

June 28, 1932.

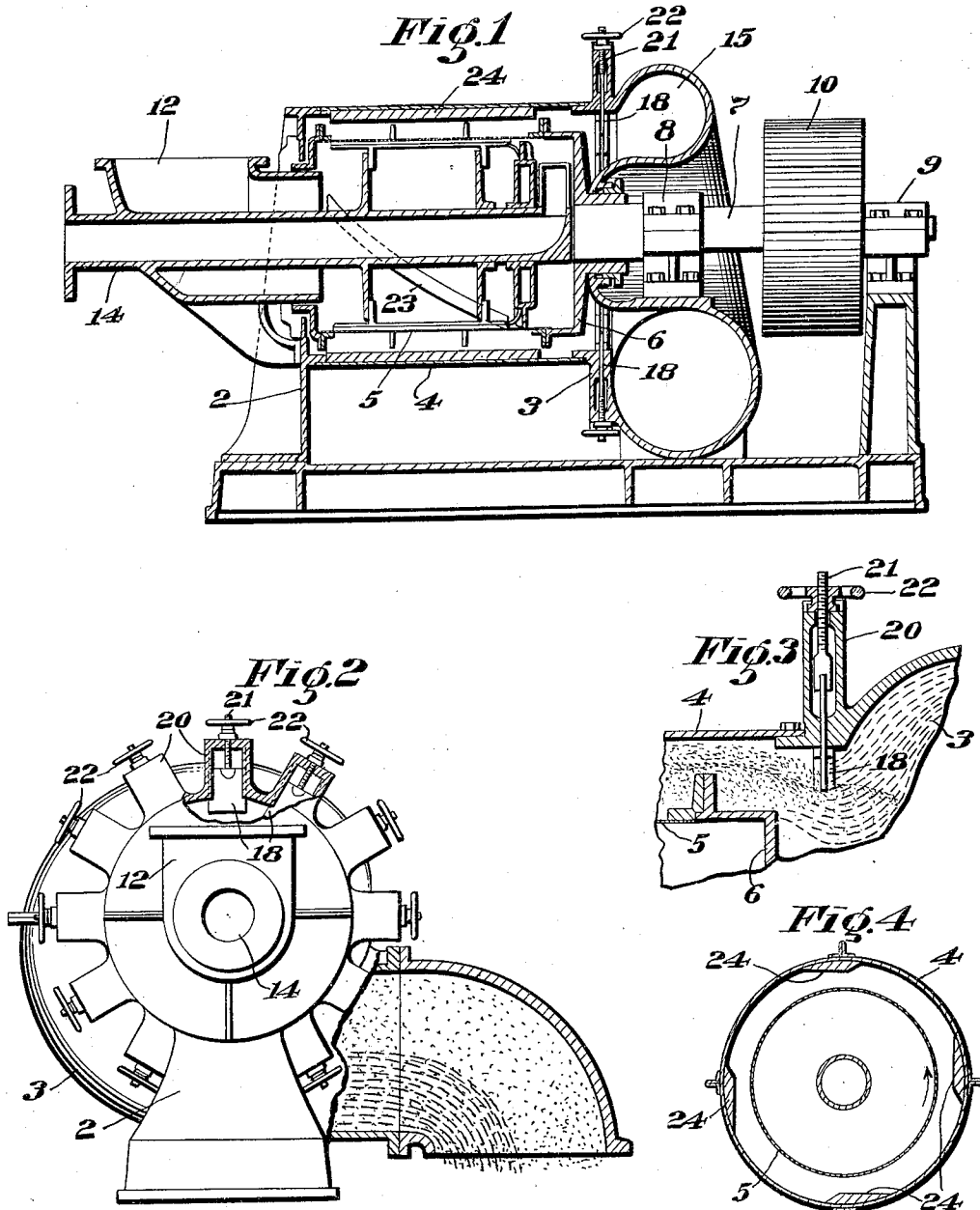
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1,864,818

PULP SCREENING MACHINE AND PROCESS

Filed Jan. 9, 1929

2 Sheets-Sheet 1



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FIG. 5

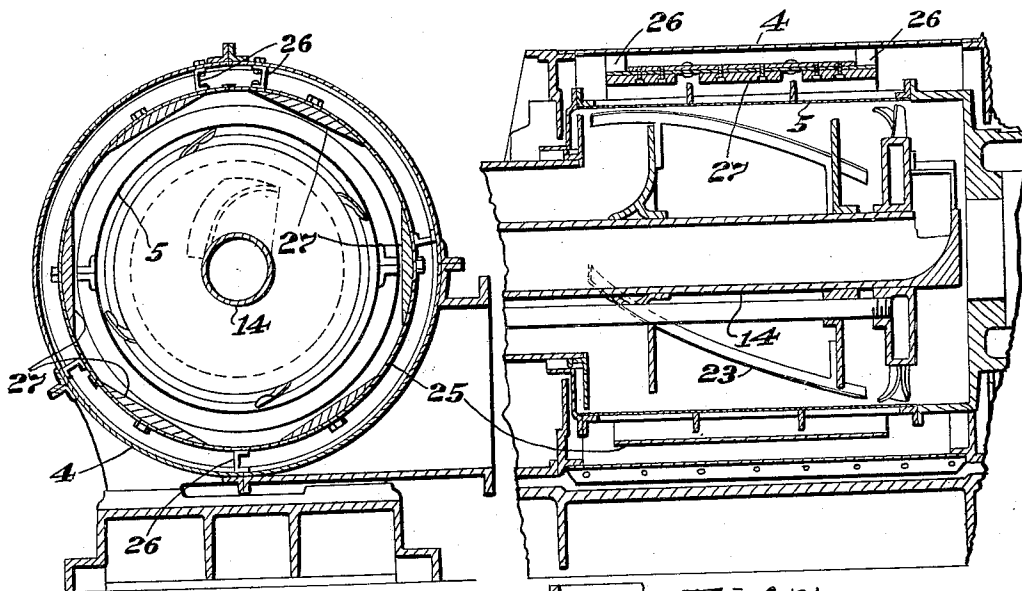
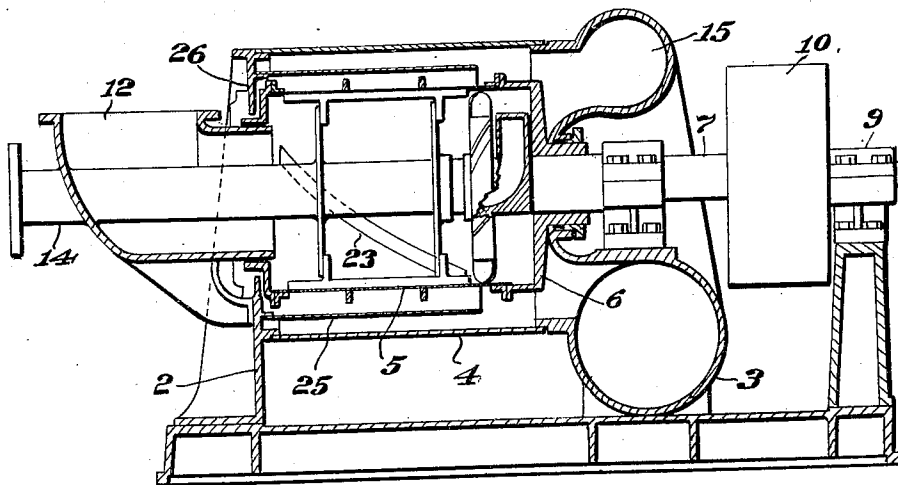


FIG. 6

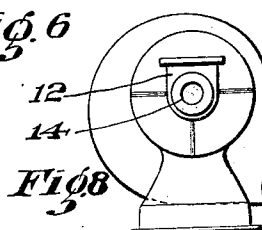


FIG. 8

FIG. 7

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## UNITED STATES PATENT OFFICE

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## PULP SCREENING MACHINE AND PROCESS

Application filed January 9, 1929. Serial No. 331,173.

This invention relates to pulp screening machines and will be herein disclosed as embodied in machines of the type shown in my prior Patents Nos. 1,533,410 April 14, 1925, and 1,551,953 September 1, 1925. The machines disclosed in these patents have proved exceptionally satisfactory in practice and represent a substantial advance in this art. It is the chief object of the invention further to improve and perfect machines of this general type. It will be understood, however, that the invention is also applicable to other pulp screening machines.

A machine of the construction disclosed in said patents includes a screening drum mounted for rotation at a sufficient peripheral speed to create a very substantial centrifugal force in the body of pulp in contact with the screen and the force so created urges the pulp through the screen. The drum is mounted in a casing so constructed that the screen is maintained constantly submerged in a body of screened pulp. Pulp to be screened is delivered to the interior of the screening drum and the screened pulp is discharged from the casing through an opening which extends longitudinally of the casing near the bottom thereof. In using these machines it has been found that there is a strong tendency for the stock to thicken in the lower part of the drum near the outlet for the screened stock. The screening action thus varies very substantially at different points around the circumference of the screening drum, the most desirable conditions being maintained at the region diametrically opposite to the outlet for the screened stock, while decidedly inferior conditions obtain in the part of the drum adjacent to said outlet.

A study of the pressure conditions at various points around the screen drum when the machine is in operation also shows great variations in hydraulic pressure at different sides of the drum, the pressure around the lower part of the drum being very much lower than that at the top and lateral portions. This is accompanied by corresponding variations in the flow of stock through the drum, or at least a tendency to produce such variations.

The actual flow does not always correspond to the differences in pressure between the inner and outer surfaces of the screen because of the thickening action which is produced under certain conditions. It is clear, however, that these extreme variations in pressure conditions and in rates of flow are undesirable. The present invention deals especially with these considerations and it aims to devise a construction in which the desired screening conditions will be maintained around substantially the entire circumference of the screening drum.

The invention also aims to provide an improved arrangement for freeing the screen from accumulations of pulp, preferably through the action of the pulp itself.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a vertical, sectional view of a pulp screening machine embodying this invention;

Fig. 2 is an end view of the machine shown in Fig. 1, parts of the casing being broken away in order better to illustrate certain details of construction;

Fig. 3 is a fragmentary sectional view illustrating means for supporting and adjusting the baffle plates;

Fig. 4 is a transverse vertical section through the casing and screen of the machine shown in Fig. 1;

Fig. 5 is a view similar to Fig. 1 illustrating a modification;

Figs. 6 and 7 are transverse and longitudinal sections, respectively, of another modification; and

Fig. 8 is an end view on a small scale of the machine shown in Fig. 5.

Referring first to Figs. 1 to 4, inclusive, the machine there shown comprises a stationary casing including end members 2 and 3 and a shell 4. Mounted in the casing is a rotary screening cylinder or drum 5 which is supported by an end piece 6, this end piece being

secured fast on a shaft 7 which is mounted in bearings 8 and 9. This mounting permits the rapid rotation of the screening drum, and the shaft 7 is provided with a pulley 10 by means of which the machine may be belted to any convenient source of power.

The paper stock or pulp to be screened is conducted into the open end of the screen through a spout 12 which preferably is formed integral with a stationary tailings conduit or chute 14. The entire organization so far described may be constructed and arranged substantially as shown in my patent No. 1,551,953, and reference should be made to said patent for a more detailed description of the construction and operation of the machine.

When the machine is in operation the pulp flows into the screen through the spout 12 under a very low head, and the rapid revolution of the screen 5 creates a very substantial centrifugal effect on the liquid stock in contact therewith. The centrifugal force so produced forces the pulp through the perforations in the screen and discharges it from the casing. In this machine the screened pulp finds an exit at one end of the casing through the large chamber or outlet 15 provided in the end piece 3. Preferably the casing shell 4 is substantially concentric with the screen 5 and is spaced from it by an approximately uniform distance. This construction, together with the fact that the outlet for the screened stock is at one end of the screening drum, tends to equalize the screening action and to distribute the flow of the screened stock evenly throughout the entire circumference of the screen. In order to maintain the screening drum submerged in screened stock, the outlet 15 may open directly into a discharge conduit or box 16, Fig. 8, equipped with a weir 17, the height of this weir being so adjusted that the drum 5 will be maintained constantly submerged. Or, instead of this arrangement, a series of baffles 18 may be arranged circumferentially at the outlet 15, these baffles being adjustable from a point outside the casing so that their setting can be changed, as desired, while the machine is in operation. Such a construction is shown in Figs. 2 and 3 in which a series of baffle plates 18 are mounted, respectively, in ways formed in bosses 20 which, in the construction shown, are integral with the end casting 3. Each plate is equipped with a screw threaded stem 21 projecting through the upper end of its respective boss, and an internally threaded hand wheel 22 is provided for each stem. Consequently, by turning the hand wheel the plate is moved radially in or out, depending upon the direction of rotation of the wheel.

This construction, therefore, makes it possible to maintain the drum 5 constantly submerged in screened stock, and also to apply

the desired back pressure to the drum. Such a back pressure is desirable in order to partly counteract the effect of the centrifugal force and to adjust and control the differential pressure which produces the flow of pulp through the perforations of the screen and which, consequently, determines the rate of such flow. In other words, it permits adjustment of the hydrostatic pressure at the surface of the screen. Usually the pulp to be screened is fed to the intake spout 12 from a head box, and by properly adjusting the baffle plates 18 and the head of the supply fed to the screen, the rate of flow through the screen as a whole can be adjusted to suit the requirements of different grades and consistencies of stock.

During the operation of the machine the coarser materials or tailings which cannot pass through the screen, and which consequently tend to accumulate on its inner surface, are moved along said surface by an inclined scraper 23, Fig. 1, just as in the machine shown in my prior Patent No. 1,551,953, these tailings finally being discharged through the chute 14, as explained fully in said patent. Certain of the coarser constituents of the stock, however, still cling to the inner surface of the screen, and in order to dislodge these accumulations I have provided in the machine shown several deflector elements 24. The construction of these parts will be clear from an inspection of Figs. 1 and 4. It will be observed that these deflectors consist of pieces extending substantially the entire length of the screening surface and secured to the inner surface of the casing shell 4. When the machine is in operation a considerable body of stock closely surrounding the screen 5 revolves with it and probably at nearly the same speed. The deflecting elements 24 serves to constrict, at intervals, the area through which this revolving body of stock must flow. This results in producing periodical inward impulses or movements of the stock through the screening surface which act to dislodge accumulations of stock clinging to the inner surface of the screen. While Fig. 4 of the drawings shows four of these deflecting elements, it will be understood that this number may be varied, as desired, to suit the requirements of individual machines.

The pulp screening machine shown in Fig. 5 is substantially like that shown in Figs. 1 to 4, inclusive, except for the differences hereinafter described. In this machine the shell 4 of the casing is located farther from the screening drum 5 than in the machine above described. Between this screen and the shell a supplemental shell or sub-casing 25 is mounted. It consists of a cylindrical sleeve of sheet metal supported rigidly on an annular flange 26 which projects inwardly from the end piece 2 of the casing. It serves to re-

strict the volume of screened stock rotating with the screen 5 and it is open at the end toward the discharge outlet 15 so that it also acts in a manner similar to the casing shell 4 in Fig. 1 to maintain approximately uniform pressure conditions on the screen around its entire circumference.

It will be clear from a comparison of the construction shown in Figs. 1 and 5 with those shown in my prior patents above designated, that in the latter machines the path of travel of the screened stock from the screening surface to the discharge outlet is much more direct from some points than others. This fact apparently is responsible for the thickening action above described which occurs in the lower part of the screen. In other words, this action is caused by the fact that the stock tends to flow away from the lower part of the screen so much more rapidly than from the upper part. This difference in the rate of flow through the screen at different points around its circumference is caused by the substantial difference in the pressure conditions at various points around the screen, as above pointed out. By using the sub-casing 25 or the adjustable baffles 18 these differences in hydraulic pressure and these wide variations in flow from different points on the screen are greatly reduced. With either arrangement the stock cannot pass through the screen and directly away from it to the discharge outlet but must flow in a generally axial direction to the discharge outlet at one end of the screen. A far more uniform flow through the entire circumference of the screen thus is produced and the localized thickening action is substantially eliminated.

In some cases it may be desirable to leave the sub-casing 25 open at both ends so that the screened pulp can be discharged through both of these open ends, and such a construction is illustrated in Figs. 6 and 7. The supplemental or subcasing 25 may be supported by spacing elements 26 which are bolted or riveted at their inner ends to the casing 25, their outer ends being bolted to the shell 4. The sub-casings shown in Figs. 5, 6 and 7 may also be equipped with deflector elements, as indicated at 27 in Figs. 6 and 7, these elements acting on the rotating body of stock in essentially the same manner that the deflectors 24 act on this material in the machine shown in Figs. 1 to 4, inclusive.

It will now be understood that the invention provides a construction in which a far better control of the screening action is obtainable than in prior machines. The fact that the screening conditions can be made approximately uniform at all sides of the screen is an important advantage not only in producing improved results but also in increasing the efficiency of the machine. The pressure conditions under which the screen operates can be adjusted while the machine is in

operation, and such adjustment affects the entire screening area substantially uniformly since the whole screening surface is under approximately the same hydraulic pressure or head except where this pressure is modified at certain points by the action of the deflectors when they are used.

While I have herein shown and described preferred embodiments of my invention, it will be understood that the invention may be embodied in other forms without departing from the spirit or scope thereof.

No claim is made in this application to the feature of using deflectors such as those shown at 24, Fig. 4, and at 27 in Figs. 6 and 7, in a pulp screening machine, the claims to this feature being presented in my pending application Serial No. 494,322, filed November 8, 1930.

Having thus described my invention, what I desire to claim as new is:

1. A pulp screening machine comprising, in combination, a rotary screening drum, means for rotating said drum rapidly to create a substantial centrifugal effect on the stock in contact with the drum, means for delivering stock to be screened to the interior of said drum, and means for maintaining said drum submerged in screened stock and for applying a substantially uniform hydraulic pressure to the drum at points spaced uniformly around the circumference thereof.

2. A pulp screening machine comprising, in combination, a rotary screening drum, means for rotating said drum rapidly to create a substantial centrifugal effect on the stock in contact with the drum, means for delivering stock to be screened to the interior of said drum, and means for maintaining said screen submerged in screened stock and for maintaining substantially the same pressure conditions on said screening surface at points spaced uniformly around the circumference of said drum.

3. A pulp screening machine comprising, in combination, a rotary screening drum, means for rotating said drum rapidly to create a substantial centrifugal effect on the stock in contact with the drum, means for delivering stock to be screened to the interior of said drum, and means for maintaining said drum submerged in screened stock and for conducting the screened stock away from the drum at one end of the drum.

4. A pulp screening machine comprising, in combination, a rotary screening drum, means for rotating said drum rapidly to create a substantial centrifugal effect on the stock in contact with the drum, means for delivering stock to be screened to the interior of said drum, and a casing in which said drum is mounted and into which the screened stock is discharged, said casing serving to hold a supply of screened stock in which said

drum rotates and including a casing section closely surrounding said drum and serving to direct the stock flowing through the screening surface toward one end of the drum.

5 5. In a centrifugal pulp screening machine, the combination of a rotary screening drum, means for delivering pulp to be screened to the interior of said drum, and a casing in which said drum is mounted and in which  
10 the drum may be kept submerged in screened stock, said casing having an outlet for discharging said screened stock at one end of said drum.

15 6. In a centrifugal pulp screening machine, the combination of a rotary screening drum, means for delivering pulp to be screened to the interior of said drum, a casing in which said drum is mounted and in which the drum may be kept submerged in  
20 screened stock, said casing having an outlet for discharging said screened stock at one end of said drum, and means associated with said casing for applying back pressure to the screened stock surrounding said drum.

25 7. In a centrifugal pulp screening machine, the combination of a rotary screening drum, means for delivering pulp to be screened to the interior of said drum, a casing in which said drum is mounted and in  
30 which the drum may be kept submerged in screened stock, and a sub-casing substantially concentric with and encircling said drum, said sub-casing having an open end for the discharge of the screened stock.

35 8. In a centrifugal pulp screening machine, the combination of a rotary screening drum, means for delivering pulp to be screened to the interior of said drum, and means for equalizing approximately the rate  
40 of flow of the pulp through the drum at points spaced approximately uniformly around the circumference thereof.

9. In a centrifugal pulp screening machine, the combination of a rotary screening drum,  
45 means for delivering pulp to be screened to the interior of said drum, a casing in which said drum is mounted, said casing being constructed and arranged to maintain the rate of flow of screened stock through the upper half  
50 of the drum substantially equal to that through the lower half.

10. In a centrifugal pulp screening machine, the combination of a screening drum, means for delivering pulp to be screened to  
55 the interior of said drum, a casing in which said drum is mounted and which maintains the drum substantially submerged in screened stock, and means in said casing for maintaining an approximately uniform distribution of flow of pulp through the drum at  
60 all sides thereof.

11. In a centrifugal pulp screening machine, the combination of a rotary screening drum, means for delivering pulp to be  
65 screened to the interior of said drum, and a

casing in which said drum is mounted and in which the drum may be kept submerged in screened stock, said casing being constructed to discharge the screened pulp at points so located as to produce an approximately uniform distribution of the flow at all sides of the screen.

12. In a centrifugal pulp screening machine, the combination of a rotary screening drum, means for delivering pulp to be screened to the interior of said drum, and a casing in which said drum is mounted and in which the drum may be kept submerged in screened stock, said casing having an outlet for discharging said screened stock at one end of said drum, and a series of baffles adjustable to control the flow of screened stock through said outlet.

13. In a centrifugal pulp screening machine, the combination of a rotary screening drum, means for delivering pulp to be screened to the interior of said drum, a casing in which said drum is mounted and in which the drum may be kept submerged in screened stock, said casing having an outlet located at the end of said drum for discharging the screened stock from the machine, a circumferential series of baffles for controlling the flow of screened stock through said outlet, and means for adjusting said baffles while the machine is in operation.

14. That improvement in processes of screening pulp which consists in performing the screening operation by centrifugal force against a head of surrounding screened liquid, creating said force through the motion of the screen itself, and maintaining approximately the same hydraulic pressure on the screen at both the upper and lower portions thereof.

15. A pulp screening machine comprising, in combination, a rotary screening drum, means for rotating said drum rapidly to create a substantial centrifugal effect on the stock in contact with the drum, means for delivering stock to be screened to the interior of said drum, and means for maintaining said drum submerged in screened stock and for conducting the screened stock away from the drum at the ends of the drum.

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