July 29, 1947. H. D. WELLS 2,424,726

PULP BEATER AND SELECTOR

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FIG. 1.

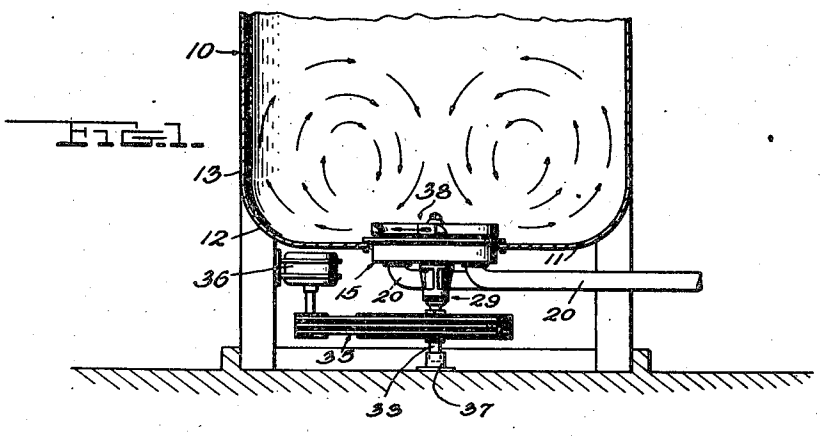


FIG. 2.

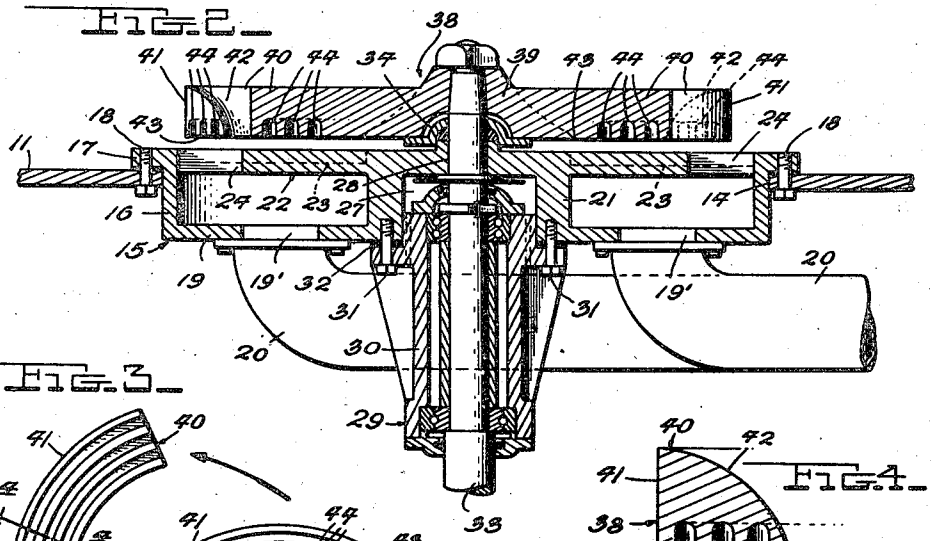


FIG. 3.

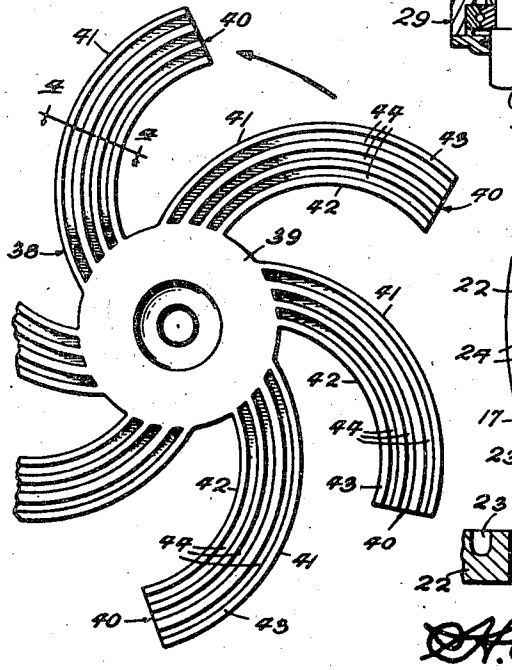


FIG. 4.

FIG. 5.

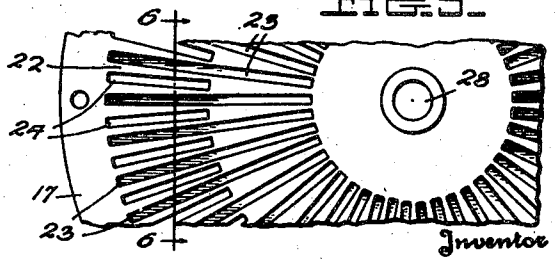
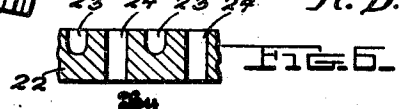


FIG. 6.



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FIG. 7

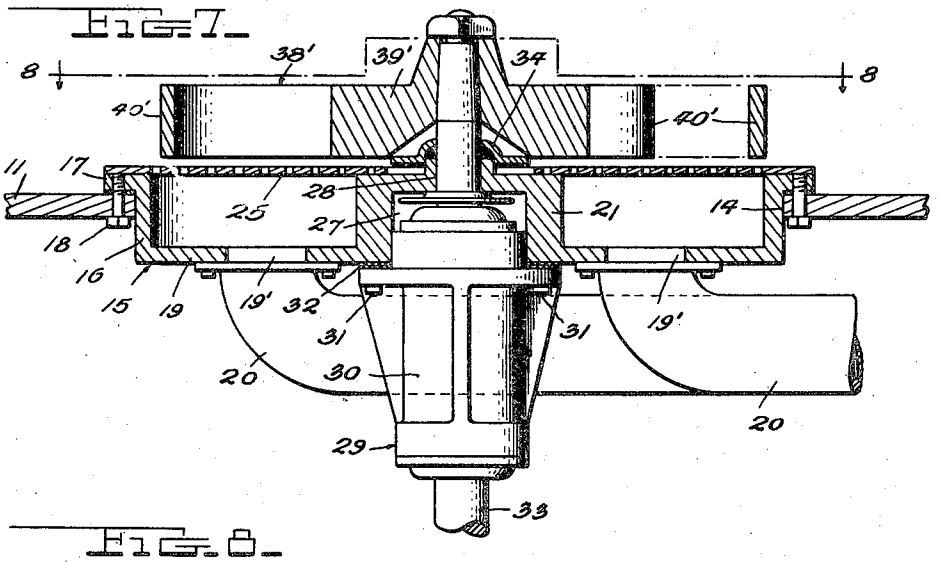
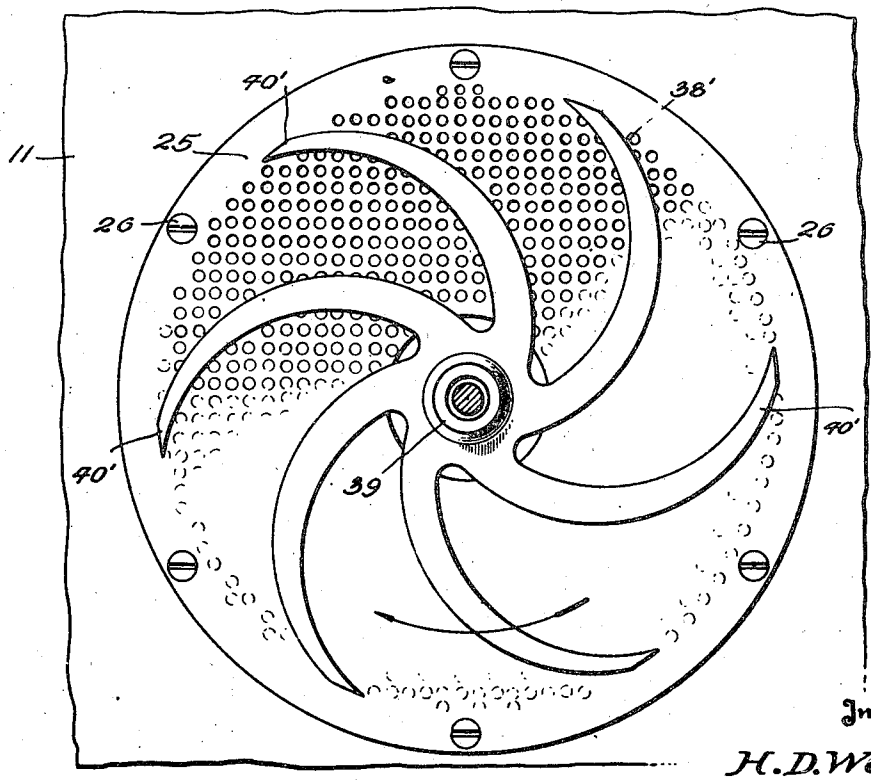


FIG. 8



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PULP BEATER AND SELECTOR

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9 Claims. (Cl. 92—23)

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The invention aims to provide a novel way for rapidly and effectively beating, defibering, brushing, and hydrating paper-making pulp, and for fibrillating the individual fibers and brooming their ends.

Another aim is to provide a simple, effective and durable apparatus with which all of the above operations may be expeditiously performed simultaneously.

Figure 1 of the accompanying drawings is a vertical sectional view partly in elevation showing one form of the invention.

Fig. 2 is an enlarged sectional view through the coacting screen and impeller and associated parts.

Fig. 3 is a fragmentary bottom plan view of the impeller shown in Figs. 1 and 2.

Fig. 4 is an enlarged detail section on line 4—4 of Fig. 3.

Fig. 5 is a fragmentary top plan view of the screen shown in Fig. 2.

Fig. 6 is an enlarged detail vertical section on line 6—6 of Fig. 5.

Fig. 7 is a view similar to Fig. 2 but showing a different form of construction.

Fig. 8 is a horizontal sectional view on line 8—8 of Fig. 7.

Preferred features of construction have been illustrated and will be rather specifically described, with the understanding, however, that within the scope of the invention as claimed, variations may be made.

A suitably supported tank 10 is shown, in which the paper-making material is immersed in liquid. The bottom 11 of this tank is curved upwardly at 12 to the side wall 13 to facilitate vertical circulation of the pulp, as indicated by the arrows in Fig. 1.

A central opening 14 is formed in the tank bottom 11, and a shallow selected-pulp-receiving-and-discharge-casing 15 is secured in said opening. This casing 15 comprises a continuous side wall 16 fitting within the opening 14 and having a lateral flange 17 secured by screws or the like 18 upon the tank bottom 11, a bottom 19 integral with said side wall 16 and having selected pulp outlets 19' connected with suitable pipes 20, a central hub 21 integral with the central portion of said bottom 19, and a screen extending from the upper end of said hub 21 to the upper end of said side wall 16. In the form of construction shown in Figs. 1 to 6, the screen is in the form of a plate 22 integral with the hub 21 and side wall 16, said plate having radial grooves 23 in its upper side, and pulp-selecting slots 24 between the outer end portions of said grooves. In the

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form of construction shown in Figs. 7 and 8, however, the screen is in the form of a suitably perforated plate 25 which may be secured in place by any suitable means, the screws 26 being shown in Fig. 8 for this purpose.

The boss 22 and the bottom 19 are jointly formed with a downwardly opening recess 27 and the upper end of said boss has a central opening 28 communicating with said recess 27. This recess receives the upper end of a bearing assembly 29, the housing 30 of which is secured at 31 to the lower end of the hub 21, the securing being preferably done with the aid of shims 32 which permit vertical adjustment of the entire assembly 29. This assembly rotatably mounts a vertical shaft 33 and holds it against end play. The upper portion of this shaft passes through the opening 28 with which a suitable packing box 34 is associated. A belt drive 35 is shown for the shaft 33 in Fig. 1, operatively connecting said shaft with an electric motor 36, and below said belt drive, there is preferably another bearing 37 for said shaft.

An impeller is secured upon the upper end of the shaft 33 for imparting a vertical circulation to the pulp and for performing various other operations hereinafter described. In Figs. 1 to 4, the impeller is denoted at 38 and in Figs. 7 and 8, at 38'.

The impeller 38 comprises a central hub 39 and circumferentially spaced arms 40 integral with and extending outwardly from said hub in closely spaced parallel relation with the screen plate 22. Each arm 40 is formed with a longitudinally convex front side 41 for beating and vertically circulating the pulp, said side having sufficient width to well perform these functions and being preferably perpendicular to the plate 22. The sides 41 are tangential to a circle concentric with the shaft 33. The rear side 42 of each arm 40 is preferably longitudinally concave as shown, and this side preferably curves transversely from the lower side 43 of the arm to the upper edge of the front side 41, as seen best in Fig. 4. Each arm is formed with a plurality of longitudinal grooves 44 which open through its lower side 43 and extend from the hub 39 to the outer end of the arm. This impeller construction is such that the pulp will be effectively rubbed and brushed against the screen plate 22 and such that it will impart a vertical motion to the pulp, as well as vertically pulsating the pulp to keep the screen clean. The rubbing and brushing of the pulp between the impeller 38 and the screen, effectively defibers and hydrates said pulp and moreover the individual fibers will be fibrillated

and their ends will be effectively broomed. Obviously, any relatively large masses of the pulp and large flakes will be forcibly struck by the arms 40 and will thus be broken up to aid in rapid reduction to pulp of the required fineness. As this fineness is reached, the selected pulp discharges through the slots 24 into the casing 18 and may discharge through the pipes 21, and obviously the apparatus may either operate continuously or upon batches.

The impeller 38' shown in Figs. 7 and 8, comprises a hub 39' and outwardly projecting arms 40' integral therewith and operable over the screen plate 25. Insofar as their longitudinal shape is concerned, the arms 40' are very similar to the arms 40. They are preferably, however, of rectangular form in transverse section as will be clear from Fig. 7 and their lower sides are devoid of grooves. This construction is more simple than that disclosed in Figs. 1 to 4 and is less rapid in operation, yet nevertheless constitutes quite an improvement over conventional apparatus for performing the functions above explained. It will be obvious that the impeller 38' could be used with any appropriate kind of screen and is not restricted to use with the specific screen plate 25. It will also be understood that the impeller 38 could be used in connection with any suitable screen and is not, therefore, restricted to use with the screen plate 22. The impeller 38 could well be used with the screen 25 and the impeller 38' with the screen 22, if desired.

The impeller 38 or 38' may be adjusted further toward the screen by adding one or more of the shims 32, to increase the brushing and scrubbing defibering actions, for better defibering hard sized fibers (stuck together with glue or the like) paper and dry baled pulp, and frozen pulp. Also it gives the pulp fibers a brushing, fibrillating and booming action insuring better and stronger paper. The apparatus does work similar to that performed in the conventional paper mill beater, in which the blades of the beater roll coact with the blades of the bed plate to brush, fibrillate and hydrate the pulp fibers for making into well formed and strong paper. It improves the usual beating method by fast circulation, thorough mixing, short cycles of pulp travel for an increased number of beatings, etc., thereby saving time, increasing capacity and effecting greater efficiency. For effective beating, the pulp can be worked in batches and when satisfactorily beaten, it can then be drawn off through the screen, thereby preventing chunks from passing along with beaten pulp, or the machine can be operated continuously for improved and quicker pulping, resulting from the additional brushing, scrubbing and defibering.

While preferences have been disclosed, attention is again invited to the possibility of making variations within the scope of the invention as claimed.

I claim:

1. In a pulp beater and selector, a pulp discharge screen forming part of a tank wall, a rotary shaft perpendicular to said screen and disposed centrally thereof, and an impeller secured to said shaft in spaced opposed relation with the inner side of said screen, said impeller having circumferentially spaced arms projecting away from said shaft and spaced from said inner side of said screen in the direction of the shaft axis, said inner side of said screen being exposed to the tank interior between said arms, said arms each having a front side of a width to beat the pulp and vortically circulate the same, said arms being sufficiently close to said screen to cause said arms and screen to coact in giving the pulp fibers a thorough rubbing and brushing, thereby simultaneously defibering and hydrating the pulp, and fibrillating the individual fibers and brooming their ends.

2. In a pulp beater and selector, a pulp discharge screen forming part of a tank wall, a rotary shaft perpendicular to said screen and disposed centrally thereof, and an impeller secured to said shaft in spaced opposed relation with the inner side of said screen, said impeller having circumferentially spaced arms projecting away from said shaft and spaced from said inner side of said screen in the direction of the shaft axis, said inner side of said screen being exposed to the tank interior between said arms, said arms each having a front side of a width to beat the pulp and vortically circulate the same, at least the inner end portions of said front sides being tangential to a circle concentric with said shaft to vortically circulate the pulp, said arms being sufficiently close to said screen to cause said arms and screen to coact in giving the pulp fibers a thorough rubbing and brushing, thereby simultaneously defibering and hydrating the pulp, and fibrillating the individual fibers and brooming their ends.

3. In a pulp beater and selector, a pulp discharge screen forming part of a tank wall, a rotary shaft perpendicular to said screen and disposed centrally thereof, and an impeller secured to said shaft in spaced opposed relation with the inner side of said screen, said impeller having circumferentially spaced arms projecting away from said shaft and spaced from said inner side of said screen in the direction of the shaft axis, said inner side of said screen being exposed to the tank interior between said arms, said arms each having a longitudinally convex front side of a width to beat the pulp and vortically circulate the same, the inner end portions of said longitudinally convex front sides being tangential to a circle concentric with said shaft, said arms being sufficiently close to said screen to cause said arms and screen to coact in giving the pulp fibers a thorough rubbing and brushing, thereby simultaneously defibering and hydrating the pulp, and fibrillating the individual fibers and brooming their ends.

4. A structure as specified in claim 1; said screen consisting of a plate having substantially radial grooves in the side thereof toward said arms, and pulp discharge slots through said plate between said grooves.

5. A structure as specified in claim 1; the sides of said arms toward said screen having longitudinal grooves.

6. A structure as specified in claim 2; the sides of said arms toward said screen having longitudinal grooves.

7. A structure as specified in claim 3; the sides of said arms toward said screen having longitudinal grooves.

8. In a pulp beater and selector, a screen for coaction with a rotor, said screen comprising a plate having substantially radial grooves in its rotor-facing side, and pulp discharge slots extending through said plate between said grooves.

9. Apparatus of the character described comprising a tank containing stock to be treated, a pump-like impeller mounted for rotation in said tank, said impeller having circumferentially spaced arms for beating the stock and for creat-

ing a vortical circulation, said impeller having fiber beating, fibrillating and hydrating grooves in the underside of said arms, and a grooved base coacting with said grooved impeller arms, said base having screen openings between its grooves.

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