W. H. HARDING, Jr.

PAPER PULP APPARATUS.

APPLICATION FILED MAR. 4, 1915.

1,213,866.

Patented Jan. 30, 1917.

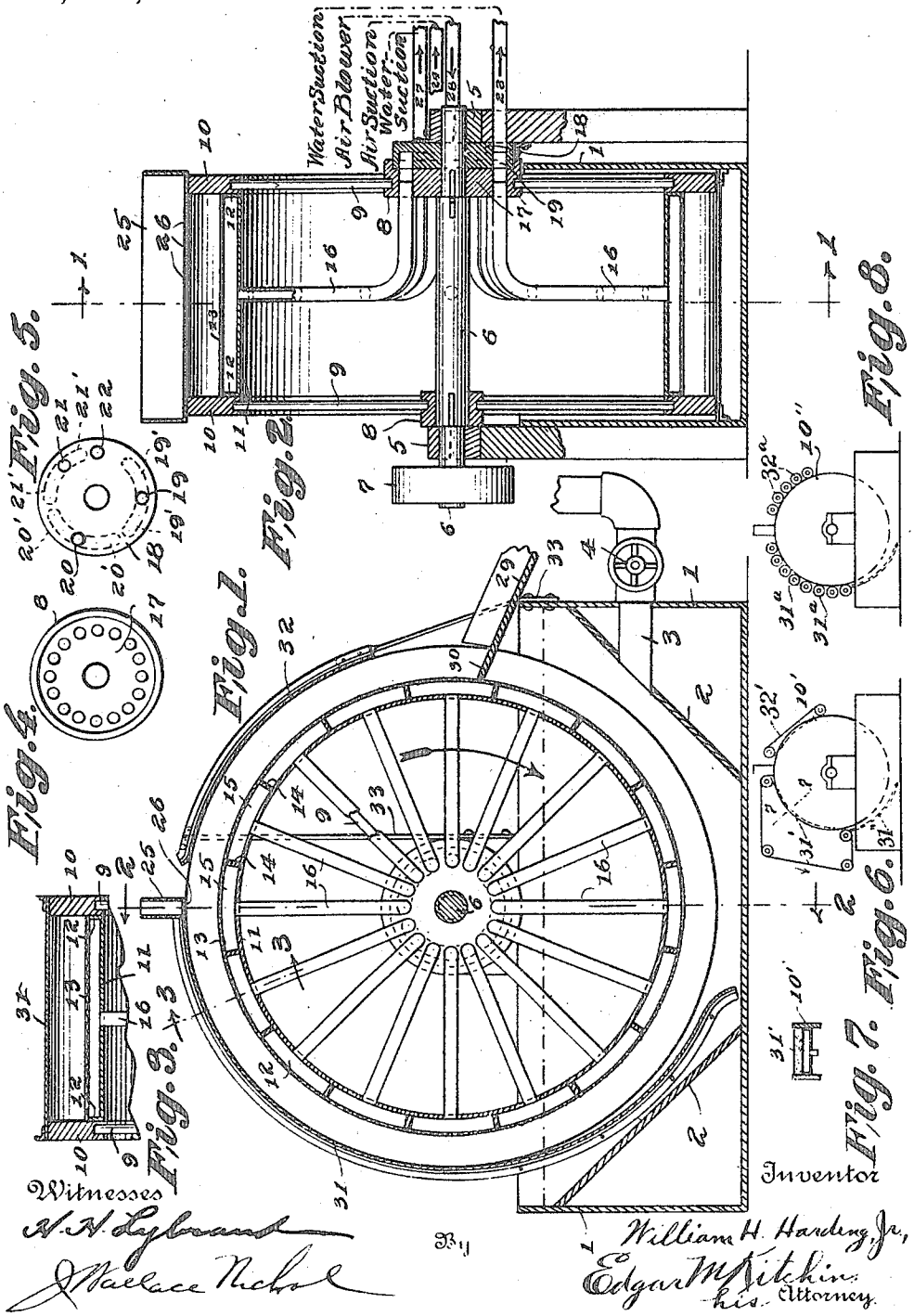


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Witnesses

W. N. Lybrand

J. Wallace Nichol

Inventor

William H. Harding, Jr.,

By Edgar M. Kitchin

his Attorney

UNITED STATES PATENT OFFICE.

WILLIAM H. HARDING, JR., OF NEW YORK, N. Y.

PAPER-PULP APPARATUS.

1,213,866. Specification of Letters Patent. Patented Jan. 30, 1917.

Application filed March 4, 1915. Serial No. 12,047.

To all whom it may concern:

Be it known that I, WILLIAM H. HARDING, Jr., 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 Paper-Pulp Apparatus; 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.

This invention relates to improvements in the art of treatment of paper pulp and more particularly to apparatus designed for effectively removing and recovering bleaching agents or other chemicals from pulp.

One of the objects in view is the effective control of the pulp for maintaining it conditioned to be subjected to the thickening action of a sucking apparatus drawing fluid away from the pulp, and a further object is the cleansing of the pulp under similar conditions.

With these and still further objects in view, as will in part hereinafter become apparent, and in part be stated, the invention comprises certain novel constructions, combinations and arrangements of parts as will be hereinafter specified and claimed. In the accompanying drawing, Figure 1 is a transverse, axial, sectional elevation of an apparatus embodying the features of the present invention. Fig. 2 is an axial section taken on the plane indicated by line 2—2 of Fig. 1. Fig. 3 is a fragmentary section taken on the plane indicated by line 3—3 of Fig. 1. Figs. 4 and 5 are elevations of the coöperating disks of the controlling valve detached. Figs. 6 and 8 are, respectively, outline views of slightly modified embodiments, the parts being seen on a reduced scale. Fig. 7 is a cross section taken on the plane of line 7—7 of Fig. 6.

In the handling of paper pulp, the washing of the bleaching agent or other chemicals from the pulp while in an ordinary vat with no attempt at saving the chemicals, or when saved, being in an undesirably dilute form, has become a recognized waste but proposed methods to prevent such waste have not worked out satisfactorily for many reasons, one of which resides in the nature of the pulp whose porosity is so perfect as to offer practically no resistance whatever to the passage of water or other cleansing agent. This very condition of porosity also renders it difficult, if not quite impossible, to retain any considerable amounts of pulp on a screen by the sucking of air therethrough and also prevents the building by suction of a coating of pulp on the screen having anything like uniformity in bulk or thickness.

The present invention is designed particularly to overcome the difficulties mentioned, and to render practicable the recovery of chemicals from paper pulp not diluted to an injurious extent.

Referring to the drawing by numerals, 1 indicates a container for paper pulp or waste waters containing fine particles of paper pulp. A false bottom 2 is preferably provided for tank 1. A waste water or pulp supply pipe 3 controlled by a valve 4 discharges into tank 1, or the pulp may be supplied to the tank over the upper edge thereof as preferred.

Journaled in bearings 5, 5, sustained upon or adjacent to tank 1, is a shaft 6 driven by belting not shown engaging a pulley 7 keyed to the shaft. Also keyed to the shaft is a rotary screen or filter consisting of hub portions 8, 8 fixed to shaft 6 and having radial spokes 9 carrying annuli 10 at their outer ends. Connecting the inner edges of the annuli 10 is an impervious plate 11 having outwardly, radially extending flanges 12 at its edges and within and snugly engaging the inenr faces of the annuli 10. A screen 13 either of wire mesh or wire mesh and fabric is fixed to the outer edges of the flanges 12 and completely surrounds and is spaced outwardly radially from plate 11. The annular area inclosed between plate 11 and screen 13 is divided by radial partitions 14, 14 forming sections 15, 15. To each of the sections 15 extends a controlling pipe 16, and all of the pipes 16 project radially inwardly and are then turned to extend axially to communicate with the plate 17 of the controlling valve, the said plate coöperating with a plate 18 to complete the valve, the plate 17 being preferably formed as a part of one of the hub portions 8 and thus being adapted to rotation while the plate 18 is held stationary by being fixed to the support of the adjacent bearing 5. The plate 17 is provided with a port for each pipe 16 extending axially through the plate and disposed to successively register with ports 19, 20, 21 and 22 of plate 18. The port 19 extends axially through the plate 18 and

communicates with a pipe 23 which extends to a suction pump for liquid, not illustrated, the inner face of plate 18 being formed with a circumferentially extended groove 19′ for keeping the port 19 in communication with all of the pipes 16 of those sections 15 which are submerged in tank 1. The port 20 communicates with an air suction pump, not illustrated, through a pipe 24, and the inner face of plate 18 is formed with a circumferentially extended groove 20′ communicating with port 20 for enabling the port 20 to maintain communication with all of the pipes 16 whose sections 15 are moving from the liquid level of tank 1 up to the point of cleansing. The cleansing is accomplished by the delivery of water or other cleansing fluid from an elevated tank 25, through apertures 26 in the bottom of the tank down on material carried by the rotary screen. Port 21 communicates through pipe 27 with a water suction pump, not illustrated, distinct from the pump connected with the pipe 23, and the inner face of plate 18 is formed with a circumferentially extended groove 21′ communicating with port 21 for enabling port 21 to remain in communication with the pipes 16 of the several sections 15 from the point of cleansing to the point of discharge. The port 22 communicates through pipe 28 to a source of compressed air supply, such as a blower, not illustrated, and the port 22 is located for communicating successively with the pipes 16, one at a time, as the respective sections 15 arrive at the point of discharge. A chute 29 is located for receiving the discharge and is provided with a scraper-like extension 30 projecting between the annuli 10 and disposed with its inner edge adjacent the screen 13.

A confining plate or retaining shield 31 extends from within tank 1 at a point below the rotary screen about the outer edges of the annuli 10 up to the tank 25. The lower portion of shield 31 is spaced from the annuli a considerable distance and is thence tapered toward the annuli until at about the liquid level of tank 4 the shield is substantially in touch with the annuli being spaced therefrom only a distance sufficient to allow the annuli to rotate freely without frictional contact with the shield. The shield may be supported by outside framework not illustrated, and is supported in the structure shown by being fixed to the tank 1, and the tank 25 may be supported in any appropriate way sufficiently out of contact with annuli 10 to allow free rotation thereof without frictional resistance. In the structure shown, the tank 25 is sustained by the upper end portion of shield 31.

A shield 32 extends from a point adjacent tank 25 about the outer edges of annuli 10 down to substantially the point of discharge. The shield 32 is constructed similar to shield 31 and is sustained by brackets 33 in position sufficiently spaced from the annuli 10 to allow free rotation thereof without frictional contact. Both the shields 31 and 32 at the points above the tank 1 should be sufficiently close to the annuli 10 to as far as possible prevent lateral spilling of material between the respective shield and the edges of the annuli.

In operation, the paper pulp from which the chemical or chemicals must be removed is supplied to tank 1, and the screen, consisting of the entire rotary wheel structure, is revolved while the several pumps connected with pipes 23, 24, 27 and 28 are operated. Quantities of the pulp are thus drawn against the face of screen 13 for the several sections 15 as they approach the lower portion of shield 31, and the wheel structure should be revolved sufficiently slowly so that the area between the screen 13 and the shield 31 will be substantially filled with pulp. As the pulp-laden portions of the screen ascend the inward taper of the shield 31 causes the pulp to become more compact and less liable to fall apart. As the shield 31 extends for substantially ninety degrees, there is no opportunity afforded for the pulp to fall away from the screen 13 and from between the annuli 10. As the pulp passes beneath tank 25 and while it is descending toward the point of discharge, it is washed with water supplied from tank 25. However, before reaching the point of the tank 25, the pulp will have been deprived of as much moisture as the suction pump connected with pipe 24 can draw therefrom, so that the pulp is in the best possible condition for having the chemical deposits washed therefrom. The wash water delivered from tank 25 passing through the pulp is drawn through pipe 27 to a different point for disposition from that of the richer solution drawn through pipe 23, and, therefore, the richer solution is not diluted, and the weaker solution resulting from cleansing with wash water from tank 25 may be concentrated before re-used in the bleaching vat.

The shield 32 is employed to insure that the pulp cannot be washed off from the screen by water supplied from tank 25 and to further insure maintenance of sufficient compactness to enable the pump connected with pipe 27 to effectively suck the wash water from the pulp. As the pulp passes beneath the lower end of shield 32, it receives an outwardly acting blast from port 22, and is thus discharged down chute 29.

In the recovering of finely divided pulp from waste waters, the operation will be substantially the same as that described, except that the screen will be rotated much more slowly to enable the building of an appropriate cake of pulp, and since the

waste waters are usually highly diluted, so far as chemicals are concerned, it will ordinarily not be necessary to use wash water from tank 25.

In Fig. 6 I have indicated an embodiment which, for the purposes of the appended claims, may be considered the preferred embodiment, and in which the rotary wheel or screen 10′ is provided with an endless belt 31′ disposed to act as a moving shield so as to retain the pulp in place and to move in the same direction with it to thereby eliminate liability of clogging from friction, and to further aid the retention of the pulp the belt 31′ is driven slightly faster than the rate of travel of the peripheral portion of screen 10′. The shield portion 31″ within the tank is stationary. A shield 32′ consisting of belting driven slightly slower than the travel of the peripheral portion of screen 10′ is located at the discharge side of the screen, and both belts 31′ and 32′ are of a width and are located to fit between the annuli of the screen structure. The structure is otherwise identical in detail and function to that just described.

In Fig. 7 is shown another modified embodiment consisting of the rotary wheel or screen 10″ having at one side a shield consisting of a series of rollers 31ª disposed to operate in lieu of the upper portion of shield 31, and having at the other side rollers 32ª operating in lieu of shield 32, the structure being otherwise the same in function and detail as that specified with respect to Fig. 1. Rollers 31ª and 32ª may be geared and driven, and in that event, the rollers are respectively driven at rates corresponding to the rates of travel of belts 31′ and 32′ respectively.

I claim:—

1. In paper pulp apparatus, the combination of a rotary screen adapted to have its lower portion dipping into a body of paper pulp, means for confining paper pulp in quantities of a thickness exceeding the maximum thickness of felt-elevated sheets of pulp, and mechanically directing the same toward and against the screen, and retaining it in engagement with the screen while such pulp is in substantially a vertical position.

2. In paper pulp apparatus, the combination of a rotary screen, a vat in which said screen rotates, means for maintaining a difference in pressure between the exterior and interior surfaces of the screen for causing paper pulp to collect in the form of a coating on the screen while in the vat in quantities exceeding in thickness the maximum thickness of felt-elevated sheets of pulp, and means for confining the coating of pulp against dislodgment from the screen during ascent from the body of pulp in the vat.

3. In paper pulp apparatus, the combination of a rotary screen, a vat for containing paper pulp into which the screen extends, means for maintaining a difference in pressure at the respective faces of the screen for building and retaining a coating of pulp on the exposed face of the screen, means directing paper pulp in the vat toward the exposed face of the screen, and additional means moving in the direction of travel of the screen for retaining the coating of pulp on the screen while substantially vertical.

4. In paper pulp apparatus, the combination, with a container for paper pulp, of a rotary screen extending into the container and adapted to be partly submerged in pulp, and traveling shields spaced apart and extending about exposed portions of the screen at the respective opposing ascending and descending parts of the screen.

5. In paper pulp apparatus, the combination of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of paper pulp on the screen, additional means for retaining the coating of pulp on the screen, and means for washing the pulp while so retained.

6. In paper pulp apparatus, the combination of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of pulp on the screen and for exhausting moisture from the coating so built, additional means for retaining the coating of pulp on the screen, and means for washing the pulp while so retained subsequent to such exhausting of moisture.

7. In paper pulp apparatus, the combination of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of pulp on the screen, and a shield for mechanically directing the pulp toward and retaining the coating of pulp on ascending portions of the screen.

8. In paper pulp apparatus, the combination of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of paper pulp on the screen, means for washing said coating, and shields at opposite sides of the washing means for mechanically retaining the coating of pulp on the screen.

9. In paper pulp apparatus, the combination of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of paper pulp on the screen, means for washing said coating, and moving shields at opposite sides of the washing means for mechanically retaining the coating of pulp on the screen.

10. In paper pulp apparatus, the combi-

nation of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of paper pulp on the screen, means for washing the coating of pulp, and a shield at one side of the washing means for mechanically retaining the coating of pulp on the screen.

11. In paper pulp apparatus, the combination of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of paper pulp on the screen, and a shield spaced from the screen at the point of approach of the built-up coating toward the shield, the shield converging thence toward and conforming substantially to the contour of the screen for a portion of its circumference in position for directing pulp toward and retaining pulp on ascending portions of the screen in quantities exceeding in thickness the maximum thickness of felt-carried sheets of pulp.

12. In paper pulp apparatus, the combination of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of paper pulp on the screen, a paper pulp containing tank into which a portion of the periphery of said screen extends, and a shield having its lower end within the tank spaced from the screen and extending thence upwardly and converging toward the screen to the upper portion of the tank and thence extending on a curved line conforming substantially to the contour of the screen for a portion of the circumference of the screen.

13. In paper pulp apparatus, the combination of a rotary screen, means for maintaining a difference in pressure at the respective sides of the screen for building and retaining a coating of paper pulp on the screen, annuli at opposite sides of the screen having portions extending radially beyond the face of the screen, and a shield extending contiguous to and along the edges of the annuli.

14. In paper pulp apparatus, the combination with a pulp container, of a rotary screen extending into the container and adapted to be partly submerged in pulp therein, and a traveling shield extending about an exposed portion of the screen for aiding in maintaining pulp in contact therewith, and retaining means for confining the pulp against the screen between the plane of the surface of the pulp in the container and the lower portion of the traveling shield.

15. In paper pulp apparatus, the combination, with a container for paper pulp, of a rotary screen extending into the container and adapted to be partly submerged in pulp, and traveling shields extending about different exposed portions of the screen at the respective opposing ascending and descending parts of the screen for retaining pulp in engagement therewith.

16. In paper pulp apparatus, the combination, with a container for paper pulp, of a rotary screen extending into the container and adapted to be partly submerged in pulp, and a shield traveling with the peripheral portion of the screen about an exposed portion thereof and at a less rapid rate.

17. In paper pulp apparatus, the combination, with a container for paper pulp, of a rotary screen adapted to be partly submerged in pulp in the container, and traveling shields extending about exposed portions of the screen, each traveling with the screen and one traveling at a greater rate and the other at a less rate than the screen.

18. In paper pulp apparatus, the combination, with a container for paper pulp, of a rotary screen adapted to be partly submerged in pulp in the container, traveling shields extending about exposed portions of the screen, each traveling with the screen and one traveling at a greater rate and the other at a less rate than the screen, and means for delivering water on to pulp sustained by the screen between the shields.

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

WILLIAM H. HARDING, JR.

Witnesses:
EDGAR M. KITCHIN,
HERMAN A. HOLSTER.