

Nov. 5, 1940.

E. COWLES

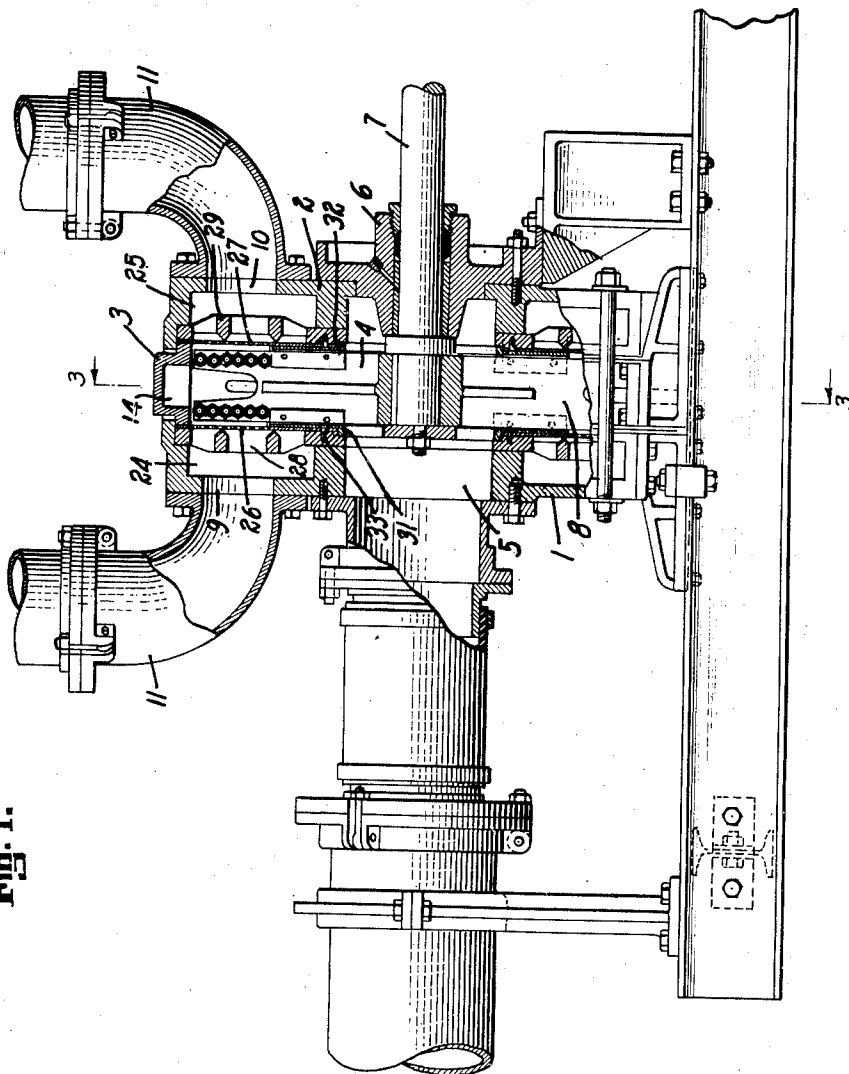
2,220,676

METHOD AND APPARATUS FOR REFINING PAPER STOCK

Filed July 29, 1937

2 Sheets-Sheet 1

Fig. 1.



INVENTOR
Edwin Cowles
BY
Emory, Varnay, Whittlemore & Dix
ATTORNEY

Nov. 5, 1940.

E. COWLES

2,220,676

METHOD AND APPARATUS FOR REFINING PAPER STOCK

Filed July 29, 1937

2 Sheets-Sheet 2

Fig. 3.

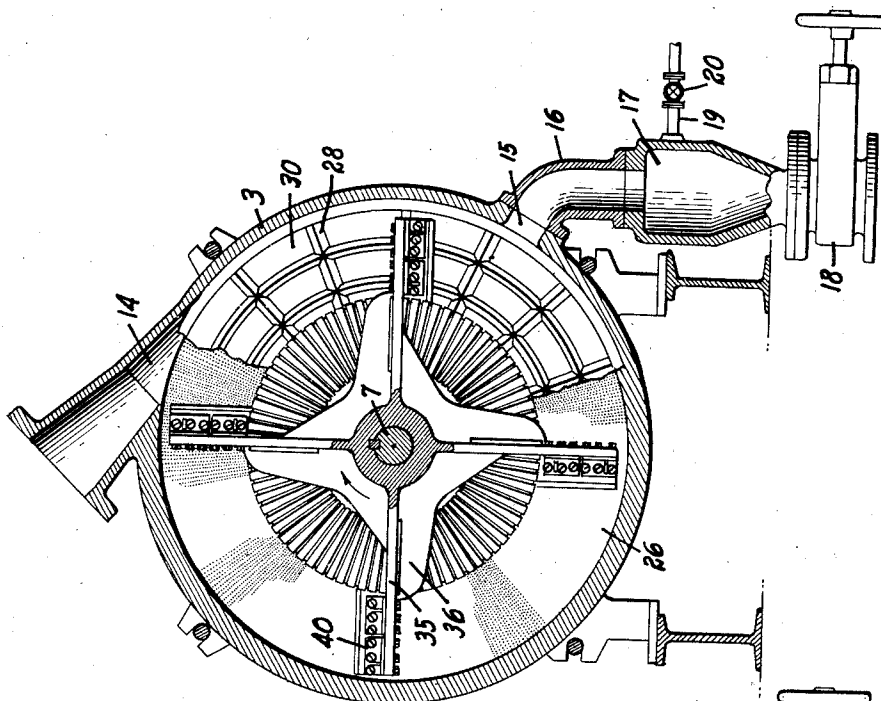
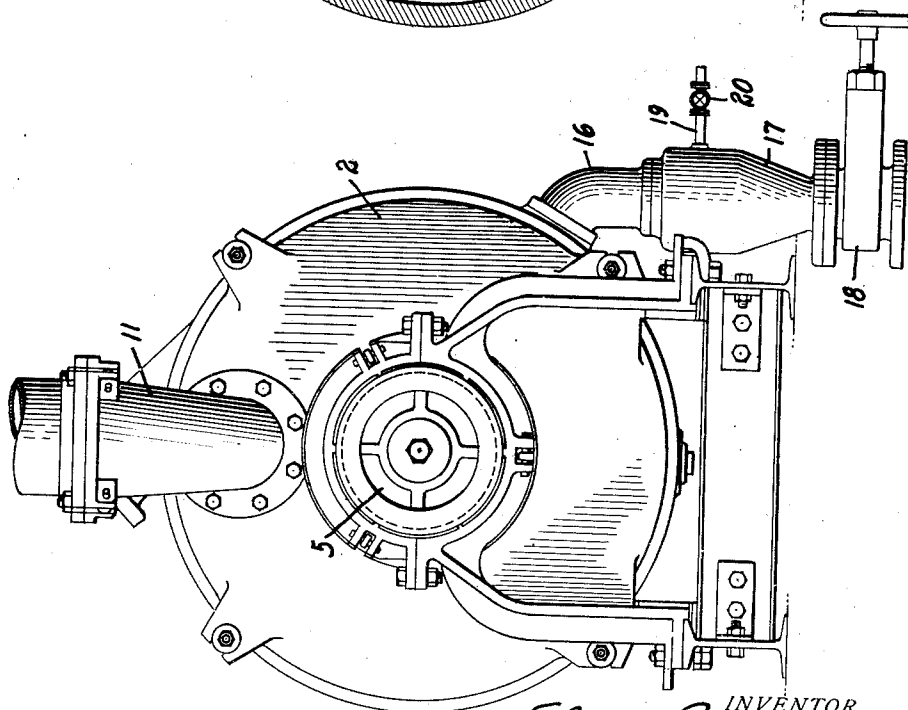


Fig. 2.



INVENTOR
Edwin Cowles
BY
Emory, Vane, Whittemore & Co.
ATTORNEY

UNITED STATES PATENT OFFICE

2,220,676

METHOD AND APPARATUS FOR REFINING
PAPER STOCKEdwin Cowles, Hopewell, N. J., assignor to The
Cowles Company, Princeton, N. J., a corporation
of New Jersey

Application July 29, 1937, Serial No. 156,268

7 Claims. (Cl. 92—26)

This invention relates to methods and apparatus for refining paper stock and constitutes an improvement in apparatus of the type previously disclosed in Letters Patent Nos. 2,033,123, dated March 10, 1936, and 2,180,080, dated Nov. 14, 1939.

It is an object of the invention to improve the hydraulic efficiency of such apparatus, and thereby to effect a saving in the amount of power required: and it is a further object of the invention to improve the performance of the apparatus, particularly with respect to the separation and discharge of trash and undefibred material which fails to pass through the screens.

Other objects and advantages of the invention will appear hereinafter.

A preferred embodiment of the invention selected for purposes of illustration is shown in the accompanying drawings, in which,

Figure 1 is a front elevation of the apparatus, partly in section, in order to better illustrate the interior thereof.

Figure 2 is an end elevation.

Figure 3 is a section on the line 3—3 of Figure 1.

In the apparatus disclosed in my prior patent and application the inlet opening, through which material is introduced to the impeller chamber, is arranged coaxially with the impeller shaft, and the outlet opening for discharge of material which fails to pass through the screens is located at the periphery of the impeller chamber.

According to the present invention I propose to introduce material to the impeller chamber through an inlet opening located at the periphery of the impeller chamber, and preferably in a direction substantially tangential to the periphery. I also propose to discharge material which fails to pass through the screens through a plurality of outlet openings, one of which is coaxial with the impeller shaft, and another of which is located at the periphery of the impeller chamber.

Referring to the drawings, the apparatus comprises a casing having opposed end plates 1 and 2 which are spaced by an annular ring 3 located therebetween and forming a substantially cylindrical chamber 4 for purposes hereinafter described. The end plate 1 is provided with an opening 5 constituting an outlet opening from the casing and the chamber 4 and the end plate 2 is provided with a bearing member 6 supporting a shaft 7 carrying an impeller 8 which rotates within the chamber 4. As shown, the outlet opening 5 is arranged coaxially with the shaft 7. The plate 1 is also provided with an outlet opening 9

and the end plate 2 is provided with a similar outlet opening 10, the said openings being connected with similar outlet conduits 11.

The ring 3 is provided with an inlet opening 14 which as previously stated, and as illustrated in Figure 3, is arranged substantially tangentially to the periphery of the ring. That is, the inlet opening is so arranged that the incoming flow of material enters the chamber 4 in a tangential direction, and moves in the same direction that the impeller is moving (clockwise as shown in Figure 3). The said ring is also provided with an outlet opening 15 connected by a conduit 16 to a trap 17 for purposes hereinafter described.

The end plate 1 is provided with an annular chamber or trough 24 and the end plate 2 is provided with a similar annular chamber or trough 25, which said chambers communicate with the outlet openings 9 and 10 respectively. Covering the said annular chambers so as to form one wall thereof are perforated screens 26 and 27 which are thus interposed between the inlet opening 14 and outlet openings 9 and 10 in such manner that material supplied to the apparatus through the inlet opening cannot leave the apparatus through outlet openings 9 and 10 without passing through screens 26 and 27.

The said screens, which are in the form of annular disks, are supported from behind by grids or frames 28 and 29 having large openings therein so as not to interfere with the flow of material through the screens. The screens 26 and 27 are held rigidly in place, being clamped at their outer peripheries between the annular ring 3 and the supporting frames 28 and 29, which in turn are clamped between the end plates 1 and 2. The inner peripheries of the screens are fastened between the supporting frames 28 and 29 and screen retaining plates 31 and 32 by screws 33.

Any suitable type of perforated screen may be employed, but I prefer to use the type of screen disclosed in my said Patent No. 2,180,080 to which reference may be had for a more complete description.

According to the present invention it is proposed that the material to be treated be introduced through the inlet opening under pressure, and at suitable velocity, i. e. in the region of 2,000 lineal ft. per minute or more. For this purpose the material may be pumped to the inlet opening by any suitable type of hydraulic pump, as for example a centrifugal pump. Therefore, the impeller 8 need not be relied upon, as before, to circulate the material, but merely keeps the material in circulation and carries the scrapers

which perform the functions described in my previous application. Accordingly, it is necessary to supply very little power to the shaft 7, it being sufficient merely to overcome the friction of the scrapers against the screens. Consequently there is an important gain in efficiency, for since pumps of high efficiency are readily obtainable, the total power input to pump and impeller is considerably less than that required to drive the impeller alone when said impeller is used to circulate the material.

The impeller comprises a plurality of radial vanes 35 reinforced by web members 36 and carrying scrapers 40 of any suitable construction such, for example, as those disclosed in said application.

It will be understood that the trash and undefibered material which it is desired to separate from the useful fibrous material which passes through the screens may be of various types, depending on the kind of material being treated. In the case of waste paper, there are certain waste materials of high specific gravity such as sand, bits of glass, metal, etc., which must be separated out, and there are also certain waste materials of low specific gravity such as strings, rubber bands, Cellophane, wood, etc., which must be separated out. From the foregoing description, it will be seen that the present apparatus is particularly well adapted to the separation of both types of waste materials, for the relatively high velocity of the material in the casing produces a centrifugal action which throws the heavy materials outwardly toward the periphery where they can enter the outlet opening 15, and permits the light materials to move toward the axis where they can enter the outlet opening 5.

The heavy materials which enter the outlet opening 15 fall into the trap 17 from which they may be removed through valve 18. If desired the trap may be provided with a pipe connection 19 having a valve 20 through which water may be introduced to the trap at a rate sufficient to cause a slow flow from the trap to the chamber 4. If the rate is properly adjusted, the flow will not interfere with the entrance of heavy materials, but will prevent entrance and loss of good fibers.

The light materials which enter the outlet opening 5 may be removed by permitting continuous flow through said opening or by causing intermittent flow therethrough by periodically opening and closing a valve controlling said opening.

It will be understood that the invention may be variously modified and embodied within the scope of the subjoined claims.

I claim as my invention:

1. Method of refining paper stock which comprises spinning said stock at relatively high velocity in a substantially cylindrical chamber having a perforated screen therein and forming one wall thereof, introducing said stock tangentially through the cylindrical wall of said chamber in a direction parallel to said screen, withdrawing screened stock through said screen, and withdrawing rejected material axially through the end wall of said chamber in a direction at right angles to said screen.

2. Method of refining paper stock which comprises spinning said stock at relatively high velocity in a substantially cylindrical chamber having a perforated screen therein and forming one wall thereof, introducing said stock tangentially through the cylindrical wall of said chamber in

a direction parallel to said screen, working said stock against said screen by means of rotatable scrapers engaging said screen, withdrawing screened stock through said screen, and withdrawing rejected material axially through the end wall of said chamber in a direction at right angles to said screen.

3. Method of refining paper stock which comprises spinning said stock at relatively high velocity in a substantially cylindrical chamber having a perforated screen therein and forming one wall thereof, introducing said stock tangentially through the cylindrical wall of said chamber in a direction parallel to said screen, withdrawing screened stock through said screen, withdrawing rejected material of low specific gravity axially through the end wall of said chamber in a direction at right angles to said screen, and withdrawing rejected material of high specific gravity through the cylindrical wall of said chamber.

4. Method of refining paper stock which comprises spinning said stock at relatively high velocity in a substantially cylindrical chamber having a perforated screen therein and forming one wall thereof, introducing said stock tangentially through the cylindrical wall of said chamber in a direction parallel to said screen, working said stock against said screen by means of rotatable scrapers engaging said screen, withdrawing screened stock through said screen, withdrawing rejected material of low specific gravity axially through the end wall of said chamber in a direction at right angles to said screen, and withdrawing rejected material of high specific gravity through the cylindrical wall of said chamber.

5. Apparatus for refining paper stock, comprising, in combination, a casing having opposed end plates and an annular member therebetween spacing said plates to form an impeller chamber, an impeller mounted for rotation in said chamber on an axis coinciding with the axis of said annular member, a screen in said chamber, said screen being flat and lying in a plane perpendicular to the axis of said impeller, said casing being provided with inlet and outlet openings to and from said chamber on opposite sides of said screen, said inlet opening being located in said annular member, a conduit connected to said inlet opening, said conduit being arranged to direct the incoming flow of material substantially tangentially to the inner wall of said annular member, and said casing being provided with an additional outlet opening located coaxially with the axis of said impeller.

6. Apparatus for refining paper stock, comprising, in combination, a casing having opposed end plates and an annular member therebetween spacing said plates to form an impeller chamber, an impeller mounted for rotation in said chamber on an axis coinciding with the axis of said annular member, a screen in said chamber, said screen being flat and lying in a plane perpendicular to the axis of said impeller, said casing being provided with inlet and outlet openings to and from said chamber on opposite sides of said screen, said inlet opening being located in said annular member, a conduit connected to said inlet opening, said conduit being arranged to direct the incoming flow of material substantially tangentially to the inner wall of said annular member, said casing being provided with an additional outlet opening located coaxially with the axis of said impeller, and said annular

member being provided with a second additional outlet opening spaced from said inlet opening.

7. Apparatus for refining paper stock, comprising, in combination, a casing having opposed end plates and an annular member therebetween spacing said plates to form an impeller chamber, an impeller mounted for rotation in said chamber on an axis coinciding with the axis of said annular member, a screen in said chamber, said screen being flat and lying in a plane perpendicular to the axis of said impeller, scrapers on said impeller engaging said screen, said casing

being provided with inlet and outlet openings to and from said chamber on opposite sides of said screen, said inlet opening being located in said annular member, a conduit connected to said inlet opening, said conduit being arranged to direct the incoming flow of material substantially tangentially to the inner wall of said annular member, and said casing being provided with an additional outlet opening located coaxially with the axis of said impeller.

EDWIN COWLES.