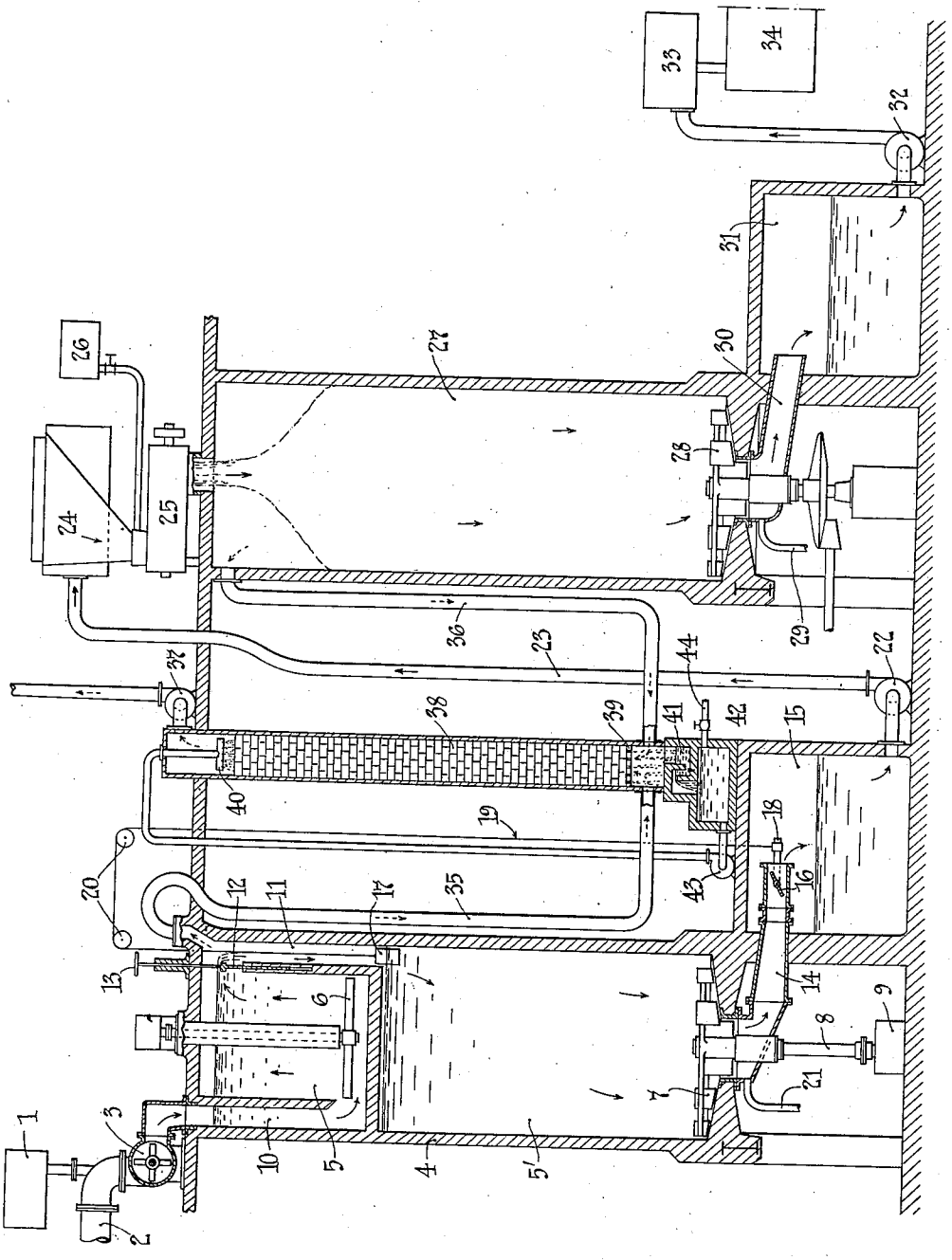
Jan. 29, 1935. C. B. THORNE 1,989,571

METHOD OF AND APPARATUS FOR BLEACHING AND REFINING PULP

Filed May 6, 1932



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Patented Jan. 29, 1935 1,989,571

UNITED STATES PATENT OFFICE

1,989,571

METHOD OF AND APPARATUS FOR BLEACHING AND REFINING PULP

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Application May 6, 1932, Serial No. 609,732

5 Claims. (Cl. 8—2)

This invention relates to methods of and apparatus for bleaching and refining pulp by means of chlorine gas, chlorinated water, or the like.

The invention has for object to provide an improved method of increased efficiency, economy, and safety, and is particularly, though not exclusively, applicable to the treatment of wood pulp. By means of the invention a considerable saving of bleaching medium is effected, and the process is continuous and easily controlled. It enables a gaseous bleaching medium to be used with complete safety; the apparatus requires much less space than ordinary low density bleaching apparatus, the time required for bleaching is greatly reduced, and an improved product is produced.

A further object of the invention is to provide in a process of this character an absorption zone, in which the preliminary absorption period may be varied at will, and provide for the initial penetration of the pulp by the bleaching medium.

Another object is to provide for maximum efficiency in the step of the process involving the treatment of low density pulp.

A still further object of the invention is to provide for the utilization of all the gases of the bleaching medium, avoiding their escape into the plant and at the same time utilizing them to treat and improve the white water so that it may be reused in the process.

The accompanying drawing is a vertical sectional elevation and illustrates diagrammatically, and by way of example, one form of apparatus for carrying the invention into effect, the full line arrows indicating the direction of flow of the pulp and the dotted arrows the gases.

1 indicates a supply of chlorine gas or chlorine water. The low density pulp to be bleached enters the apparatus through the pipe 2 and flows together with a measure quantity of chlorine gas or chlorine water into a mixer 3 where the pulp and bleaching medium are thoroughly mixed. 4 represents a tower provided with an upper chamber 5 and lower chamber 5'. An agitator 6 rotates in the chamber 5 to assist in keeping the fibres in suspension in the liquid. A scraper arm 7 is located at the bottom of the tower 4 and rotates at a very slow speed to assist in the removal of the pulp from the tower. The scraper arm 7 is driven by any suitable means, such as a shaft 8, which is connected to the speed reducer 9.

The pulp which is fed to the mixer 3 is at low density, for example, between 3% and 6%. When it leaves the mixer 3 it flows down a channel 10 into the bottom of the chamber 5 in which it gradually rises and flows over into a channel 11 and so down to the lower chamber 5' of the tower.

Means are preferably provided for controlling the level to which the pulp can rise, and thus the time that the pulp will remain, in the chamber 5. As illustrated, these means comprise a vertically adjustable gate valve or weir 12, controlled, for example, from above by means of a hand wheel 13. The pulp then gradually flows downward in the chamber 5' and flows out through a chute 14 to a tank 15.

It is desirable to keep the level of the pulp in the chamber 5' as nearly constant as possible, and suitable means are provided for this purpose, for example, a valve 16 is placed in the chute 14 and this valve is automatically controlled by a float 17 which is connected to the valve 16 by a weighted arm 18 and a cable 19 guided by pulleys 20. It will be seen that as the level of the pulp in the chamber 5' drops, the float 17 will also drop and thus wholly or partially close the valve 16 and retard the flow of the pulp through the chute 14 and so cause the pulp to rise again in the tower to the desired level.

A pipe 21 is provided through which caustic or any other chemical may be added if desired. The pulp from the tank 15 passes through a pump 22, through a pipe 23 up to a washer and thickener 24 where it is washed and concentrated to a high density of, say, 15% or more. From the thickener the pulp drops down a chute into a mixer 25. Bleach medium from the tank 26 is also fed to the mixer 25 and the pulp and bleaching medium are very intimately mixed before dropping into a high density tower 27. This high density tower may conveniently be of the kind described in applicant's United States Patent No. 1,642,978, dated September 20, 1927.

The pulp gradually descends in the tower 27 to the bottom opening thereof. A scraper arm 28 scrapes the pulp towards the centre opening so that the pulp is discharged uniformly from across the whole diameter of the tower. The pulp is preferably diluted by water from a pipe 29 and is washed out through a spout 30 into a tank 31 from which the pulp is delivered by a pump 32 to a washer 33, and thence to any known system of low density bleaching indicated diagrammatically at 34.

It will be seen that the above describes a three-stage system of bleaching in which the first stage is at low density and the bleaching medium is either chlorine gas or chlorine water. The second stage is at high density using, for example, a hypochlorous or similar bleaching medium.

The third stage is the customary low density system using a hypochlorous or similar bleaching medium. The chemical treatment which takes place in the tank 15 may, if desired, be repeated between the second and third stages by adding a chemical instead of water through the pipe 29. The percentage of the total bleach required which is to be added in each stage will vary according to the quality or grade of final product required and also according to the kind of pulp to be bleached.

One of the difficulties in using chlorine gas as a bleaching medium in a continuous system of bleaching has been the difficulty of confining the gas and therefore making it safe to operate. It will be noticed, however, that, according to the present invention, the chamber 5 forms a perfect seal for the gas and that the system is entirely closed so that there can be no danger from escaping gases. Some gas will, of course, be given off in both the towers 4 and 27 and pipes 35 and 36 are provided to convey these gases to a recovery system. The excess gases which are sucked from the towers and through the recovery system by a fan 37, flow through the pipes 35 and 36 into the bottom of a recovery tower 38. This recovery tower is filled above its perforated false bottom 39 with a filling such as acid resistant glazed tile. At the top of the tower is a spray 40 which sprays water on to the tile. The gases rise in the tower 38 and are absorbed by the water which is trickling down over the tile. The resultant hypochlorous solution flows through a pipe seal 41 into a box 42 from where it is returned to the spray 40 through a pump 43. When the hypochlorous solution has reached the desired concentration, it is bled through a pipe 44 and is led to any desired point of consumption, for instance, to the bleach liquor box 26.

It is advantageous to use the spray "white water" down the tower 38. The white water thus treated is rendered fit for reuse in the mill process due to chlorine gas combining with the slimy ingredients in the white water.

It will also be obvious that the chamber 5 and its associated parts need not necessarily be placed in the tower 4, but may be constructed as a separate unit located at any convenient point, so long as the passage 11 communicates with the lower chamber 5'.

It will be understood that the steps in the process can be varied if desired in order to suit the particular conditions required by certain classes of pulps. For instance, the high density stage may be used first followed by the low density using chlorine gas or chlorine water and then followed by the customary low density bleaching or any other combination of the various stages may be used without departing from the invention.

I claim:

1. A method of bleaching pulp in at least two stages, the first of which is an absorption stage in which a mixture of low density pulp and a bleaching medium is fed into the lower end of a closed absorption zone, maintaining the mixture in said zone for a predetermined period of time to permit absorption by the pulp of the bleaching medium, gently agitating the mixture substantially only adjacent the bottom of said zone to avoid segregation of fibre and to maintain the upper portion of said mixture in a substantially unagitated state, and in the second stage discharging the mixture into a reaction zone, maintaining the mixture therein in a quiescent state for a predetermined period of time and then dischargng the same from said reaction zone.

2. A continuous two-stage method of bleaching low density pulp which comprises feeding a mixture of said pulp and a bleaching agent into the lower end of an absorption zone, closed to the atmosphere, so as to avoid agitation of the upper portion of the mass in said zone, maintaining the bulk of said mass in a substantially unagitated state to avoid escape of the bleaching medium, permitting the mass to continuously flow from the upper portion of said absorption zone into the top of a reaction zone, closed to the atmosphere, and continuously discharging the mass from the bottom of said reaction zone.

3. A method as defined in claim 2, wherein the periods of absorption and reaction are both controlled by the rate of feed to the bottom of said absorption zone and wherein the period of absorption is varied by changing the depth of said absorption zone.

4. Apparatus for bleaching pulp comprising, in combination a mixer for pulp and bleaching agent, a chamber providing a substantially quiescent absorption zone and a second chamber providing a quiescent reaction zone, both said zones being closed to the atmosphere, a conduit for feeding a mixture of pulp and bleaching agent from said mixer to the bottom of said absorption zone, a variable reaction weir, adjacent the top of said discharge zone, for feeding said mixture directly to the upper portion of the reaction zone, a discharge outlet in the bottom of said reaction zone and means in each of said zones, operative adjacent their bottoms only, for preventing undue segregation or accumulation of fibre at the bottoms of said chambers.

5. Apparatus for bleaching pulp comprising a mixer for pulp and bleaching agent, a bleaching chamber including an absorption zone in its upper end and a reaction zone in its lower end, a conduit leading from said mixer into near the bottom of said absorption zone, said mixer discharging through said conduit into the bottom of said absorption zone which is provided with an outlet at its top, a second conduit connecting said outlet with the upper part of said reaction zone and adapted for discharging into the top of said reaction zone and means for preventing accumulation of fibre in the bottom of each of said zones.

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