This invention relates to pulp screens and more particularly to the horizontal type of screen in which the rotor is provided with longitudinally disposed dilution water passages radiating outwardly from the axis of the rotor, whereby the dilution water is delivered at or near the rotor for washing of the thickened pulp mat without shock or turbulence and without forcing the rejected slivers and other foreign matter through the screen.

The invention consists essentially in building into the rotor or impeller of a pulp screen a series of longitudinally disposed radiating passages which will carry the dilution water directly to the area of thickened pulp at the inner surface of the screen, whereby the dilution water will mix in a gentle manner with the pulp so as to wash the pulp fibres and carry them through the screen without at the same time forcing reject material through the screen. The invention is further characterized in that a portion of the unthickened pulp flowing into the screen is permitted to flow radially about the outer surfaces of the internal passages to mix directly with the dilution water at the exit of the internal passages.

The object of the invention is to provide means whereby dilution water in a pulp screen is delivered at or near the inner peripheral surface of the screen. A further object of the invention is to provide means whereby a portion of the unthickened pulp in a pulp screen is constrained to flow radially about the outer surfaces of radially disposed dilution water passages.

A further object of the invention is to design the longitudinal length of the dilution water radial passages to suit the grade of coarseness of the pulp to be treated.

These and other objects of the invention will be apparent from the following description and the accompanying drawings in which:

FIG. 1 is a longitudinal vertical section of a pulp screen in which the rotary impeller has a double bladed section forming radial passages directing dilution water close to the inner surface of the screen.

FIG. 2 is a longitudinal vertical section of the rotary impeller only, as shown in FIG. 1.

FIG. 3 is an end view of the rotor shown in FIG. 2 and looking in the direction of the arrows 3–3.

FIG. 4 is a partial longitudinal exterior view of the rotary impeller shown in FIG. 2.

FIG. 5 is a modified form of rotor in which the double bladed section is extended in length to near the outlet end of the rotor impeller.

FIG. 6 is a partial vertical section of a screen rotary impeller in which the double blades forming the radial passages are of the same diameter.

FIG. 7 is a partial cross-section in the line 7–7 of FIG. 6.

FIG. 8 is an enlarged detail section showing the apertures in the hollow dilution water passage communicating with the radial passages in the rotary impeller.

FIG. 9 is an enlarged detail section of the two dilution water passages and showing the seal between them.

Referring to the drawings, a typical form of horizontal pulp screen is shown in FIG. 1 of the drawings and consists of a frame 5, having a pulp inlet 6 and a reject exit 7. An annular screen 8 is mounted in the frame 5 axially parallel about the composite drive shaft 9.

The drive shaft 9 with its rotary impeller 11 is rotated within the frame 5 by means of the drive pulley 10.

In FIG. 1 the composite drive shaft 9 is formed of an outer tubular member 12 and a stub shaft 13 projecting from one end of the tubular member 12. The tubular member 12 is journalled in the frame 5 by the bearing 14 while the stub shaft 13 is journalled in the frame 5 by the bearing 15. An open ended tubular member 16 is mounted axially within the tubular member 12. End rings 17 and 18 seal the ends of the tubular member 16 with the inner surface of the tubular member 12 to form an annular passage 19. Dilution water is fed to tubular member 16 through the inlet 20 while dilution water is fed to the annular passage 19 through the inlet 21.

The screen rotary impeller 11 driven by the composite shaft 9 consists of a series of radially disposed blades 22, mounted on the outer surface of the tubular member 12 of the drive shaft. These blades 22 are held in spaced angular position relative to each other by the rings 23 and 24. Each of the blades 22 are cut-out at 25 opposite the axial pulp inlet 6a about the stub shaft 13 in order to permit entry of the pulp into the screen with the least interference.

A series of blades 26 project radially outwards from the outer surface of the tubular member 12. These blades 26 are disposed, one between each of the blades 22 and extend lengthwise of the impeller from the inner end 25a of the cut-outs 25 for at least a portion of the length of the impeller towards the discharge end of the screen. A pair of annular baffles 27 and 28 are attached to the radial edges of the blades 26 and to the adjacent surfaces of the blades 22 to form directed passages 29. Apertures 30 drilled in the surface of the tubular member 12 in the area between the baffles 27 and 28 permit the dilution water from the inlet 20 to pass through the tubular member 16 into that portion 31 of the tubular member 12 between the end 13a of the stub shaft 13 and the end ring 17, and thence through the passages 29 to be discharged close to the inner peripheral surface of the screen 8.

The baffle 27 is provided with apertures 32 located adjacent the tubular member 12 and between the blades 26 defining the passages 29 and the adjacent blades 22 to permit the flow of pulp into the area between the baffles 27 and 28 and mix with the dilution water at the exit of the passages 29.

The surface of the tubular member 12 between the baffle 28 and the discharge end of the screen has the perforations 33 to permit dilution water from the inlet 21 to pass through the annular passage 19 into the body of the rotary screen for final washing of the pulp and the carrying away of reject material through the outlet 7.

The spacing between the baffles 27 and 28 will depend greatly on the type of pulp which is to be cleaned. Where the pulp contains a relatively small amount of slivers and other foreign matter the spacing between the baffles can be relatively small as shown in FIGS. 1 and 2 and by the same token the blades 26 need not extend to the full diameter of the rotor. In addition, the diameter of the baffle 28 can be smaller than the diameter of the baffle 27. This permits the relatively clean pulp to flow around the periphery of the baffle 27 and be further cleaned by the dilution water at the exit of the passages 29.

Where relatively coarse pulp containing a large amount of slivers and other foreign matter is to be treated, the
baffles 27a and 28a are spread apart as shown in FIG. 5 permitting a greater injection of dilution water into the pulp close to the periphery of the impeller. When the baffles are spaced apart as shown in FIG. 5, the length of the tubular member 16a is shortened to coincide with the location of the baffle.

In the modification shown in FIGS. 6 and 7 the diameter of the baffles 27b and 28b is increased to coincide with the outer longitudinal edge of the blades 22 and the blades 26b are also extended outwardly to extend the radial length of the passages 29.

In the operation of this invention the impeller with its built-in dilution passages having first been assembled to suit as near as possible, the grade of coarseness of the pulp to be treated, the pulp is allowed to flow into the screen through the inlet 6 and axially about the shaft 13 towards the first baffle 27. The baffle 27 diverts the larger quantity of the pulp radially outwards towards the inner periphery of the screen 8 where it forms a thickened mass. A portion of the pulp flowing into the screen passes through the apertures 32 in the baffle 27 and is diverted radially outwards by the baffle 28. At the same time, dilution water from two separate inlets 20 and 21 is delivered to the interior of the screen. The water from the inlet 20 is fed directly to the internal passages 29 in the impeller and is mixed with both the thickened pulp on the inner peripheral surface of the screen 8 and with the pulp flowing radially outwards between the baffles 27 and 28. The pulp washed by the dilution water from the passages 29 is gently cleaned and washed through the apertures in the screen 8 while the heavier reject material is permitted to move axially along the screen to beyond the baffle 28. Further washing of the coarse pulp beyond the baffle 28 is done by the dilution water from the inlet 21 which passes through the apertures 33 into the body of the screen beyond the baffle. The pulp fibres remaining are now separated from the reject material and pass through the screen 8 while the reject material is washed through the outlet 7.

The differences in longitudinal length of the internal dilution water passages as shown between FIGS. 2 and 3 permits of the washing out of a maximum of pulp fibres from slivers or other foreign matter in the shortest possible time and without forcing any slivers or foreign matter through the screen. Furthermore, the blending of the dilution water and relatively thin pulp at the periphery of the impeller with the thickened pulp, results in a gentle washing of the pulp and its separation from slivers without forcing of the slivers against and through the screen, with sufficient water in the vicinity of the screen to wash the slivers along beyond the baffle 28 for final washing and discharging of the reject material through the outlet 7.

What we claim is:

1. In a pulp screen including an annular screen and a rotary impeller, a pulp stock inlet located axially with respect to said impeller, a hollow drive shaft, the said impeller comprising a series of blades projecting radially outwards from said hollow drive shaft, a pair of baffles set transversely of the axis of the impeller, a second series of blades projecting radially outwards from said hollow drive shaft, and located longitudinally of the impeller between said transverse baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages open at their outer ends adjacent the inner surface of the said screen, the said hollow shaft having a series of apertures in its surface area between the planes of said baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages open at their outer ends adjacent the inner surface of the said screen, and with said hollow shaft having a series of apertures in its surface area between the planes of said baffles and communicating with the said radiating passages, the said baffles and the blades forming the walls of said radiating passages.

2. In a pulp screen including an annular screen and a rotary impeller, a pulp stock inlet located axially with respect to said impeller, a hollow drive shaft, the said impeller comprising a series of blades projecting radially outwards from said hollow drive shaft, a pair of baffles set transversely of the axis of the impeller, a second series of blades projecting radially outwards from said hollow drive shaft, and located longitudinally of the impeller between said transverse baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages open at their outer ends adjacent the inner surface of the said screen, and with said hollow shaft having a series of apertures in its surface area between the planes of said baffles and communicating with the said radiating passages, the said baffles and the blades forming the walls of said radiating passages.

3. In a pulp screen including an annular screen and a rotary impeller, a pulp stock inlet located axially with respect to said impeller, a hollow drive shaft, the said impeller comprising a series of blades projecting radially outwards from said hollow drive shaft, a pair of baffles set transversely of the axis of the impeller, a second series of blades projecting radially outwards from said hollow drive shaft, and located longitudinally of the impeller between said transverse baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages open at their outer ends adjacent the inner surface of the said screen, and with said hollow shaft having a series of apertures in its surface area between the planes of said baffles and communicating with the said radiating passages, the said baffles and the blades forming the walls of said radiating passages.

4. In a pulp screen as set forth in claim 1, in which the said transverse baffles and radiating passages are located intermediate of the length of the said impeller.

5. In a pulp screen as set forth in claim 1, in which the said second mentioned blades are of less radial length than the first mentioned blades to locate the outlet end of the radiating passages radially inwards from the periphery of the impeller.

6. In a pulp screen as set forth in claim 1, in which the transverse baffle adjacent the stock inlet of the screen is of less diameter than that of the other of the pair of baffles, and the open ends of the radiating passages are set at an angle in the plane of the periphery of the pair of baffles.

7. In a pulp screen as set forth in claim 1, in which the transverse baffle adjacent the stock inlet of the screen has a series of apertures therethrough, the said apertures being offset from the said radiating passages.

8. In a pulp screen including an annular screen and a rotary impeller, a pulp stock inlet located axially with respect to said impeller, a hollow drive shaft, the said impeller comprising a series of blades projecting radially outwards from said hollow drive shaft, a pair of baffles set transversely of the axis of the impeller, a second series of blades projecting radially outwards from said hollow drive shaft, and located longitudinally of the impeller between said transverse baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages open at their outer ends adjacent the inner surface of the said screen, the said hollow shaft having a series of apertures in its surface area between the planes of said baffles and communicating with the said radiating passages and means to supply dilution water to said hollow shaft and said radiating passages.

9. In a pulp screen including an annular screen and a rotary impeller, a pulp stock inlet located axially with respect to said impeller, a hollow drive shaft, the said impeller comprising a series of blades projecting radially outwards from said hollow drive shaft, a pair of baffles set transversely of the axis of the impeller, a second series of blades projecting radially outwards from said hollow drive shaft, and located longitudinally of the impeller between said transverse baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages open at their outer ends adjacent the inner surface of the said screen, the said hollow shaft having a series of apertures in its surface area between the planes of said baffles and communicating with the said radiating passages and means to supply dilution water to said hollow shaft and said radiating passages.

10. In a pulp screen including an annular screen and a rotary impeller, a pulp stock inlet located axially with respect to said impeller, a hollow drive shaft, the said impeller comprising a series of blades projecting radially outwards from said hollow drive shaft, a pair of baffles set transversely of the axis of the impeller, a second series of blades projecting radially outwards from said hollow drive shaft, and located longitudinally of the impeller between said transverse baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages open at their outer ends adjacent the inner surface of the said screen, the said hollow shaft having a series of apertures in its surface area between the planes of said baffles and communicating with the said radiating passages, the said baffles and the blades forming the walls of said radiating passages.
means to feed dilution water separately to the said radiating passages and through the said second series of apertures in the hollow shaft.

9. In a pulp screen including an annular screen and a rotary impeller, a pulp stock inlet located axially with respect to said impeller, a hollow drive shaft, the said impeller comprising a series of blades projecting radially outwards from said hollow drive shaft, a pair of baffles set transversely of the axis of the impeller, a second series of blades projecting radially outwards from said hollow drive shaft and between the said pair of baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages whose open outer ends are located at the periphery of the said baffles, the said hollow shaft having a series of apertures in its surface area between the planes of said baffles and communicating with the said radiating passages, the said hollow shaft having a second series of apertures in its surface area beyond the baffle remote from said stock inlet, and means to feed dilution water separately through said hollow shaft to the said radiating passages and through the said second series of apertures in the hollow shaft.

10. In a pulp screen including an annular screen and a rotary impeller, a pulp stock inlet located axially with respect to said impeller, a hollow drive shaft, the said impeller comprising a series of blades projecting radially outwards from said hollow drive shaft, a pair of baffles set transversely of the axis of the impeller, a second series of blades projecting radially outwards from said hollow drive shaft and between the said pair of baffles and positioned one between each of said first mentioned blades and forming therewith and with said transverse baffles a series of radiating passages whose open outer ends are located at the periphery of the said baffles, the said hollow shaft having a series of apertures in its surface area between the planes of said baffles and communicating with the said radiating passages, the said hollow shaft having a second series of apertures in its surface area beyond the baffle remote from said stock inlet, and means to feed a portion of pulp stock into the area between said baffles along said radiating passages.

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