank.

7. In pulp bleaching, a main tank, an inner uptake tank, arranged centrally within said main tank, said uptake tank provided with an impeller screw and being widest at its top and spaced from the top of the outer tank, a series of pulp impeding vanes at the bottom of the outer tank, and a series of pulp impeding vanes in the lower part of the inner uptake tank.

8. In pulp bleaching, a main tank, circular in cross-section, contracting at its upper and lower ends but still retaining a circular form, an inner uptake tank circular in cross-section arranged centrally within said main tank, said uptake tank provided with an impeller screw and being widest at its top and spaced from the top of the outer tank, a series of pulp impeding vanes arranged in said tanks to prevent any rotary action of the pulp mass.

9. In pulp bleaching, a main tank, an inner uptake tank circular in cross-section, arranged centrally within said main tank, said uptake tank formed of an impeller casing and an uptake at the top thereof, said impeller casing provided with an impeller screw and said uptake at the top of said impeller casing extending upwardly and widening until it reaches the widest extent at its mouth and a series of pulp impeding vanes arranged in said tanks to prevent a rotary movement of the pulp.

10. In pulp bleaching, the method of moving a mass of pulp and bleaching agent by imparting to the bottom of said mass a tendency to rotate, then impeding said mass in its tendency to rotate, and then trans-

forming said impeded mass into an upwardly vertical moving mass, moving said mass upwardly to a point and then allowing the same to gravitate downwardly and repeating said actions.

11. In pulp bleaching, the method of moving a mass of pulp and bleaching agent by imparting to the bottom of said mass a tendency to rotate, then impeding said mass in its tendency to rotate and then transforming said impeding mass into an upwardly vertical moving mass, moving said mass upwardly to a point and then allowing the same to gravitate downwardly, and repeating said actions, applying a rotary force to said upwardly vertical moving mass, and at the same time reacting on the mass to keep said mass moving upwardly to provide a thorough mixture of said mass and bleaching agent to prevent the forming of nodules.

12. In pulp bleaching, a main tank, an inner uptake tank, arranged within said main tank and spaced therefrom, said uptake tank provided with an impeller screw and a series of pulp impeding vanes at the bottom of the outer tank, against which the pulp mass is forced when the impeller screw is operating.

13. In pulp bleaching, a main tank, an inner uptake tank, arranged within said main tank and spaced therefrom, said uptake tank provided with an impeller screw, a series of pulp impeding vanes at the bottom of said uptake tank, against which the pulp mass is forced while the impeller screw is operating.

In testimony whereof, I affix my signature at Watertown, New York, this twenty-fifth day of February, 1925.

ALBERT D. MERRILL.