

1,253,162.

Patented Jan. 8, 1918.

Fig. 1.

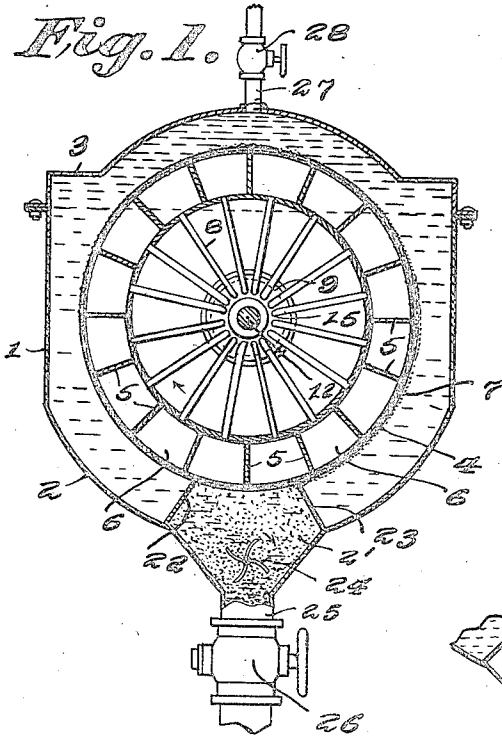
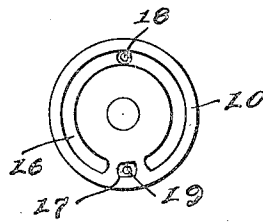


Fig. 3.

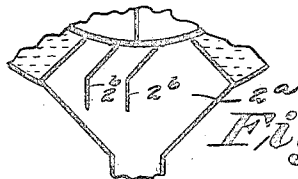


Fig. 5.

Fig. 2.

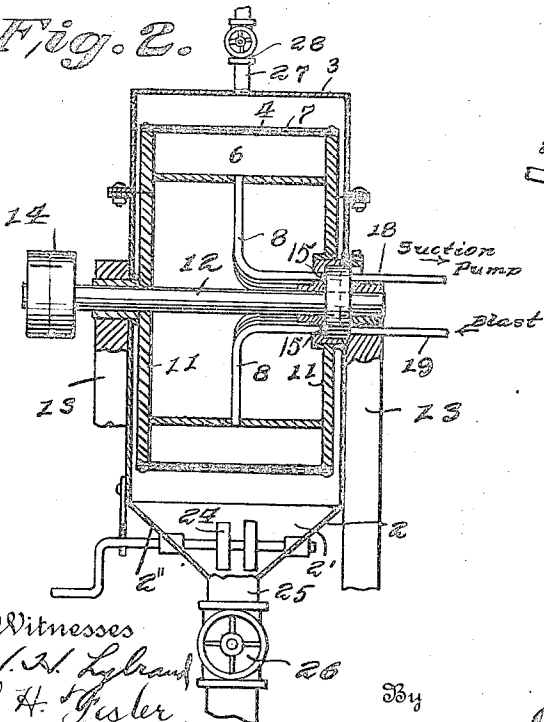
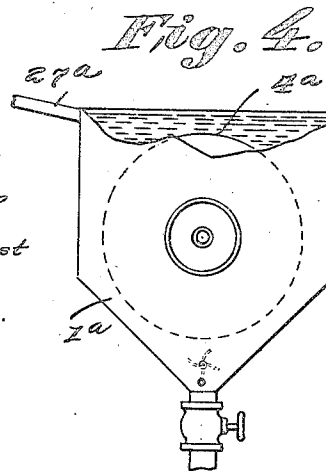


Fig. 4.

Witnesses
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UNITED STATES PATENT OFFICE.

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THICKENER.

1,253,162.

Specification of Letters Patent.

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Application filed September 1, 1915. Serial No. 48,522.

To all whom it may concern:

Be it known that I, HENRY B. FABER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Thickeners; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Difficulty has been experienced in the art of thickening pulp because very fine particles frequently remain in suspension for prolonged and even indefinite periods, so that gravity thickening has at best been found to be only partly satisfactory, and while attempts have been made to induce movement of solids in pulp toward each other to a condition of compactness providing the requisite thickness, entirely satisfactory results have not always followed.

It is the primary object of the present invention to overcome these difficulties, and to thereby render the action of thickening of pulp rapid, beyond any possible thickening incident to gravitation, and effective, beyond that of heretofore proposed apparatus employing force additional to or different from gravitation.

To this end, the invention comprises certain novel constructions, combinations and arrangements of parts, and certain novel steps in the treatment of pulp, all of which will hereinafter be rendered apparent and substantially pointed out in the claims.

As the steps of the process may be set forth with greater facility and completeness by reference to a physical embodiment of that part of the invention involving structure, an illustrative form of such structure is graphically presented in the accompanying drawing, in which,

Figure 1 is a vertical section, parts being seen in elevation.

Fig. 2 is a section taken on the plane indicated by line 2, 2 of Fig. 1, parts being seen in elevation.

Fig. 3 is a view in side elevation of the stationary member of the distributing valve showing the inner face.

Fig. 4 is a view in side elevation of a modified embodiment, parts being broken away.

Fig. 5 is a fragmentary sectional view of a further embodiment.

Referring to the drawing by numerals, 1 indicates a tank or container, having a hopper bottom 2, and a removable cover 3, bolted or otherwise appropriately secured in place so as to make a sealed chamber. Within the chamber is arranged the solids accumulator which consists of a rotary drum provided at its periphery with a separating medium or screen and having its peripheral portion divided into compartments connected by tubes through a distributing valve, with suction and blast means attached to respectively subject the compartments to exhaustion and compression alternately, for first causing influx of surrounding fluid through the separating medium and then outward discharge therethrough.

As illustrated in detail in the accompanying drawing, the said accumulator embodies a drum 4, divided by substantially radial partitions 5, 5, into compartments 6, 6. Compartments 6 are susceptible of a wide range of variation in their radial depth, and may be made of much less relative depth than illustrated. The outer side of the several compartments 6 are open and covered by a separating medium or screen 7, which screen may consist of a sheet of canvas or of other organic or inorganic substance designed to permit passage of liquid from within tank 1 to within the several compartments 6 without permitting entrance of solids. With each compartment 6 communicates, preferably at its inner side, a controlling tube 8, all of the tubes 8 preferably extending radially from the respective compartments 6 inward to the rotary portion 9 of a distributing valve, the rotary portion 9 coöperating with the stationary portion 10.

The framing of the drum may assume any appropriate form, so long as the several compartments 6 are sealed except for the screen 4 and communication of tube 8, such framing being indicated at 11, fixed to and carried by shaft 12, which is journaled in supports 13. The shaft 12 is driven in any appropriate manner as by belting engaging

pulley 14, and supplied with power from any appropriate source not illustrated. The section or part 9 of the distributing valve is fixed to the shaft 12, and the several pipes 8, after extending radially inward to a point beyond the periphery of the valve section 9, are extended into said section so as to communicate, respectively, with ports 15, which are uniformly distributed about the section 9, in position for registering with grooves 16 and 17 of the fixed section of part 10 of the distributing valve. The grooves 16 and 17 are arcuate in form, the groove 16 describing the major portion of a circle, and the groove 17 being comparatively short, and both grooves being struck on the same radii so that in the course of revolving, the several ports 15 register with the groove 16 for the greater portion of the revolution and are cut off from any communication at all as they pass the end of the groove 16, and then open communication with groove 17 as they cross the end thereof, remaining in communication until they pass beyond the grooves 17, where communication is again shut off until they reach the groove 16. A port 18 communicates through section 10 of the distributing valve with the groove 16, and a similar port 19 communicates with the groove 17, the port 18 being in communication with a suction pump or other suction means not illustrated. Port 19 communicates with a blast supply of any appropriate fluid such as water under pressure or air or other gas under pressure adapted to deliver a reverse current to the successive pipes 8 as they pass from communication with groove 16 to communication with groove 17.

The bottom 6 terminates with what may be designated as a thickened pulp chamber 2' formed by walls 2'' of the hopper bottom with a less degree of convergence than the main portion of the wall, and by division plates 22, 23, arranged within the container and extending across the same and fixed at their lower edges and ends to the bottom 2. The upper edge of the plate 22 extends as close to the outer surface of the separating medium or screen 4 as practicable without actually touching the same, so that while the plate 22 does not serve as a scraper and allows the free movement of the screen past its upper edge, it does prevent discharge of thickened solids from the chamber 2'. The upper edge of the plate 23 is spaced slightly from the separating medium 4 a distance approximately, as nearly as practicable, the maximum thickness of the coating of solids to be collected on the separating medium or screen 4. The distance between the upper edge of plate 23 and the surface of the screen may be varied by any appropriate means, as by substitution of a new plate whenever

a different form of pulp is to be treated, so as to maintain the space between the upper edge of the plate and the surface of the screen approximately correct relative to the thickness of the solids coating. The distance may, of course, be otherwise appropriately mechanically varied. Within the chamber 2' is arranged the agitator 24 which may assume any of various forms, that shown consisting merely of radially extending stirring arms carried by a rotary shaft journaled in the walls 2'' and having a part extending beyond one of the walls and provided with a crank or other operating device for enabling action of the agitator from time to time. The lower portion of the chamber 2' terminates in a discharge pipe 25 provided with a control valve 26, the pipe 25 extending to any appropriate point of discharge not illustrated.

A supply pipe 27 communicates with tank 1 at any appropriate point, as, for example, at the top thereof, and the supply through pipe 27 is controlled by a valve 28. The outer surface of the separating medium or screen 4 will for convenience of reference, be called the influx surface because throughout the major portion of the action, liquid is flowing inward through the medium 4 from the tank 1 to the compartments 6, and the inner surface of said medium will be referred to as the effluent surface, since the inflowing liquid is discharged as a clear effluent through the pipe 8 and away from the inner surface of the medium.

The operation of the structure disclosed is believed to be reasonably obvious but may be briefly described as follows: The tank 1 being filled with pulp to be thickened and the supply of pulp being maintained through pipe 27, valve 28 being left open, the valve 26 being closed, the solids accumulator is slowly rotated, communication of port 18 with the suction pump, and port 19 with the blast being open. However finely divided the solids, such solids will be caused to move with the flowing of the contained liquid toward the separating medium or screen 4, and, as the liquid penetrates the separating medium, a solids deposit is left on the surface of the medium. This layer of solids thus forming on the influx surface of the medium 4 continues to build up to the line where the solids coating is moved past the plate 23. At this line, communication is shut off from the suction means as the particular pipe 8 of the compartment 6 is at that time moved to the place for having its port 15 pass beyond the end of the groove 16. The continued movement of the drum brings the said port 15 into register with groove 17 just as the respective compartment 6 has assumed a position within the vertical planes of the chamber 2' and inside of the

plate 23. The reverse current or blast then delivered from port 19 through groove 17 and the respective pipe 8 effects a discharge of the solids coating within the chamber 2', and the compartment moves on until it again enters the body of pulp being thickened and again begins its work of gathering solids incident to the action of the suction within the respective compartment 6. This operation continues until the chamber 2' is filled with the thickened mass. In starting the operation, the chamber 2' will ordinarily be full of unthickened pulp, but this is rapidly forced out into the main part of tank 1 by the incoming thickened pulp, and thereafter, the mass within the chamber 2 will have a thickness and consistency such as may be required and controlled by the degree of difference in pressure maintained between the influx and effluent surfaces of the separating medium 4, which difference in pressure may be effected solely by the action of the suction through port 18 or may be the combined result of such suction plus the hydraulic head of the inflowing column through pipe 27, according to whether or not the said column is arranged to have an appreciable head, and, at all events, the compactness of solids will be incident to the pressure of the contained fluid in tank 1 exerted from the influx toward the effluent surface of the medium 4 in addition to the action of the suction through port 18. Of course, if the supply through pipe 27 is delivered in a manner rendering additional pressure impossible, as, for instance, in such a structure as seen in Fig. 4, the amount of pressure to which the accumulated and accumulating solids are subjected, is limited approximately to atmospheric pressure. Maximum difference in pressure between the influx and effluent surfaces of the separating medium 4 can be attained only by pressure exerted on the body of pulp in container 1, as by the hydraulic head of the incoming pulp, and this may be made sufficiently high to obviate any necessity for use of suction in addition to this pressure. For the treatment of some pulp, the structure seen in Fig. 1 is preferred, in the operation of which, the amount of pressure is not limited and may be maintained sufficiently high to insure the discharge of solids in chamber 2' with a relatively low moisture content. When the solids are sufficiently deprived of moisture to tend to clog within the chamber 2', the agitator 24 is either intermittently or continuously operated, and the valve 26 is opened from time to time to permit discharge of thickened pulp.

In Fig. 4 is illustrated an embodiment designed for the treatment of certain pulp where it is not desired to employ inwardly acting pressure in excess of that which may

be obtained by vacuum. In this figure is seen the tank 1^a in which is mounted the solids accumulator 4^a submerged in pulp supplied to the tank 1^a through a launder or other appropriate supply means 27^a. The structure and operation of the parts seen in Fig. 4 are otherwise identical with that above described.

In some instances it is found desirable to aid in that action of discharge of thickened pulp by the employment of deflecting means, such for example as seen in Fig. 5, wherein chamber 2^a (identical in structure and function to chamber 2') is provided with scraper-like plates 2^b, 2^b, one for deflecting the heavier parts of the coating before the reverse cleansing current has acted, and the other for deflecting pulp loosened by such current. The latter is accordingly set nearer the screen than the former. Plates 2^b are not scrapers in the true sense since they do not actually contact with the filtering medium.

What I claim is:—

1. In a pulp thickener, the combination of movable separating medium through which liquid from pulp is adapted to pass incident to difference in pressure at one side of the medium from that at the other and leave a deposit of solids on said separating medium, a pulp supply chamber adapted to contain a supply of pulp in contact with which said separating medium is adapted to move, and a thickened-pulp container communicating with the pulp supply and adapted to have solids on the separating medium discharge thereinto while such solids are in contact with thickened pulp in the container therefor.

2. In a pulp thickener, the combination with a pulp container, of separating medium movably mounted therein and adapted to be submerged in pulp within the container, means for maintaining a difference in pressure between opposite sides of the separating medium for effecting a flow of liquid from the pulp through the medium and leaving a deposit of solids on the medium, and a thickened-pulp chamber located for communicating with the separating medium and for receiving solids discharged therefrom, said chamber being also located for enabling pulp in the container to seal the chamber against effecting release of the difference in pressure.

3. In a pulp thickener, the combination with a pulp container, of separating medium movably mounted therein and adapted to be submerged in pulp within the container and for having liquid from the pulp passed through the separating medium, whereby a deposit of solids is adapted to be formed on said medium, and a thickened-pulp container communicating with the pulp con-

tainer in position to be subject to the pressure of the pulp, the thickened-pulp container being adapted to receive deposited solids discharged from the separating medium against the pressure of the pulp.

4. In a pulp thickener, the combination of a movable separating medium adapted to be submerged in pulp, a thickened-pulp chamber also immersed in the pulp and subject to the pressure thereof, means for discharging liquid from pulp through the separating medium, and means for dislodging solids from the medium in the thickened-pulp chamber.

5. In a pulp thickener, the combination with a container for pulp, of movably mounted separating medium within the container, means for effecting deposit of solids from pulp on said medium, a thickened-pulp chamber in said container in position for being submerged in pulp in the container, and means for dislocating solids deposits from the separating medium in the thickened-pulp chamber.

6. In a pulp thickener, the combination with a container, of a movably mounted separating medium within the container, a thickened-pulp chamber beneath the separating medium and past which said medium is adapted to move, said chamber being beneath the liquid level of the container and communicating with the container beneath said level, and means for dislocating solids deposited on the separating medium while moving past said chamber.

7. In a thickener, movable separating medium, a pulp container, means for moving the separating medium in pulp in the container, the separating medium being adapted for the passage of liquid of pulp and the deposit of solids of pulp for producing thickened pulp, and means for dislodging deposited solids from the separating medium while the medium is in a body of thickened pulp and for packing the solids therein.

8. In a thickener, a pulp container, a thickened-pulp chamber, separating medium adapted to be brought alternately into operative contact with the pulp in the container and the thickened pulp in the chamber, means for maintaining a difference in pressure between the influx and effluent portions of the separating medium for delivering liquid from pulp through the separating medium and the deposit on the separating medium of solids of pulp for producing thickened pulp, and means for reversing the difference in pressure when the separating medium is in operative contact with the thickened pulp for discharging the deposited solids against the pressure of thickened pulp in the chamber.

9. In a thickener, the combination of a

container for pulp, a drum rotatably mounted therein and having peripherally arranged separating medium, the drum being adapted to be submerged in pulp in the container, and the separating medium being designed to be penetrated by liquid from the pulp for leaving a deposit of solids on the separating medium, a thickened-pulp chamber beneath the drum and opening toward and against the separating medium for enabling direct contact of thickened pulp in the chamber with deposits on the separating medium, and means for discharging deposited solids from the separating medium while contacting with the contents of the thickened-pulp chamber.

10. In a thickener, the combination of a container for pulp, a drum rotatably mounted therein and bearing separating medium, the drum being adapted to be submerged in pulp in the container, means for effecting a difference in pressure between the influx and effluent portions of the separating medium for causing the separating medium to be penetrated by liquid from the pulp for leaving a deposit of solids on the separating medium, a thickened-pulp chamber opening toward and against the separating medium for enabling direct contact of thickened pulp in the chamber with deposits on the separating medium, and means for discharging deposited solids from the separating medium while contacting with the contents of the thickened-pulp chamber.

11. In a thickener, the combination of a container for pulp, a drum rotatably mounted therein and bearing separating medium, the medium being adapted to be submerged in pulp in the container, means for effecting a difference in pressure between the influx and effluent portions of the separating medium for causing the separating medium to be penetrated by liquid from the pulp for leaving a deposit of solids on the separating medium, a thickened-pulp chamber opening toward the separating medium for enabling direct contact of thickened pulp in the chamber with deposits on the separating medium, and means for reversing the difference in pressure for discharging deposited solids from the separating medium while such solids are in contact with the contents of the thickened-pulp chamber.

12. In a pulp thickener, movably mounted separating means for separating liquids from solids of pulp, said separating means being adapted to be moved from a body of pulp being separated by said separating means to a body of thickened pulp, containers for the respective body of pulp and body of thickened pulp, means for effecting the separating action while said separating means is in contact with the body of pulp, and means for discharging solids of pulp

from the separating means when the separating means is in contact with the body of thickened pulp.

13. In a pulp thickener, movably mounted
5 separating means for separating liquids
from solids of pulp, said separating means
being adapted to be moved from a body of
pulp being separated by said separating
means to a body of thickened pulp, con-
10 tainers for the respective body of pulp and
body of thickened pulp, means for effecting
the separating action while said separating
means is in contact with the body of pulp,
and means for discharging solids of pulp
15 from the separating means when the sepa-

rating means is in contact with the body of
thickened pulp, the containers being in com-
munication with each other and in such re-
lation to each other and to the separating
means as to enable movement of the sepa- 20
rating means from the body of pulp to the
body of thickened pulp while remaining in
contact with pulp.

In testimony whereof I affix my signature
in presence of two witnesses.

HENRY B. FABER.

Witnesses:

C. O. MAGNUSON,
L. N. FITZGERALD.