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APPARATUS FOR PRESOAKING LIGNO-CELLULOSE MATERIAL

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3 Claims. (Cl. 92—7)

This invention relates to an apparatus for and method of producing pulp for paper products from fibrous ligno-cellulose material, and which includes the subjection of the material to soaking in a chemical solution in the presence of steam, followed by the known mechanical defibration process.

According to the improved method and apparatus, the ligno-cellulose, after having been reduced to chips of suitable size, is introduced into a heated, steam-filled hopper from which the chips are fed at a predetermined and controlled rate of feed into a tank containing the required chemical or liquor and steam. The tank contains a lengthy, vertically arranged, cylindrical stack in which a vertical, spiral elevating feeder is rotated at a relatively high rate of speed. The saturated chips enter through an opening in the lower part of the stack and are carried upwardly by the feeder to a point outside of the tank and well above the top of the same. An outlet tube, connected at the top to the upper portion of the stack, and connected at its lower end to a pre-heater of known construction, conveys the stock from the interior of the stack into the interior of the pre-heater, which pre-heats the stock for a predetermined period, and then transfers the same to a defibrator in which defibration of the material is mechanically performed so that the material is discharged from the apparatus in the form of pulp.

In order to maintain the stock in the pre-heater for the requisite period of time, as well as retaining it in the tank for a predetermined soaking period, it is desirable that the flow of material into the tank as well as out of the same and into the pre-heater be controlled or regulated so that the flow of such material will be a continuous and uniform one. It is therefore one of the important objects of the present invention to provide a means and method by which uniformity of feed of the material from the inlet of the apparatus to its emergence therefrom shall be had.

It is another object of the invention to provide an apparatus by means of which a thorough soaking or impregnation of the chips by the liquor will be had; by means of which there shall be a continuous flow of the stock to the pre-heater and by means of which a control over the rate of flow shall be effectively had.

With these and other objects to be set forth in view, I have devised the arrangement of parts to be described and more particularly pointed out in the claims appended hereto.

In the accompanying drawing, wherein an illustrative embodiment of the invention is disclosed, Fig. 1 is a side elevation, with parts in section and parts broken away, of an apparatus for carrying out the method herein described, and

Fig. 2 is a sectional view, taken substantially on the line 2—2 of Fig. 1, looking in the direction of the arrows.

Referring to the drawing, 10 indicates a chip bin or hopper into which the chips are fed from a stack 11 having a lower foraminous or perforated part 12 extending down into the hopper and, because of its perforated nature, permitting penetration of steam through it to reach the

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chips. The upper portion of the stack 11 is closed by a lid 13 from which a vent pipe 14 extends. The supply pipe or conduit is shown at 15 and the same delivers the stock 16 into the stack 11, and from which the stock falls down into the hopper 10. Steam under pressure is delivered into the hopper 10 by means of the pipe 17 which extends from the receiving end of a pre-heater and rotary feeder, generally indicated at 18.

At the lower or outlet end of the hopper 10 is provided a metering device 19 of rotative type which feeds and controls the flow of the stock into a tank 20 located below the metering device. The operation of the metering device is controlled by a controlling device 21 to thereby insure regularity of flow of the stock into the tank in required quantity. A vertical partition 22 divides the upper portion of the interior of the tank into two sections to separate the inflowing material from that which is returned from a feed stack indicated at 23 and which will be presently described.

Contained within the tank 20 and preferably maintained at a predetermined level therein is the liquor or chemical solution 24 employed in the treatment of the chips, a gauge 25 being used for the purpose of maintaining the liquor at the desired level. The liquid is delivered to the tank 20 from a storage tank 26 from which a pipe 27 extends and communicates with a pump 28. A valve 29 is employed in the pipe 27 to control the flow from the tank 26. The outlet of the pump 28 is connected to a heat exchange unit such as a heating coil 31 which connects with a pipe 30 having its upper end connected into the housing of the metering device 19. The rotor of the metering device is driven by an electric motor 32, the operation of which is regulated by the controlling device 21.

At the lower end of the tank 20 is provided a strainer 33 which is connected by the pipe 34 to the pump 28. The arrangement of piping just described, and including the pump 28, heat exchanger 31, tank 26 and strainer 34 is such that a circulation of the liquor from the tank 20 to the metering device 19 is constant and uniform, with the liquor retained at a predetermined level in the tank 20 and at a desired temperature.

Located vertically within the tank 20 and having an upper portion rising above the top of the tank, is the cylindrical, lengthy feed stack 23 containing a spiral feeder 36 operative on a vertical axis. Said feeder 36 is rotative at a relatively high speed, such as approximately 150 R. P. M. and acts to lift or elevate the liquor-saturated stock out of the tank 20 for delivery into the angularly-extending tube 37 having its upper end connected to the stack 23 above the tank 20 and its lower end in communication with the interior of the inlet 38 of the pre-heater 18. The inlet 38 may contain a vertical rotary feeder which delivers the stock into the pre-heater 18, the latter also containing a rotary feeder. The stock is heated in the pre-heater for a predetermined period of time and is delivered through the outlet end 39 of the same to the defibrator 40.

A portion of the stack 23 is perforated or foraminous as indicated at 41, such portion of the stack being preferably located above the liquor-level in the tank 20, and terminating inside of the tank below the top of the same. As the stock is carried upwardly in the stack by the rotary feeder 36 therein, the liquor will drain out through the perforated area 41 of the stack to descend into the tank.

The delivery tube 37 has its upper end in communication with the interior of the stack 23 at a point above the top of the tank 20 and as the stock is carried upwardly most of the stock will be delivered through the tube 37 to the inlet 38 of the pre-heater 18. Any portion of the stock that is carried upwardly past the tube

37 will be received by a return tube 42 which has its lower end entering into the tank 20.

From the foregoing, the operation of the improved structure and method will be readily understood. The chips or stock 16 are delivered into the hopper 10 by way of the supply pipe or conduit 15 and stack 11. Steam is delivered under pressure into the hopper 10 by the pipe 17, and a pipe 44 extends between the hopper 10 and the tank 20 to distribute the steam uniformly in both the hopper and tank. The metering device or feeder 19 delivers the stock at a predetermined rate into the tank 20 to the left of the baffle or partition 22 which separates the incoming stock from that which is returned from the elevating feeder 36 by way of the return pipe 42. The metering device or feeder 19 is controlled by the device 21 so that the feed of stock into the tank 20 is uniform and at a desired rate.

The stock thus delivered into the tank 20 descends into the liquor 24 and is impregnated thereby, and at the bottom of the tank the saturated stock is picked up through the opening 45 in the stack 23, by means of the vertical elevating feeder 36 and is carried upwardly. Drainage of the liquor out of the stack 23 is had through the perforated or foraminous area 41 which allows the liquor thus drained to descend into the tank 20. The stock thus carried upwardly is caused to descend through the delivery tube 37 to reach the inlet 38 in which suitable feeding means such as a vertical spiral feeder, causes the stock to be fed into the pre-heater and feeder combination 18 of known construction, which is heated and supplied with steam by the piping indicated at 45. Any stock passing the tube 37 will be caused to descend through the return pipe 42 and will fall down into the tank 20 for re-circulation. The stock which has passed through the preheater will be delivered through the outlet 39 thereof and into the defibrator 40 in the known manner.

A feature of the present invention resides in the means by which regulation of the flow of material or stock into and out of the apparatus is assured. This is attained by control of the inflow through the metering device or feeder 19 and a regular output through the use of a substantially tall or long vertical feeder which elevates the stock and causes it to then descend into the preheater. Thus, the flow of stock into the preheater to attain predetermined heating time is easily regulated and a uniformity of product is attained.

Having described one embodiment of the invention, it is obvious that the same is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. An apparatus for presoaking of ligno-cellulose material in the production of pulp which comprises a closed tank adapted to contain a chemical solution, a substantially closed feed hopper for said material disposed above said tank, a metering device interposed between the hopper and the tank for regulating the flow of material from the hopper into the tank, means for supplying steam under pressure into contact with the material in the hopper, pipe means extending between the hopper and the tank for uniformly distributing steam to both the hopper and tank, a stack disposed within the tank with the lower end thereof communicating with the lower portion of said tank to receive treated material, the upper portion of said stack extending through and above the top of said tank, said stack having an intermediate foraminous portion below the top of said tank to provide direct drainage from the stack into the tank, a material delivery tube communicating with the upper portion of the stack outside of said tank, conveying means within said stack for elevating treated material to the delivery tube, and a baffle disposed within the tank between the metering device and the intermediate portion of said stack to direct the material downwardly toward the lower portion of said tank and the lower end of the stack.

2. An apparatus according to claim 1 in which a return tube extends from the upper portion of the stack above the delivery tube to the tank, and the baffle is disposed between the metering device and said return tube.

3. An apparatus according to claim 2 in which pipe and conduit means are provided for circulating solution from the bottom of said tank to the metering device.

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