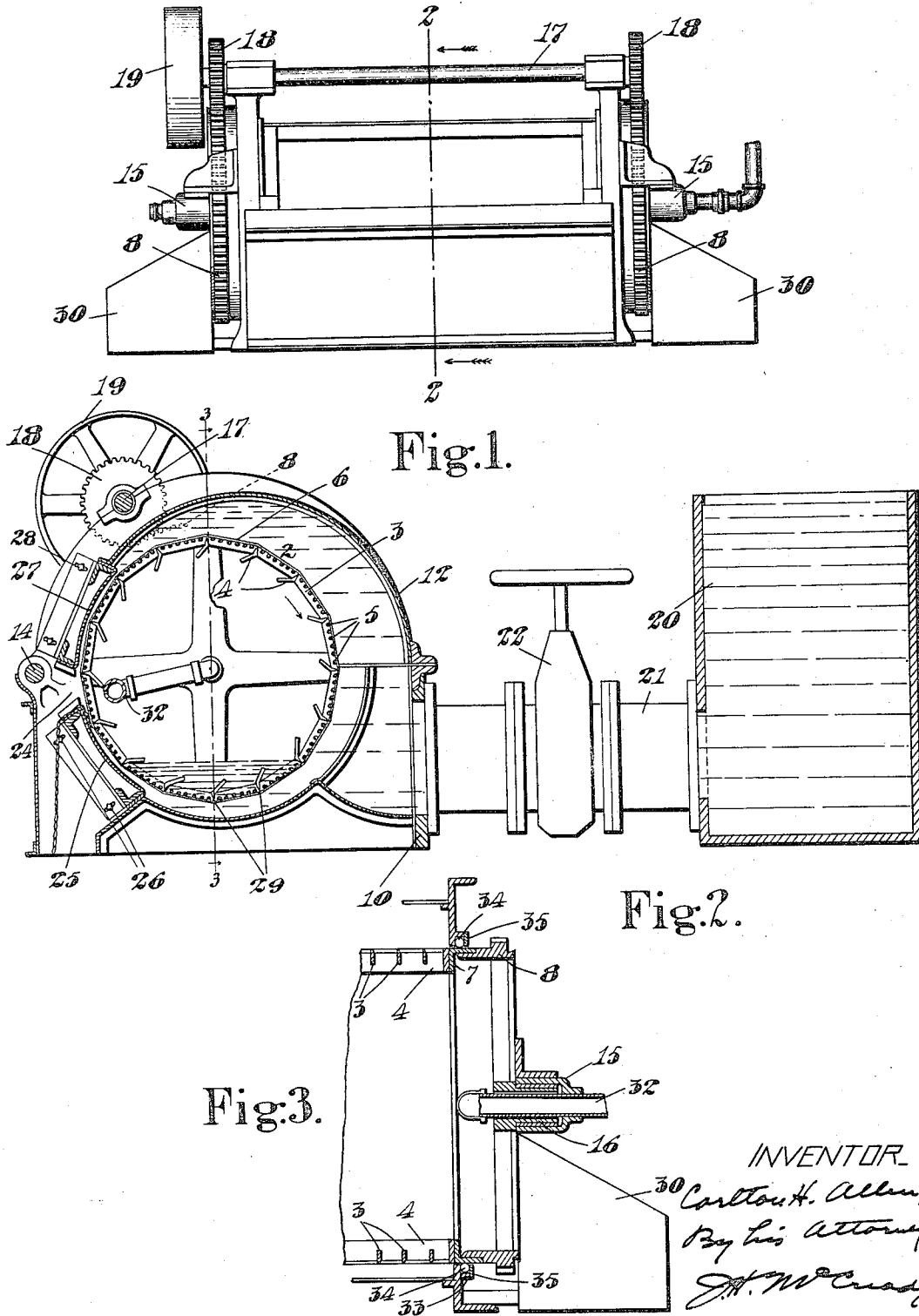


C. H. ALLEN.
PULP THICKENING MACHINE.
APPLICATION FILED MAY 28, 1920.

1,421,364.

Patented July 4, 1922.



INVENTOR.
Carlton H. Allen,
By his Attorney,
J. H. McCready.

UNITED STATES PATENT OFFICE.

CARLTON H. ALLEN, OF MILLINOCKET, MAINE, ASSIGNOR OF ONE-HALF TO GREAT NORTHERN PAPER COMPANY, OF MILLINOCKET, MAINE, A CORPORATION OF MAINE.

PULP-THICKENING MACHINE.

1,421,364.

Specification of Letters Patent.

Patented July 4, 1922.

Application filed May 28, 1920. Serial No. 384,942.

To all whom it may concern:

Be it known that I, CARLTON H. ALLEN, a citizen of the United States, residing at Millinocket, in the county of Penobscot and State of Maine, have invented certain Improvements in a Pulp-Thickening Machine, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to a thickener or washer for pulp. According to the usual processes of making pulp an excessive quantity of water is used for the purpose of facilitating the screening operation and consequently it is necessary later to thicken the pulp before it goes to the paper machine. For instance, a normal consistency for the pulp immediately after the screening operation is approximately three-tenths of one per cent, while it is desirable that this consistency be increased to from two to five per cent before the pulp is delivered to the paper machine. This may be done by removing part of the water in which the solid material is suspended and pulp thickeners operating on this principle are known at the present time.

It is the chief object of the present invention to devise an apparatus of this character which will have a greater capacity for a given area of screening or filtering surface than similar apparatus heretofore used, which will produce more uniform results, which can be economically manufactured, in which repairs can readily be made, and which generally shall be an improvement on apparatus of this character heretofore proposed.

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.

Referring now to the drawings,

Figure 1 is a front elevation of a pulp thickening machine embodying the invention in the form at present preferred;

Fig. 2 is a transverse cross sectional view of the machine shown in Fig. 1 showing it in connection with certain apparatus for supplying pulp thereto; and

Fig. 3 is a vertical cross sectional view at

one end of the machine, the section being taken substantially on the line 3—3, Fig. 2.

The apparatus shown comprises a rotary drum or filter designated in general at 2. This drum is mounted to revolve about a horizontal axis and is polygonal in cross sectional outline, the particular form shown having sixteen faces. The drum may be built in any suitable manner but preferably it comprises a series of plates or ribs 3, approximately annular in shape, spaced apart by, and interlocked or cast with, a series of longitudinally extending bars 4. The plates 3 are grooved to support a series of small tubes or rods 5 which extend the entire length of the drum and support a screen or wire cloth 6 that forms the filtering surface. At each end the drum is provided with an annular member 7, Fig. 3, secured rigidly thereto and forming a part thereof, and each of these members is bolted or riveted to the projecting flange of a spur gear 8.

The filtering drum is supported in a casing comprising a lower or base portion 10 and an upper portion 12 which is hinged to the lower portion at 14. Normally these two parts occupy the positions in which they are shown in Fig. 2, a tight joint being provided between them by a suitable gasket. This casing is provided with bearing members 15 at its opposite ends which support sleeve-like extensions 16, Fig. 3, projecting from the hubs of the respective spur gears 8. The upper portion 12 of the casing is provided with bearings which support a shaft 17 having two pinions 18—18 thereon which mesh with the respective spur gears 8 at the opposite ends of the drum and drive the drum, the shaft itself being driven by a belt connection to a pulley 19 fast thereon.

The pulp to be thickened is conducted to a head-box 20 which is connected by a pipe 21 to the lower part 10 of the casing, the flow of pulp to the casing being controlled by a valve 22. The head-box is higher than the casing and the valve 22 is so adjusted that the casing is substantially filled with pulp at all times during the normal operation of the apparatus, so that the drum 2 is completely submerged. As shown in Fig. 2, the casing is provided with a delivery or discharge opening 24 at one side of the drum, and the portion of the casing immediately below this opening consists of a

plate 25 extending the entire length of the cylinder and having an inner surface curved concentrically with the drum. This plate is adjustably secured at its ends to the stationary parts of the casing by bolts 26—26 passing through slots in a flanged portion of the plate. The clearance between the rotating screen and the inner surface of the plate is adjusted so that the flow of the unthickened pulp through the discharge opening is prevented. A similar construction is provided above the discharge opening and comprises a plate 27 secured by bolts 28, as in the construction just described.

It should be noted that the inner surfaces of the curved plates 25 and 27 are of such dimensions circumferentially of the drum that they cover, at all times, at least two of the projecting edges 29 that separate the adjacent flat faces of the drum. In other words, they each cover more than one flat face of the drum.

When the apparatus is in operation the casing is filled with pulp or "stuff", the entire drum being submerged, and the drum is driven very slowly in the direction indicated by the arrow, Fig. 2. A large proportion of the water drains through the screen and runs out the opposite ends of the drum, which are open, into the discharge chutes 30—30. This leaves a layer of thick slushy pulp on the surface of the drum which seals the space between the plate 25 and the projecting edges 29 of the drum. As the drum rotates slowly past the discharge opening 24 the thickened pulp held in the sector-like space formed between one of the flat faces of the drum and the inner face of the plate 25 is discharged through the opening 24, but any rush of the thin stock or unthickened pulp through this opening is prevented by the presence of the layer of pulp in the thin clearance space between the edges 29 of the drum and the inner curved surface of the plate 25. In other words, the flat faces of the drum cooperate with the curved face of the plate 25 to form discharge buckets which control the delivery of thickened pulp to the opening 24.

The upper curved plate 27 prevents leakage of the unthickened stock from above the drum to the opening 24, the drum apparently exerting a pumping action which carries the pulp upwardly away from the discharge aperture 24. Usually this upper plate is set somewhat closer to the periphery of the drum than is the lower plate 25. In this connection it may be pointed out that the machine can be operated to thicken pulp when the drum is rotated in either direction and that it is not necessary to have the drum entirely submerged, although the apparatus operates more rapidly, or has a greater capacity, other things being equal, when it is submerged.

The thickened pulp is discharged from the opening 24 substantially continuously and is of a comparatively uniform consistency. Furthermore, this consistency can be varied by varying the head of pulp in the box 20 or by changing the speed of rotation. Usually the speed of rotation is very slow, say for example, from eleven to twelve revolutions per minute.

For the purpose of cleaning the wire screen on the drum a stationary pipe 32 is led through the hollow hubs 16 and is positioned within the drum opposite the discharge opening 24. A series of small holes are drilled in the forward side of this pipe so that they direct a spray of clean water against the inner surface of the screen and thus tend to keep it clean.

In order to prevent the unthickened pulp from escaping at the ends of the drum a novel packing preferably is used. As shown in Fig. 3, the end of the casing is provided with a circular lip 33 surrounding the drum to receive packing 34, and a plate 35 is secured to the outer edge of the lip 33 by screws or bolts to hold the packing in place. This packing preferably consists of an endless rubber tube inflated so that it exerts a yielding pressure against the outer surface of the drum member 7 and maintains a tight joint between the ends of the drum and the casing.

It will now be understood that in this apparatus substantially the entire screening or filtering surface of the drum is utilized at all times during the normal operation of the machine. Due to this fact and to the further fact that the apparatus is operated under a certain hydraulic head, it performs the pulp thickening operation much more rapidly than do the prior machines designed for this work. Furthermore, the machine produces more uniform results. That is, the thickened pulp discharged from the machine is of a more uniform consistency than is that produced by the prior machines with which I am familiar. The particular machine shown is designed for washing or thickening sulphite stock but a machine of the same character is adapted for use with ground wood pulp, although I prefer to use a drum having a greater number of flat faces for operating on ground wood pulp. It will be understood that while I have herein referred to the drum as of polygonal shape in cross section, since this construction is convenient to manufacture and operates satisfactorily, that a true polygonal shape is not absolutely essential to producing the results above described, but that the faces of the drum may be somewhat convex or concave if desired.

It will also be understood that while I have herein shown and described the best embodiment of the invention of which I am at

present aware, this embodiment may be modified in many particulars without departing from the spirit or scope of this invention.

5 What is claimed as new is:

1. A pulp thickening apparatus comprising, in combination, a filtering drum, means for driving said drum, and a reservoir in which said drum may be submerged in pulp, said reservoir having an opening at one side of said drum for the discharge of thickened pulp.

2. A pulp thickening apparatus comprising, in combination, a filtering drum, means for driving said drum, a reservoir in which said drum may be submerged in pulp, said reservoir having an opening at one side of said drum through which the thickened pulp is discharged, and means for preventing the flow of unthickened pulp from said reservoir through said opening.

3. A pulp thickening apparatus, comprising, in combination, a filtering drum, means for driving said drum, a casing in which said drum is mounted, said casing forming a reservoir for unthickened pulp and having an opening therein at one side of said drum for the discharge of thickened pulp, said opening being below the normal level of the pulp in said casing, and means for preventing the flow of unthickened pulp through said discharge opening.

4. A pulp thickening apparatus comprising, in combination, a filtering drum, means for driving said drum, a casing in which said drum is mounted, said casing having a discharge opening at one side of said drum, and stationary parts at opposite sides of said opening fitting closely to the peripheral surface of the drum, said casing forming a reservoir in which the drum may be completely submerged in pulp.

5. A pulp thickening apparatus comprising, in combination, a rotary filtering drum of polygonal cross section, a casing therefor forming a reservoir for unthickened pulp and having an opening at one side of the drum for the discharge of thickened pulp, said opening being below the normal level of the pulp in said casing, said drum being separated from the parts of said casing at opposite sides of said opening by a small clearance space normally sealed by a layer of stock on the surface of the drum, and means for driving said drum.

6. A pulp thickening apparatus comprising, in combination, a filtering drum mounted to rotate about a substantially horizontal axis, means for driving said drum, a casing in which said drum is mounted, said casing forming a reservoir for pulp to be thickened and having a horizontal opening therein at one side of said drum for the discharge of the thickened pulp, said opening being below the normal level of the

unthickened pulp in the casing, and means cooperating with said drum to prevent the direct flow of unthickened pulp through said opening.

7. A pulp thickening apparatus comprising, in combination, a filtering drum mounted to rotate about a substantially horizontally axis, means for driving said drum, a casing in which said drum is mounted, said casing forming a reservoir for pulp to be thickened and having a horizontal opening therein at one side of said drum for the discharge of the thickened pulp, said opening being below the normal level of the unthickened pulp in the casing, and a part at the lower side of said opening having an inner curved surface extending for a substantial distance circumferentially of said drum and separated from said drum by a narrow clearance space, whereby said part cooperates with the drum to prevent the direct flow of unthickened pulp through said discharge opening.

8. A pulp thickening apparatus comprising, in combination, a filtering drum mounted to rotate about a substantially horizontal axis, means for driving said drum, a casing in which said drum is mounted, said casing forming a reservoir for pulp to be thickened and having a horizontal opening therein at one side of said drum for the discharge of the thickened pulp, said opening being below the normal level of the unthickened pulp in the casing, a part at the lower side of said opening having an inner curved surface extending for a substantial distance circumferentially of said drum and separated from said drum by a narrow clearance space, whereby said part cooperates with the drum to prevent the direct flow of unthickened pulp through said discharge opening, and means whereby said part may be adjusted to vary the width of said clearance space.

9. A pulp thickening apparatus comprising, in combination, a filtering drum mounted to rotate about a substantially horizontal axis, means for driving said drum, a casing in which said drum is mounted, said casing forming a reservoir for pulp to be thickened and having a horizontal opening therein at one side of said drum for the discharge of the thickened pulp, said opening being below the normal level of the unthickened pulp in the casing, and parts at the upper and lower sides of said opening having inner curved surfaces extending for a substantial distance along the circumference of said drum and separated from the peripheral surface of said drum by a narrow clearance space, whereby said parts cooperate with the drum to prevent the direct flow of unthickened pulp through said discharge opening.

10. A pulp thickening apparatus comprising, in combination, a filtering drum mounted to rotate about a substantially horizontal

axis, said drum being of polygonal cross section, a casing in which said drum is mounted, said casing being provided with a discharge opening at one side of the drum and having
5 surfaces at the upper and lower sides of said opening lying closely adjacent to the peripheral surface of the drum, the space between said drum and said surfaces being normally sealed by a layer of stock on the
10 surface of the drum, and means for driving said drum.

11. A pulp thickening apparatus comprising, in combination, a rotary filtering drum of polygonal cross section, a casing in which
15 said drum is mounted, said casing being provided with a discharge opening at one side of the drum, and a plate at one side of said discharge opening having a surface substantially concentric with the axis of the drum
20 and positioned close to the edges separating adjacent faces of the drum and of sufficient dimension circumferentially of the drum to overlie at least two of said edges simultaneously.

25 12. A pulp thickening apparatus comprising, in combination, a rotary filtering drum, a casing in which said drum is mounted, said casing comprising upper and lower portions hinged together, a shaft mounted on said
30 upper portion, and driving connections between said shaft and said drum.

13. A pulp thickening apparatus comprising, in combination, a filtering drum mounted to rotate about a substantially horizontal
35 axis, a casing in which said drum is mounted, said casing forming a reservoir in which

said drum may be submerged in unthickened pulp, means for rotating said drum, said casing having a horizontal opening therein at one side of said drum for the
40 discharge of the thickened pulp, and parts at the upper and lower edges of said opening cooperating with said drum to prevent the direct flow of unthickened pulp through said opening.

45 14. A pulp thickening apparatus comprising, in combination, a filtering drum of polygonal cross section, means supporting said drum for rotation about a horizontal axis, a casing in which said drum is mounted, said
50 casing forming a reservoir in which said drum may be submerged in unthickened pulp, means for rotating said drum, said casing having a horizontal opening therein at one side of said drum for the discharge of the
55 thickened pulp, and parts at the upper and lower edges of said opening cooperating with said drum to prevent the direct flow of unthickened pulp through said opening.

60 15. A pulp thickening apparatus comprising, in combination, an open ended filtering drum, a gear at each end of said drum and secured thereto substantially at the periphery of the drum, a shaft for each of said
65 gears, bearings supporting said shafts at opposite ends of the drum for rotation about a substantially horizontal axis, a driving shaft, and pinions carried by said driving shaft for driving said gears.

In testimony whereof I have signed my name to this specification.

CARLTON H. ALLEN.