

Nov. 25, 1924.

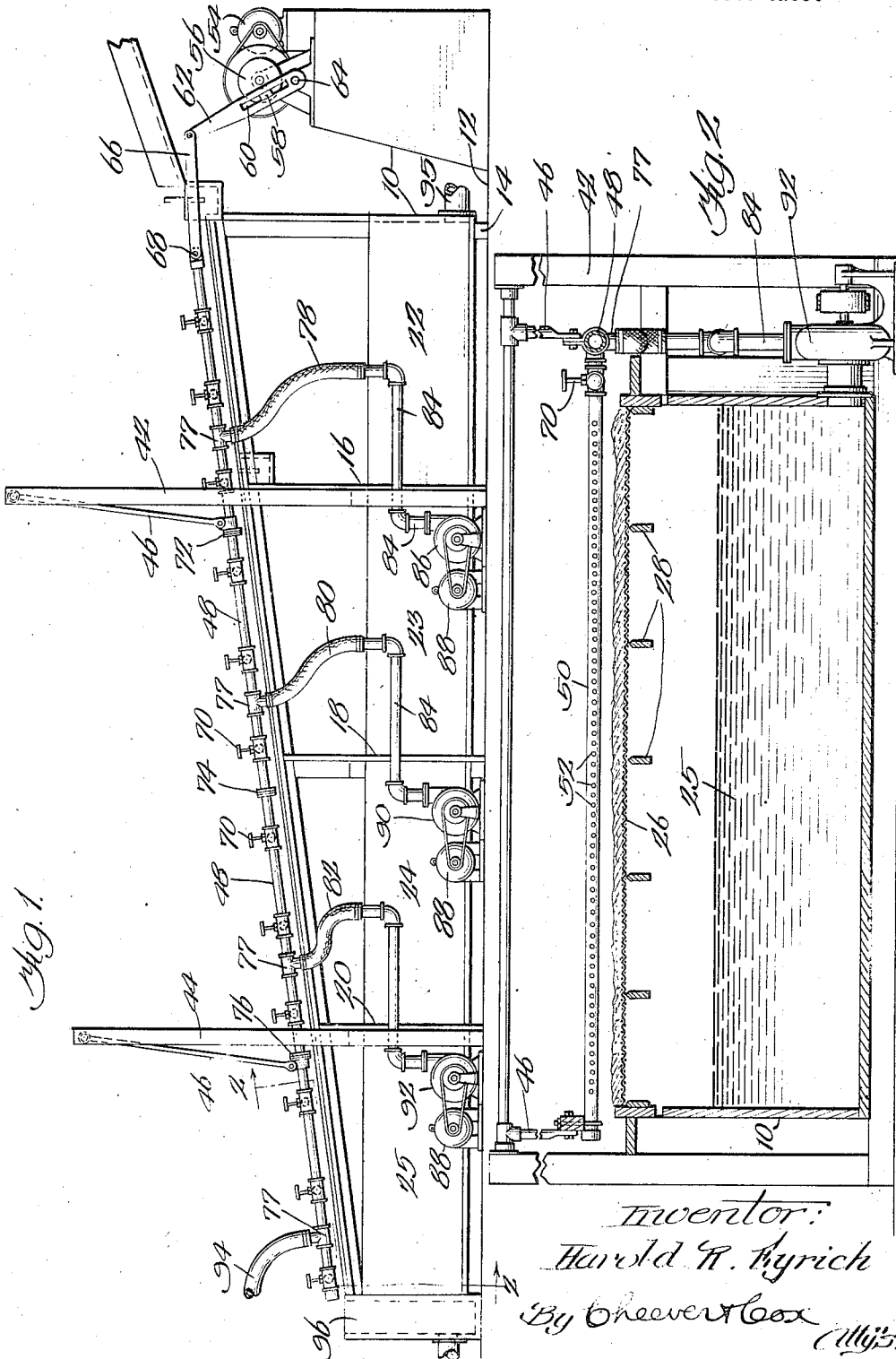
H. R. EYRICH

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METHOD OF AND APPARATUS FOR PULP WASHING

Filed March 25, 1922

3 Sheets-Sheet 1



Nov. 25, 1924.

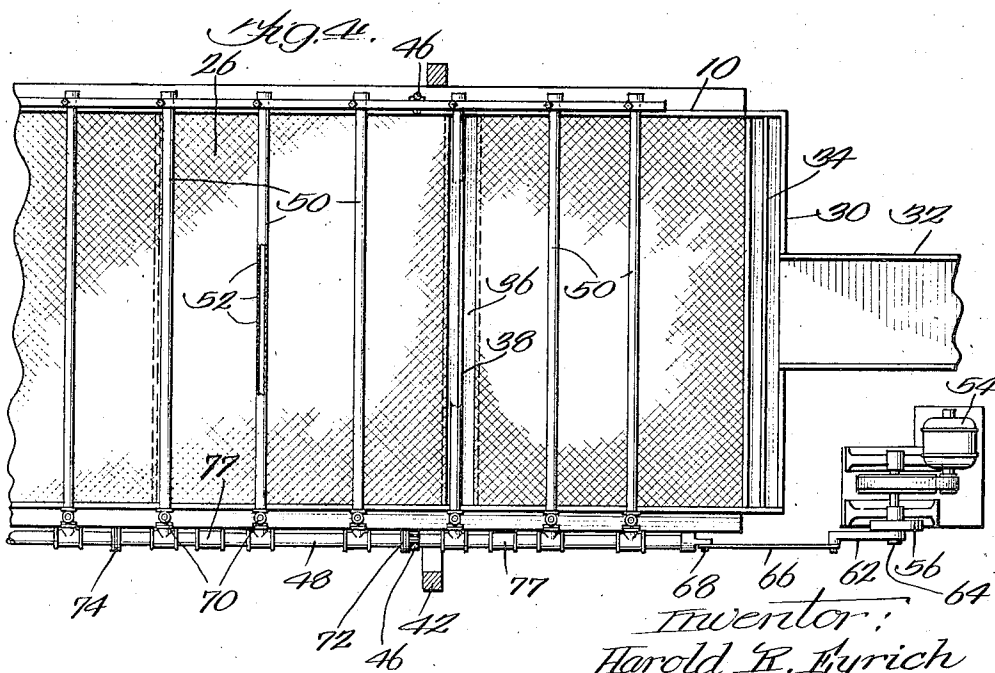
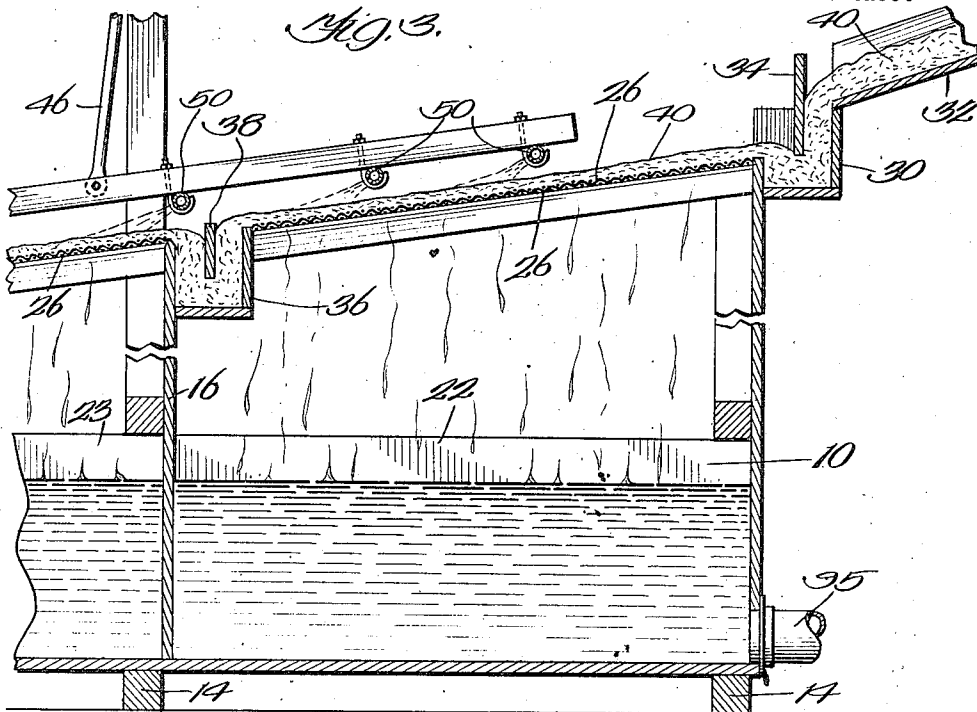
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METHOD OF AND APPARATUS FOR PULP WASHING

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3 Sheets-Sheet 2



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METHOD OF AND APPARATUS FOR PULP WASHING

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Fig. 5.

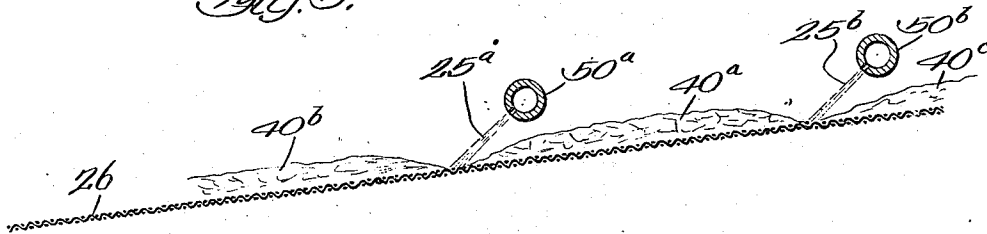


Fig. 6.

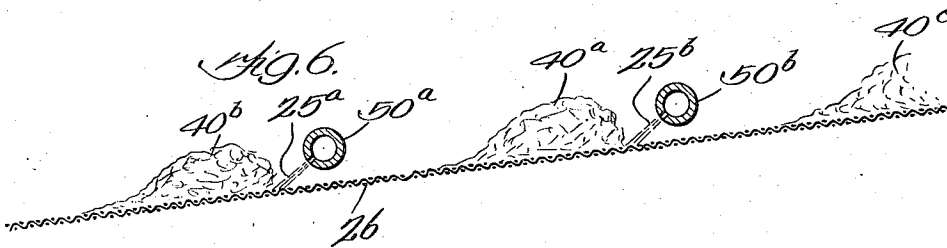


Fig. 7.

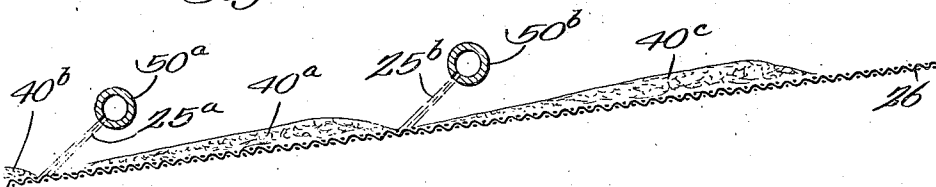
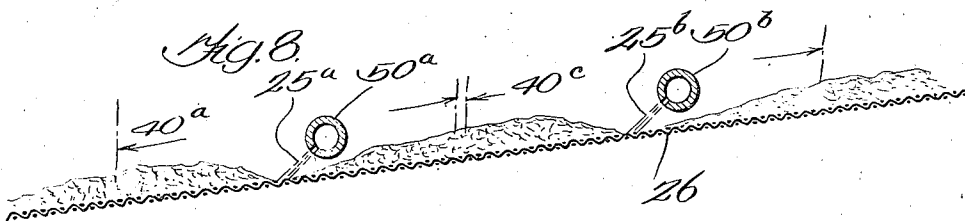


Fig. 8.



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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR PULP WASHING.

Application filed March 25, 1922. Serial No. 546,823.

To all whom it may concern:

Be it known that I, HAROLD R. EYRICH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Methods of and Apparatus for Pulp Washing, of which the following is a specification.

This invention relates to machines for washing pulp material made from torn or otherwise macerated stock, an example of such material being previously printed paper stock from which it is desired to remove the ink so that new paper made from the stock may be used again in printing.

One of the principal objects of the invention is to provide mechanism in which the initial stock is all carried through the machine in one continuous path along which the complete washing is effected before the end of that path is reached, thereby doing away with the waste which occurs in prior devices through more or less unpreventable repeated rewashings of certain parts of the stock by the machine. A further object of the invention is to provide a machine in which efficient washing is done through the use of a minimum amount of water and with a minimum loss of stock from the charge passing through the machine for the purpose of being washed. Another object is to provide mechanism by which the stock, as it passes through the machine, is subjected to successive scrubbing and draining actions, thereby to produce a more complete and satisfactory washing than has heretofore been possible.

The invention consists in means for attaining the foregoing objects which can be easily and cheaply made, which is very satisfactory in use and not readily liable to get out of order, and particularly in many features and details of construction which will be hereafter more fully set forth in the specification and claims.

Referring to the drawings, in which like numerals designate the same parts throughout the several views—

Figure 1 is a side elevation of a commercial form of mechanism now in use illustrating this invention in its preferred construction;

Figure 2 is a sectional end view on the irregular line 2—2 of Figure 1;

Figure 3 is an enlarged side view, largely in section, of the first drain box and associated mechanism at the right hand end of Figure 1;

Figure 4 is a plan view of approximately the right hand half of the mechanism of Figure 1;

Figures 5 to 8 are diagrammatic views showing the progress of a given body of stock to be washed as it passes through one cycle of operation of the machine.

The mechanism shown in the drawings is built above a horizontally disposed, elongated water tank 10 sustained above the floor 12 in any suitable desired manner, as for instance by the cross blocks 14. This tank is divided intermediate of its length by partitions 16, 18 and 20, into a plurality of suitable sized water receptacles occupied by different separate bodies of water 22, 23, 24 and 25.

Suitably supported above the tank 10, subdivided as just described, is an inclined wire screen 26 of suitable mesh so as to retain stock being washed, in large measure at least, on the upper surface thereof and allow water in such stock to pass through it into the adjacent one of the separate divisions of tank 10 heretofore described. In Figure 2, the longitudinal supporting bars 28 are shown suitably spaced to sustain this wire screen 26 in a substantially smooth condition regardless of the stock to be washed which may be upon it, as hereafter described.

At the higher end of the inclined screen 26, the right hand end as viewed in Figure 1, is placed a conventional form of head box 30 entered by a chute or spout 32 adapted to receive the pulp from any suitable source. This head box is the conventional form of apparatus well known in the art and includes a dividing partition or dam 34 extending across it in such a position that the material to be washed delivered by spout 32 has to flow under it, as shown in Figure 3, before reaching the upper end of the screen 26. In similar manner, another head box 36 having a cross partition or dam 38 is interposed across the wire screen 26 immediately adjacent to the right hand side of partition wall 16 heretofore referred to, extended upward as shown in Figure 3. A portion of the screen 26 is cut away at this point

as shown in Figure 3, for the reception of this head box.

The reason for the introduction of the head boxes 30 and 36 is that when material 5 to be washed 40 is delivered by member 32 at the upper end of the screen, that material is always wet and perhaps accompanied by a considerable volume of water which if uncontrolled would allow the water 10 carried material 40 to spread itself unevenly over the screen 26 with resulting unsatisfactory operation of the device and again, this same material 40 receives additional water, as hereafter described, in passing along the 15 wire screen 26 over the top of the first water chamber of the tank 10, and this water might, but for the head box 36, in the same manner distort the successful operation of the device. By installing these head boxes 20 with the control dams 34 and 38, as shown, any irregularities in the propulsion of different parts of the material 40 which are present in it as it is delivered onto the screen, are removed by the time the material 25 passes the second head box 36 so that in its subsequent passage to the left as viewed in Figure 1, down screen 26, the operation as hereafter described may take place without the use of additional head boxes, 30 although they could be inserted without departing from this invention.

Suitably supported by any suitable means, as for instance two pairs of upright supports 42 and 44 and their pivotally supported 35 links 46, is a pipe frame device 48—50, reciprocable lengthwise of and immediately adjacent to the wire screen 26 in such manner that water or other cleansing liquid delivered through pipe 48 to pipes 50, and 40 thence to nozzle perforations 52 therein will, on emerging from the perforations, strike preferably in an inclined direction against the screen 26 to effect washing action, as hereafter described.

45 Suitable means are provided for reciprocating this pipe frame mechanism longitudinally of the screen 26, the particular apparatus here shown comprising the motor 54 driving a crank wheel 56 carrying a crank 50 pin 58 sliding in an elongated slot 60 in a lever 62 pivoted at 64 below the wheel 56 and connected at its upper end above the wheel by connecting rod 66 to a pin 68 on the end of pipe 48. The construction of the 55 parts just described is such that in obvious manner rotation of wheel 56 in a clockwise direction by the motor 54 causes the pipe 48 to travel rapidly to the right as viewed in Figure 1, or up screen 26 and to move much 60 more slowly in the opposite direction, this due to the difference in length of the path of travel which the crank pin 58 has to traverse across the axis of the shaft of wheel 56 as that wheel rotates.

65 This quick upward or return movement

of the pipe mechanism 48 just described is very desirable, but is not required for a successful operation of the mechanism as hereafter described.

Each of the pipes 50 is preferably connected 70 to the pipe 48 through the agency of a control valve 70 of conventional form by which the operator may regulate the flow of water from pipe 48 to that particular pipe 50 and thence to the nozzles 52 therein. 75

While the pipe 48, as heretofore generically referred to, is externally one continuous pipe, it is internally far from that. The valve devices 70 and associated control spray 80 pipes 50 are divided into groups, in the particular case illustrated of three spray pipes and separated in the pipe 48 from each other by rigid partitions or couplings 72, 74 and 76, and again, each section of pipe 48 which 85 includes a group of spray pipes 50 as just described, is provided intermediate said spray pipes with a T-member 77 through which water is introduced for that particular group of spray pipes. Sections of flexible hose, 78, 80, 82 and pipes 84 are provided one for each such T, through which 90 water may be introduced into the adjacent portion of pipe 48 and thence to the adjacent group of spray pipes 50.

Pipe 78 is supplied with water through 95 pipe connections 84 leading to a pump 86 suitably driven by any suitable means, in the particular case here illustrated by an electric motor 88, and is so arranged as to take its supply of water from the body of 100 water 23 of tank 10 heretofore referred to. In like manner, pipe 80 is suitably connected to a pump 90 which draws water from the portion 24 of the water in tank 10. Similarly, pipe 82 is connected to a pump 92 105 which takes up water portion 25 from tank 10. Finally, pipe 94 is connected to a suitable source of further water located beyond the figure and not shown in detail.

The right hand water chamber of tank 10 110 is provided with a water discharge pipe 95 leading away to any convenient waste point, as for instance a sewer.

The group of pipes 50, being the three 115 right hand ones in Figure 1, supplied by pump 86, are so located in all positions of reciprocation of the pipe mechanism 48—50 as to discharge water on the screen 26 at such a point that the water so discharged 120 will pass through the first or right hand section of the screen and join water portion 22 in tank 10. Similarly, the next three pipes 50 are so positioned that they are always over the second section of the screen and water pumped through them by pump 125 90 will ultimately settle down into water portion 23 of tank 10. In like manner, water from the next three pipes joins water portion 24 and finally the fresh water from 130 pipe 94 ultimately joins water portion 25.

In the operation of the device, motor 54 is continuously operated, thereby reciprocating the pipe structure 48—50 through a predetermined limited distance along the screen 26, said reciprocating distance being, for reasons which will hereafter appear, greater than the distance between two successive pipes 50. The pipe 50 and attached parts being in operation, fresh water is supplied through pipe 94 and the pumps 86, 90 and 92 are started. Thereupon, fresh water flows through pipe 94 and the pipes 50 which it supplies, into water portion 25, which is in turn forced by pump 92 and pipe 82 through the next group of three pipes 50 over the screen 26, from which the water flows into water portion 24. From here the water is forced by pump 90 through pipe 80 to the next three pipes 50 over the screen, from which the water joins water portion 23 to be again forced by pump 86 through hose 78 into the final group of three pipes 50, from which the water falls into water portion 22 and from this point flows through pipe 95 to the sewer.

From the foregoing, it will be seen that with the pipe frame 48—50 in reciprocation and water delivered in the manner described, there is a continuous flow of water from the pipes 50 onto the screen 26 to actively engage in the manner described, portions of material 40, which pass from chute 32 down over the screen 26 through the boxes 30 and 36 and finally to the receiving box 96 of conventional form at the left hand end of the machine, the details of this receiving box not entering into the invention. Attention is particularly called to the fact, however, that the water delivered from fresh water pipe 94 is passed over the screen 26 four distinct and separate times before it reaches pipe 95 and the sewer, thereby reducing the water expense which would be required were fresh water supplied at all points or groups of points along the pipe frame mechanism. Furthermore, pumps 86, 90 and 92 each carry back onto the screen 26 any portions of material 40 which have come through those screens and joined the various water portions 25, 24 or 23, thereby preventing the wastage of such material to be washed which occurs in devices of the prior art in which water is passed only once through the material to be washed and never returned to it. The same remark applies to chemicals or other agents, such as "Bentonite" used in newspaper de-inking, which was at one time applied to the material to be washed above the screen and has passed into any one of the water sections 23, 24 or 25.

Owing to the fact that in the de-inking of newspaper stock, water flowing from the stock as it passes over the first or right hand end of the screen 26 is apt to be exces-

sively dirty because of the fact that it is the first water which has come in contact with the stock in this machine and it is not deemed advisable to try to re-use that portion of the water and it is accordingly led to the sewer through pipe 95.

While the machine shown in the drawings indicates four separated water portions and three returnings of previously used water to the screen, these numbers are entirely dependent on the character and condition of the material to be washed.

In constructing the machine of this invention, the most satisfactory results have been obtained by making the pitch of the screen 26 and cooperating parts four feet in thirty, but this may be varied within reasonable limits depending upon the character of the stock, etc.

The use of the swinging or reciprocating water sprays delivered by the pipes 50 in conjunction with the screen 26 supporting material to be washed has a very important bearing on the increased efficiency of this machine in washing the stock, over washers of the prior art.

Progressive operations of two adjacent pipes 50 on a given initial intermediate portion of stock to be washed in one complete cycle of movement of those pipes is graphically illustrated in Figures 5 to 8 inclusive. Figure 5 shows two pipes designated 50^a and 50^b in the position which they occupy above the screen 26 at the time they are as far to the right as they can go in Figure 1, and are ready to begin to swing down along screen 26. Notice between them the portion 40^a of material to be washed, also portions 40^b and 40^c adjacent thereto.

Figure 6 shows the position of everything in Figure 5 when the pipes 50^a and 50^b have moved approximately one half of their down stroke to the left over the screen. During this movement, the water, for convenience designated 25^a, flowing from pipe 50^a, has forced material 40^b along the screen to the left, leaving the screen between it and material portion 40^a comparatively clear, while water portion 25^b emerging from pipe 50^b has attacked the right hand side of material portion 40^a and caused it to pile up, as shown in Figure 6, thus getting the water portion 25^b under it and necessarily more or less in it, thereby turning it and driving it along in the path of travel of that particular pipe (all adjacent bodies of material to be washed being treated in the same way and simultaneously moved in the same way by their adjacent pipe sections 50). When the position of Figure 7, which illustrates the position of the parts immediately after reaching the limit of the forward or left hand movement of the pipes 50, is reached the material portion 40^a has become so thoroughly watered that on the pushing pressure being

stopped, it flows out in the form shown in Figure 7, in which it occupies a considerable portion of freshly cleaned screen 26 so that the water therein can flow from it through the screen into the water portion containing receptacle of the tank below it, as heretofore described. From this position, the pipes 50^a and 50^b are returned to initial position, during which movement, which is shown half way in Figure 8, they pour additional water over the tops of the adjacent piles of material to be washed, thereby, as clearly indicated in Figure 6, again stirring up and agitating the material with water, with resultant additional washing.

Because of this thoroughly efficient operation of washing every particle of the stock which passes through the commercial machine from which the drawings of this device are taken, washing results are obtained far superior in degree of cleanliness and in quantity produced, as compared with any machine of the prior art within my believed extensive knowledge.

As is clearly indicated in various figures, the device works best when the water sprayed out from the ports 52 is directed at an acute angle to the screen and in the general direction of travel thereon of the material to be washed.

The length of the reciprocation of the spray pipes along the screen is preferably something more than the distance between two adjacent pipes 50;—compare the position of pipe 50^b in Figures 5 and 7.

For convenience, the various sections 22—25 inclusive of tank 10 will be referred to as collectors.

What I claim is:

1. A device of the character described, comprising, in combination, a plurality of containers, a screen for receiving material to be washed mounted above said containers, movable means mounted above said screen for directing groups of water sprays against the upper surface of said screen, means for supplying a liquid to said movable means for a group of said sprays, said liquid being directed against said screen at such a point as to pass through the screen into one of said containers, power means for drawing the liquid from said container and forcing said liquid through a second group of said sprays and through a second portion of said screen into another of said containers, and mechanism for moving said movable means.

2. A device of the class described comprising, in combination, a receptacle, a screen mounted above said receptacle for receiving a material to be washed, movable means for directing a plurality of groups of water sprays against the upper surface of said screen, means for supplying a liquid to one group of said sprays, said liquid being directed against said screen at such a point

as to pass through a portion of the same into said receptacle, power means for drawing the liquid from said receptacle and forcing the same through a second portion of said screen, a second receptacle positioned below said screen for receiving the liquid from said second set of sprays, and mechanism for reciprocating said movable means.

3. A device of the class described comprising, in combination, a screen over which material to be washed passes, means for directing groups of liquid sprays over said screen, said material being moved along said screen by the action of said sprays, means for independently collecting the liquid passed through the screen from each group, and power means for drawing the liquid from one of the collectors and forcing the same through the next adjacent group of sprays into the next adjacent collector.

4. A device of the class described comprising, in combination, a screen over which material to be washed passes, means for directing longitudinally movable groups of liquid sprays over said screen, means for supplying liquid to the group of sprays adjacent the discharge end of said screen, a collector for receiving the liquid from said group of sprays, power means for forcing the liquid from said collector through the next adjacent group of sprays, a second collector for receiving the liquid from said second group of sprays, and means positioned intermediate the ends of said screen for removing irregularities in the layer of material to be washed.

5. The method of washing material which comprises discharging said material onto an inclined screen at one end thereof, directing sprays of liquid against said material and screen, reciprocating said sprays along the screen slowly in the direction of travel of said material and rapidly in the opposite direction, and collecting the washed material at the discharge end of said screen.

6. In mechanism of the class described, a screen over which material to be washed passes, a spray device for delivering water at spaced apart points over said screen, means reciprocating the spray device along the screen slowly in the direction of travel of the material to be washed and rapidly in the opposite direction.

7. In mechanism of the class described, the combination of a screen adapted to have material to be washed pass over it, a water spray device above the screen made up of a plurality of approximately equally spaced separated spray pipes extending across the screen at intervals along its entire length, means reciprocating the water spray device along parallel the screen in the direction of movement of the material to be washed over the screen a distance

greater than the space between successive spray pipes, and means continuously supplying water to the water spray.

8. In a pulp washing apparatus, the combination of a pulp receiving screen, a plurality of tanks arranged in series under said screen whereby water from different sections of the screen falls by gravity into different tanks, and means in operative relation with each of the tanks except one for delivering water to that section of the screen above an adjacent tank.

9. In a pulp washing apparatus, the combination of a pulp receiving screen, a plurality of tanks arranged in series under said screen, means in operative relation with each of the tanks except one for delivering liquid to that section of the screen above an adjacent tank, the liquid passing through different sections of the screen falling by gravity into different tanks, and mechanism for reciprocating the delivery portion of said means.

10. In a pulp washing apparatus, the combination of a pulp receiving screen, a plurality of tanks arranged in series under

said screen, means in operative relation with each of the tanks except one for delivering liquid to that section of the screen above an adjacent tank, the liquid passing through different section of the screen falling by gravity into different tanks, and mechanism for reciprocating the delivery portion of said means slowly in the direction of travel of said pulp, and rapidly in the opposite direction.

11. In a device of the character described, the combination of a screen for receiving material to be washed, movable means for directing sprays of water downwardly upon said screen, mechanism for simultaneously moving said sprays in one direction parallel to the surface of said screen, whereby the material to be washed is moved along said screen and caused to pile up, and moving said sprays in the opposite direction whereby water is directed over the top of said piled up material.

In witness whereof, I have hereunto subscribed my name.

HAROLD R. EYRICH.