

June 16, 1953

E. A. ELLIS
PAPER STOCK PULPER

2,641,971

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2 Sheets-Sheet 1

FIG. 1.

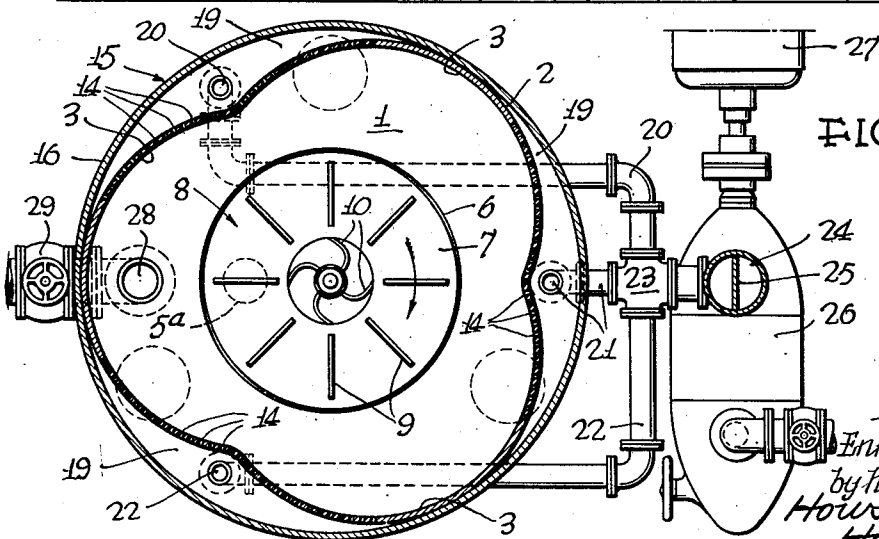
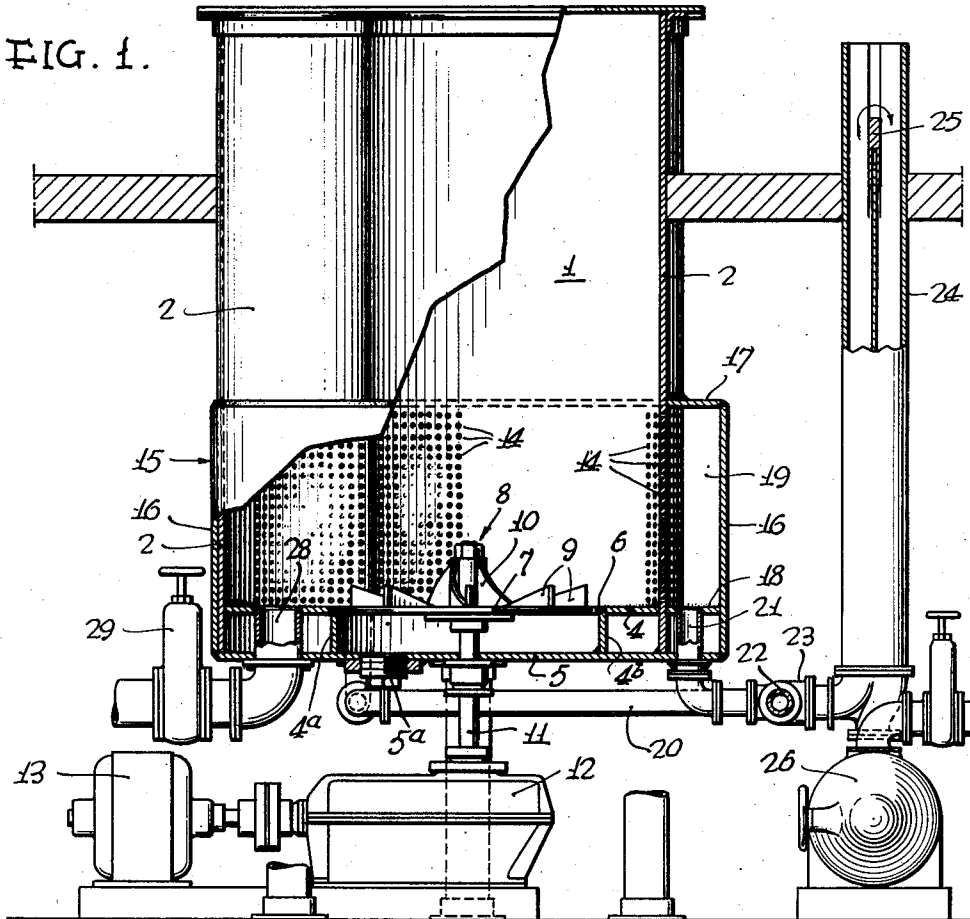


FIG. 2.

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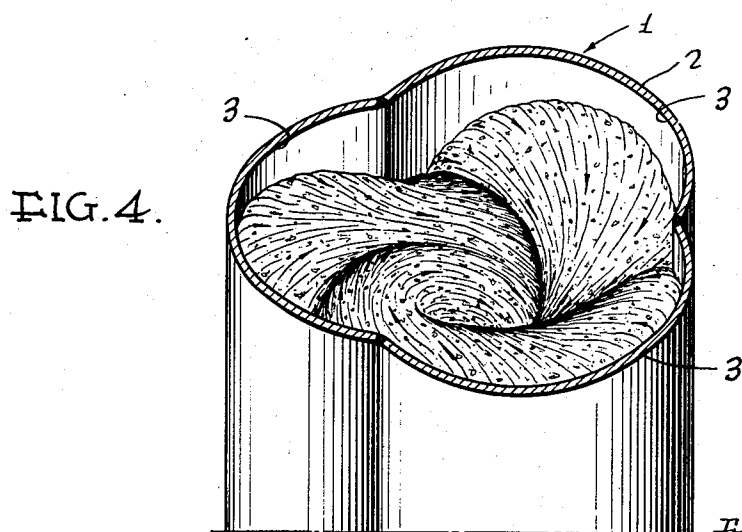
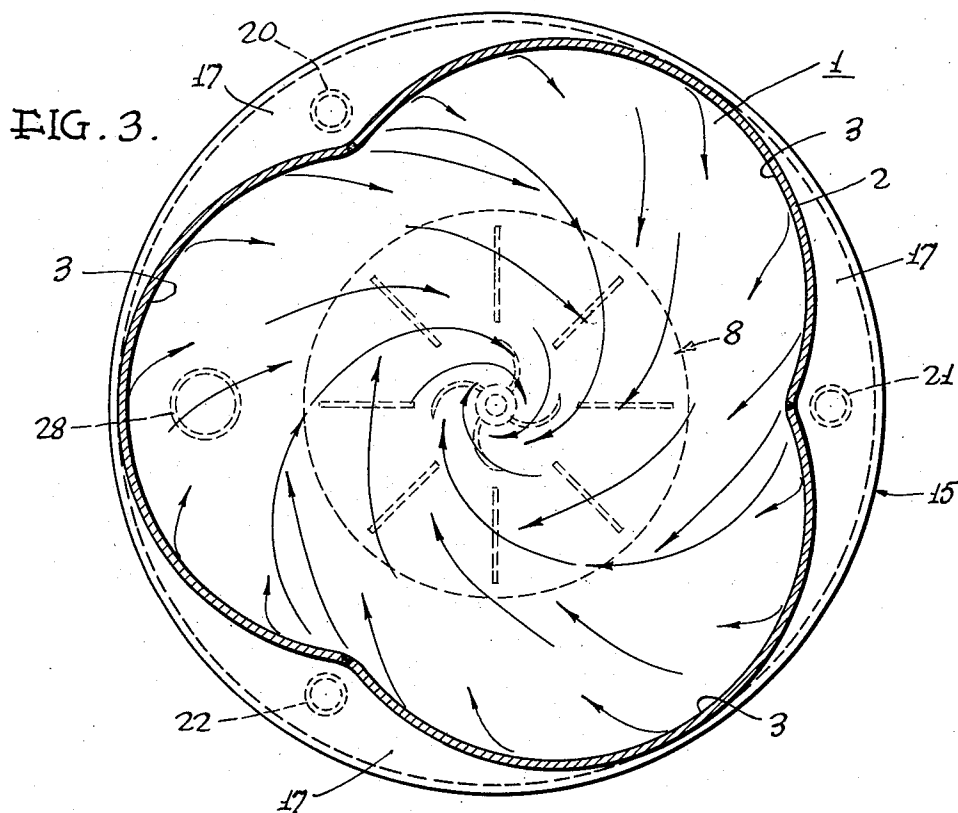
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PAPER STOCK PULPER

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7 Claims. (Cl. 92-23)

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This invention relates to new and useful improvements in apparatus for treating fibrous paper stock material, and more particularly to apparatus for pulping and extracting material used in the manufacture of paper.

The principal object of the present invention is to provide apparatus of the stated type which is characterized by its fibre liberating action and is devoid of dead spots for the accumulation of material.

Another object of the present invention is to provide a fibre treating apparatus as set forth which has a rapid pulping action and produces maximum fibre separation with a minimum of fibre hydration.

A further object of the present invention is to provide novel pulping apparatus as set forth which embodies a novel construction and arrangement of tank or vessel in which the fibrous material is treated.

Still a further object of the invention is to provide novel apparatus having the features and characteristics set forth which is of relatively simplified construction, is comparatively inexpensive to manufacture and is highly efficient and effective in operation and use.

These and other objects of the invention and the various features and details of the construction and operation thereof, are hereinafter fully set forth and described with reference to the accompanying drawings, in which:

Fig. 1 is a side elevational view partially in section of apparatus made according to the present invention;

Fig. 2 is a sectional view of the apparatus; and

Figs. 3 and 4 are plan and perspective views, respectively, illustrating the action that takes place.

Referring now more particularly to the drawings, apparatus for treating fibrous material made according to the present invention comprises a tank or vat 1 the side wall 2 of which is vertical and includes three or more concave lobes or flutes 3 spaced about the axis of the tank. The lobular side wall of the tank may be vertical, as shown in Fig. 1. The tank 1 is provided with a flat bottom 4 and may be provided with a sub-bottom 5 spaced parallel to and below the bottom 4 as shown. The bottom members 4 and 5 are interconnected and braced as indicated at 4a and 4b, and the bottom 5 is provided with a removable plug 5a for cleaning out the space between the bottom members.

In the illustrated embodiment of the invention, the bottom 4 of the tank is provided coaxially

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thereof with a relatively large circular opening 6 and within this opening there is rotationally mounted the plate portion 7 of an impeller 8 having outer and inner sets of blades or vanes 9 and 10, respectively. The impeller 8 is fixed upon the upper end portion of a vertically extending shaft 11 which is rotationally driven by a reduction gear unit 12. The unit 12 may be driven by a motor 13. The outer blades 9 of the impeller 8 are straight and extend radially of the plate 7 at equally spaced intervals thereabout. As shown, these blades 9 gradually increase in height outwardly from the axis of the impeller. On the other hand, the blades 10 of the inner set are arranged substantially spirally of the axis and decrease in height outwardly therefrom. It will be obvious, of course, that other blade arrangements and configurations may be employed as desired.

In accordance with the present invention, the lower portion of the adjacent lobes 3, from the bottom 4 to a predetermined height thereabove, are provided with openings 14 therein through which the treated fibrous material is extracted. The size and number of the openings 14 provided in any given instance will depend upon the nature of the stock treated and the fineness of the pulp that it is desired to produce.

Surrounding the exterior of the lower portion of the tank 1 to a height just above the extraction openings 14 therein is a cylindrical housing 15 comprising an outer vertical wall member 16, a top member 17 and an inner bottom member 18, the said outer wall member 16 extending downwardly entirely to the edge of the so-called sub-bottom 5 of the tank. The housing 15 cooperates with the tank wall 2 to provide outwardly of the openings 14 suitable extraction chambers 19 into which the treated stock is extracted from the tank 1 through said openings.

Stock extracted from the tank 1 into the chambers 19 is conveyed by means of suitable pipes 20, 21 and 22 to a common connection 23 at the lower end of a stand-pipe 24. The stand-pipe is disposed vertically adjacent the tank 1, and is divided diametrically by a dam or partition 25 over which the extracted stock is adapted to flow and then pass down the other side of the pipe 24 to the intake of a suitable stock refiner 26 driven by a motor 27. In lieu of the refiner 26 the extracted stock may be admitted directly to a chest, thickener or other stock treating device. The height of the dam 25 is adjustable with relation to the level of the stock in the tank and by regulating the height of the dam the rate or speed of

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extraction of the stock may be controlled so that the pulper may be operated and stock fed thereto and extracted as a continuous process with adequate control of the rate of discharge and hence the length of treatment afforded the stock.

The concave lobes 3 of the tank side wall 2 may be of the same uniform arcuate cross-sectional configuration being defined by the arcs of circles of selected radius or may, for example, have a non-uniform cross-sectional curvature. In operation, the rotation of the impeller 8 causes the material to be forced outward and upward and the lobes 3 cause it to be directed inward again and returned to the impeller; for example, as indicated in Figs. 3 and 4 of the drawings. Due to the deflecting action of the side wall lobes 3 which directs the material again and again back to the impeller 8, the impeller produces the maximum possible fibre liberation and mixing effect upon the material undergoing treatment so that a minimum of time is required for the necessary pulping action to take place.

In the continuous operation of the apparatus, particularly where waste paper is to be defibred, it is desirable to provide for the continuous removal of the trash which is always present in waste paper as supplied to the mill. For the removal of heavy materials, the apparatus may be provided with a suitable form of the usual trash chute (not shown) and for the removal of lighter trash materials a suitable ragger (not shown) is provided.

In the case of batch operation, the action of the impeller 8 and lobes 3 upon the material is the same as described. However, the openings 14 in the tank side wall 2 may be eliminated thus providing a solid wall, and the entire batch of material, after treatment is completed, may be withdrawn from the bottom of the tank 1 through a suitable outlet such as indicated at 28 and controlled by a valve 29.

From the foregoing it will be observed that the present invention provides novel fibre treating apparatus which is characterized by its superior fibre liberation and is devoid of dead spots in which the material can accumulate. The invention also provides apparatus as set forth which has a rapid pulping action and produces maximum fibre separation with a minimum of fibre hydration. Furthermore, the apparatus of the present invention embodies a relatively simplified construction, is comparatively inexpensive to manufacture and is highly efficient and effective in operation and use.

While a particular embodiment of the invention has been illustrated and described herein, it is not intended to limit the invention to such disclosure, and changes and modifications may be made therein and thereto within the scope of the following claims.

I claim:

1. Apparatus for treating fibrous paper stock material comprising a tank having a flat bottom and a vertical side wall provided with at least three upwardly extending concave lobes arranged uniformly with respect to the axis of the tank, a rotary impeller mounted in the bottom of the tank for rotation axially thereof, and means for withdrawing treated material from said tank.

2. Apparatus for treating fibrous paper stock material comprising a tank having a flat bottom and a vertical side wall provided with at least three upwardly extending concave lobes arranged uniformly with respect to the axis of the

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tank, the lobes of the tank being arcs of circles of a predetermined radius, a rotary impeller mounted in the bottom of the tank for rotation axially thereof, and means for withdrawing treated material from said tank.

3. Apparatus for treating fibrous paper stock material comprising a tank having a flat bottom and a vertical side wall formed of at least three upwardly extending arcuate lobes arranged uniformly about the axis of the tank, the lobes of the tank each being the arc of a circle of selected radius, a rotary impeller having outer and inner sets of blades mounted in the bottom of the tank for rotation axially thereof, and means for withdrawing treated material from said tank.

4. Apparatus for treating fibrous paper stock material comprising a tank having a flat bottom and a vertical side wall provided with at least three upwardly extending concave lobes arranged uniformly with respect to the axis of the tank, the lobes of the tank each having a plurality of small openings in the lower portion thereof for extraction of treated material therethrough, a rotary impeller mounted in the bottom of the tank for rotation axially thereof, means exteriorly of the tank outwardly adjacent the area of said extraction openings therein and providing in cooperation with the tank a plurality of extraction chambers for receiving the treated material, and means for withdrawing the treated material from said extraction chambers.

5. Apparatus for treating fibrous paper stock material comprising a tank having a flat bottom and a vertical side wall provided with at least three upwardly extending concave lobes arranged uniformly with respect to the axis of the tank, the lobes of the tank being arcs of circles of selected radius and each having a plurality of small openings in the lower portion thereof for extraction of treated material therethrough, a rotary impeller mounted in the bottom of the tank for rotation axially thereof, means surrounding the tank outwardly adjacent the area of said extraction openings therein and providing in cooperation with the tank a plurality of extraction chambers for receiving the treated material, and means for withdrawing the treated material from said extraction chambers.

6. Apparatus for treating fibrous paper stock material comprising a tank having a flat bottom and a vertical side wall constituted of a succession of at least three upwardly extending concave lobes arranged uniformly with respect to the axis of the tank, the lobes of the tank each having a plurality of small openings in the lower portion thereof for extraction of treated material therethrough, a rotary impeller having outer and inner sets of blades mounted in the bottom of the tank for rotation axially thereof, a housing exteriorly of the tank outwardly adjacent the area of said extraction openings therein and providing in cooperation with the tank a plurality of extraction chambers for receiving the treated material, and means for withdrawing the treated material from said extraction chambers.

7. Apparatus for treating fibrous paper stock material comprising a tank having a flat bottom and a vertical side wall provided with at least three upwardly extending arcuate lobes arranged uniformly with respect to the axis of the tank, the lobes of the tank being the arcs of circles of selected radius and each having a plurality of small openings in the lower portion thereof for extraction of treated material there-

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through, a rotary impeller having outer and inner sets of blades mounted in the bottom of the tank for rotation axially thereof, a structure exteriorly of the tank outwardly adjacent the area of said extraction openings therein and providing in cooperation with the tank a plurality of extraction chambers for receiving the treated material, and means for withdrawing the treated material from said extraction chambers.

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