

July 16, 1935.

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2,008,603

APPARATUS FOR REFINING PULP AND THE LIKE

Filed Sept. 21, 1931

2 Sheets-Sheet 1

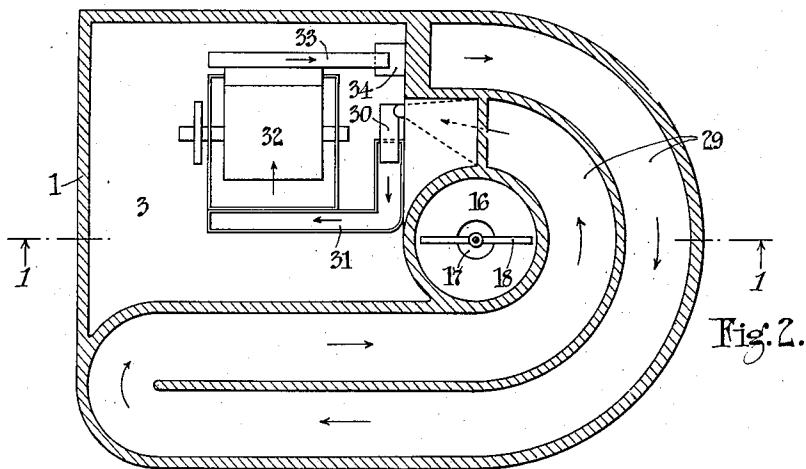


Fig. 2.

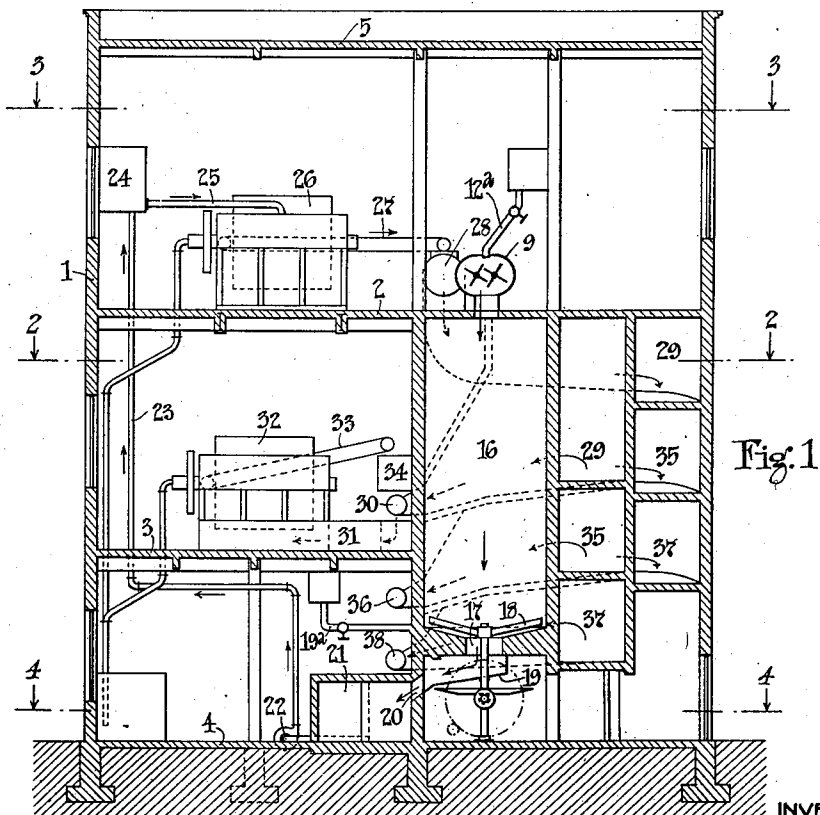


Fig. 1.

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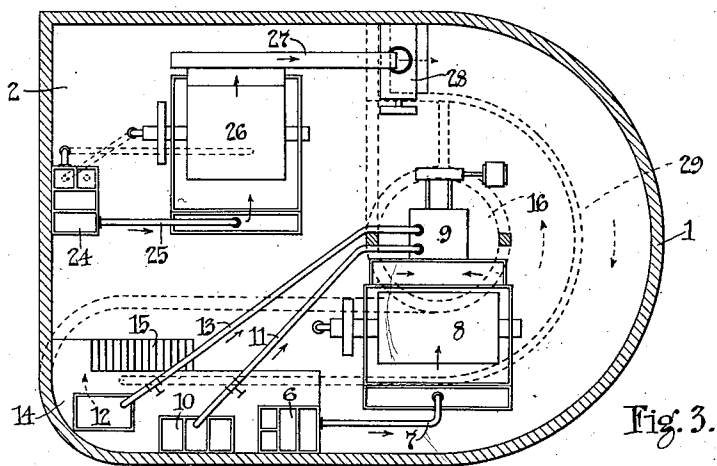


Fig. 3.

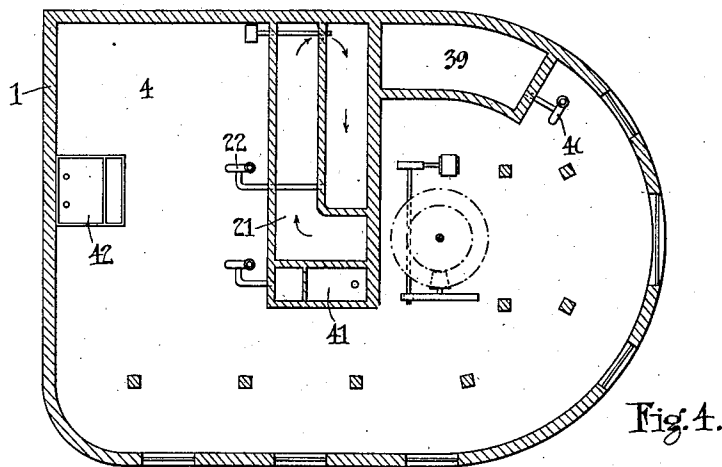


Fig. 4.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR REFINING PULP AND
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Application September 21, 1931, Serial No. 564,198

4 Claims. (Cl. 8—2)

This invention relates to apparatus for refining paper pulp or other material, and more particularly has for object to provide apparatus suitable for carrying out the refining method described in applicant's application No. 564,197, now abandoned filed on even date herewith. This co-pending application describes a method whereby pulp or the like is refined in an improved manner, hydrolysis being avoided by substantially eliminating agitation, and segregation of the suspended fibre being eliminated by avoiding the use of deep tanks for the low density material. The term "low density" is intended to refer to material of a density not in excess of 15%, although this percentage may vary with the character of the pulp.

In order to overcome the segregation of the fibre from low density pulps the common practice has been to provide agitators in the usual refining chamber. This agitation is disadvantageous from the point of view of power consumed and the cost of upkeep of the apparatus, as well as on account of its effect on the pulp, causing hydrolysis of the cellulose with the known losses incident thereto. The essential feature of this invention is directed to overcoming these difficulties, and it will be observed that the low density refining apparatus provided operates with ease and at the same time overcomes the disadvantages incident to segregation of the fibre and agitation. Moreover, initial as well as maintenance charges of this apparatus effect substantial economies in refining operations.

While the apparatus is adapted generally for the refinement of pulp where more or less prolonged contact of the latter with a reagent is required, it will be described with particular reference to the bleaching of pulp.

According to the present invention a relatively long, downwardly inclined conduit or passage is provided along which a shallow layer of mixed low density pulp and bleaching medium is allowed to flow by gravity. Deep masses of low density pulp are thus not formed so that segregation of the pulp is avoided without the need for agitation.

Mixers are provided at the inlet end of each low density conduit and discharge regulators at the outlet end; and these mixers and regulators are such as will avoid any substantial agitation of the pulp.

The invention consists in the combination and arrangement of parts hereinafter described and more particularly pointed out in the appended claims.

Referring now to the accompanying drawings which illustrate diagrammatically and by way of example, one convenient form of the invention:—

Figure 1 is a vertical cross section on the line 1—1 of Figure 2, and

Figures 2, 3 and 4 are plan views in section substantially on the lines 2—2, 3—3, and 4—4 respectively of Figure 1.

According to the illustrated form the invention comprises a building having walls 1, floors 2, 3 and 4 and a roof 5.

Above the top floor 2 is provided a flow box 6 to contain a supply of the pulp or other material to be bleached. The box 6 is connected by a pipe 7 to a density regulator 8 which is arranged to discharge into a mixer 9. A vessel 10 containing a supply of bleaching medium is connected by a pipe 11 to the mixer 9, and a container 12 for hot water may be similarly connected to the mixer by a pipe 13.

The containers 6, 10 and 12 (see Figure 3) may be conveniently arranged on an elevated platform 14 reached by stairs 15 from the top floor 2.

Beneath the mixer 9 is built a cylindrical, high density bleaching tower 16 having a discharge opening 17 at the bottom thereof. A device 18 is provided adjacent the bottom of the tower 16 to facilitate and regulate the discharge of the pulp through opening 17 without subjecting the pulp to any substantial agitation. A chute 19 and orifice 20 connect the opening 17 with a tank 21.

A pump 22 has its inlet connected with the tank 21 and its discharge connected by a pipe 23 to a tank 24 mounted above the top floor 2.

The tank 24 is connected by a pipe 25 to a washer and density regulator 26 arranged to discharge on to a belt conveyor 27 which discharges into a mixer 28.

The mixer discharges into the upper end of a long, relatively shallow, inclined low density bleaching conduit 29 which is preferably so constructed as to follow a tortuous path for the purpose of economizing floor space. As illustrated, the conduit is, at one end, semicircular in plan, and connected with parallel, straight portions, which in turn communicate with a semicircular portion of smaller diameter surrounding the tower 16. The conduit 29 discharges through a regulator 30 into a trough 31 which in turn communicates with a pulp washer 32 mounted on the floor 3 and arranged to discharge on to a conveyor 33. The conveyor discharges into a mixer 34 which in turn discharges into a conduit 35 which, in the illustrated form of the invention, is identical with

the conduit 29 and built immediately underneath it.

The conduit 35 discharges through a regulator 36 (and, if necessary, another washer, not shown) into a third low density bleaching conduit 37, also identical with the conduits 29 and 35. The conduit 37 discharges through a regulator 38 into a storage chest or tank 39 on the ground floor 4, Figure 4, from which the pulp may be conveyed by a pump 40 to any desired place for further treatment.

The numeral 41, Figure 4, indicates a seal box for the water leg of the density regulator 8 and a similar seal box 42 may, if necessary, be provided for the water leg of the washers 26 and 32.

It will be understood that the drawings are diagrammatic in character as the individual units of the apparatus, such as the washers, mixers and regulators, are of known construction. Also means may be provided for introducing any suitable kind of bleaching medium into the mixers after any of the various stages.

The arrangement and shape of the low density bleaching conduits may also be modified in a great number of ways without departing from the invention, the only essential requirement being that they shall be such as to permit the pulp to flow down gradually by gravity alone in a comparatively shallow layer so as to avoid segregation of the fibres.

The operation of the illustrated form of the apparatus is as follows:—Material flows from the box 6 through the pipe 7 into the density regulator 8 wherein the material is brought to a relatively high density, for example 20% or higher. The pulp is then continuously discharged into the mixer 9 wherein it is mixed with bleaching agent from tank 10, and if desired with hot water from tank 12. The pulp drops from the mixer 9 into the high density bleaching tower 16 through which it passes by gravity.

The device 18 is rotated slowly to regulate the flow of the material through the outlet 17 without any substantial agitation.

The pulp then flows through the orifice 20 and into the tank 21 from which it is pumped up into the tank 24. From the tank 24 the pulp flows to the washer and density regulator 26 in which the pulp is reduced to a low density. The pulp is next carried by the conveyor 27 to the mixer 28 into which bleaching medium may be introduced. From the mixer 28 the pulp flows in a relatively shallow layer along the downwardly inclined floor of conduit 29. The regulator 30 controls the discharge of the pulp from conduit 29 without exerting substantial force or agitation on the pulp.

The pulp is next washed in washer 32 and carried by conveyor 33 to the mixer 34 where further bleaching medium may be introduced, and is then permitted to flow by gravity along conduit 35 to the regulator 36 and finally through conduit 37 to the regulator 38 and into the storage tank 39.

A reagent may be added to the pulp after the final or any stage of bleaching with a view to removing or neutralizing reaction products formed during the bleaching operation, or for the purpose of absorbing excess bleaching agent. Such reagent may be milk of lime, caustic solution or the like. Means for the introduction of

such reagent is illustrated by the pipe 19a discharging into the chute 19 at the bottom of the tower 16. Similar means may be provided for the introduction of the reagent after any other bleaching stage or after any number of them, as desired.

Instead of, or in addition to, introducing hot water from the tank 12 for facilitating the bleaching action, air, steam or any other desirable fluid temperature regulating medium may be employed. Air has the advantage of not diluting the bleaching solution. Means for this purpose are illustrated by the pipe 12a discharging into the mixer 9. Similar means may be provided for the introduction of such heating medium at the point of introduction of additional bleaching agent or otherwise, as desired. It may be introduced at the regulators 30 and 36. If the temperature of the pulp in the stage just concluded is too high for most efficiency in the succeeding stage, a cooling medium is used, and if it is too low, a heating medium.

The specific series of operations just described may, of course, be varied in any desired manner to suit the needs of different kinds of pulp, and any of the stages may be by-passed or omitted or further stages added. Also the apparatus can be readily modified to omit the high density stage or to arrange it after the low density stage or stages.

A suitable mixer is described in applicant's prior United States Patent No. 1,767,102.

While the apparatus has been described with particular reference to the bleaching of cellulose pulp it may be equally well applied to the bleaching of other similar materials.

The operation of the apparatus as applied to the refinement of pulp, by other than bleaching reagents, will be readily understood from the particular description given with respect to bleaching.

I claim:

1. Apparatus for bleaching low density pulp comprising means for mixing bleaching agent with said pulp, a long shallow conduit through which said mixture may flow by gravity, said conduit being interrupted at one or more points in its length, and a flow regulator at each of said points to control the flow and renew intimate and uniform mixture of solid and liquid portions of said pulp.

2. Apparatus as defined in claim 1 having means for washing said pulp associated with said flow regulators.

3. Apparatus as defined in claim 1 having means for washing said pulp and means for adding to the washed pulp bleaching agent both said means being associated with said regulators.

4. Apparatus for combined high density and low density bleaching of pulp comprising in combination means for mixing bleaching agent with high density pulp, a high density bleaching tower, discharge means therefor, means for regulating the density of said discharged pulp, a long shallow low density bleaching conduit arranged in communicating sections about said tower and a pulp-flow regulator for intimately mixing the pulp as it flows from each of said sections to the next.

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