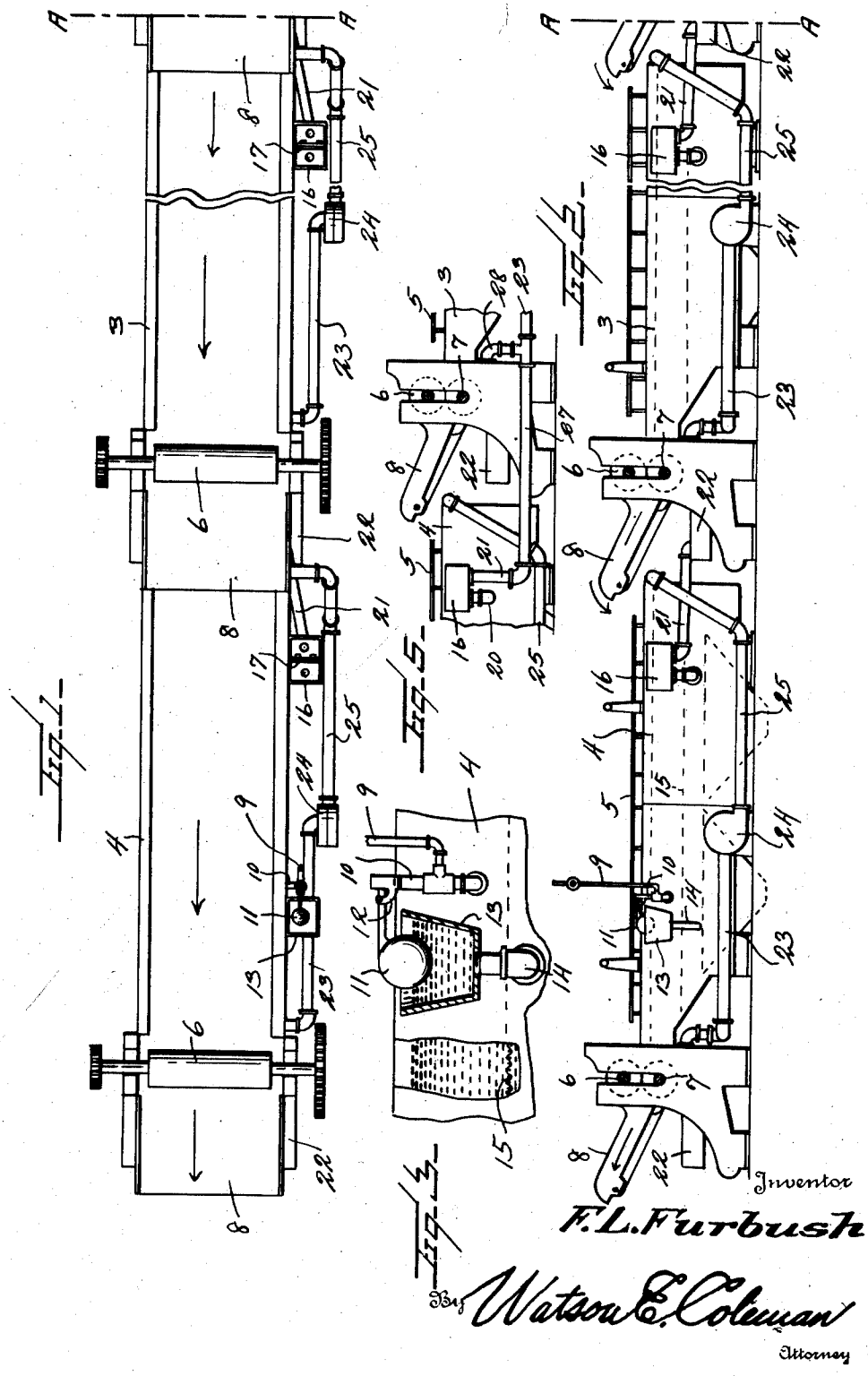
May 9, 1939. F. L. FURBUSH 2,157,287

COUNTERFLOW SYSTEM FOR WOOL SCOURING MACHINES

Filed Dec. 7, 1937 2 Sheets-Sheet 1



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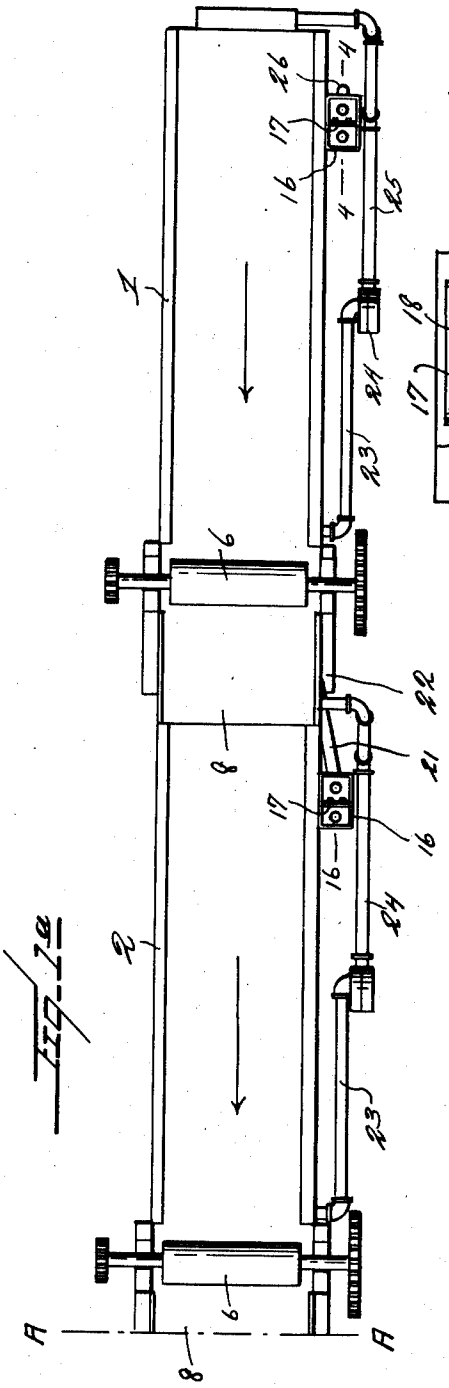


Fig. 1a

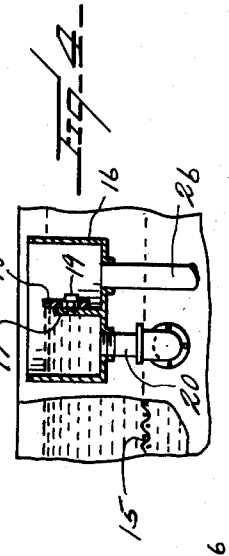


Fig. 2

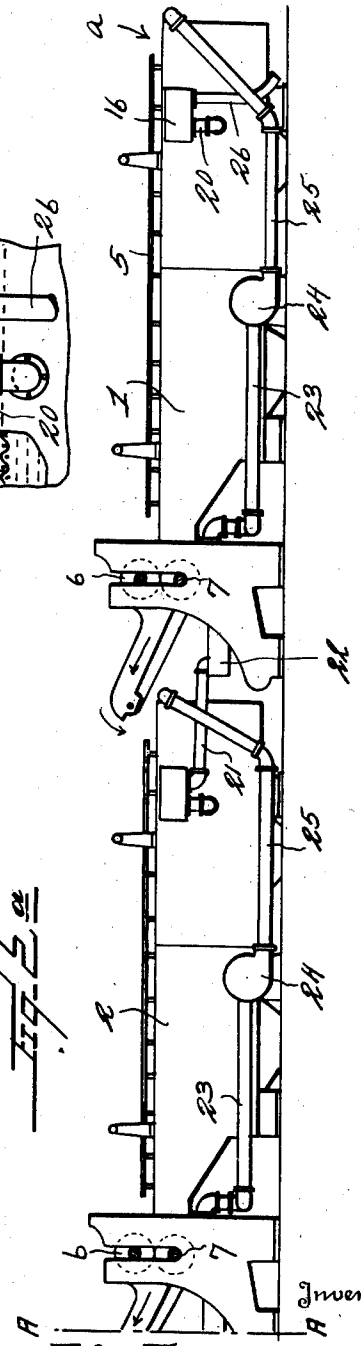


Fig. 2a

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## COUNTERFLOW SYSTEM FOR WOOL SCOURING MACHINES

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5 Claims. (Cl. 68—22)

This invention relates to wool scouring machines of a character quite commonly in use and in which the wool passes through a series of separate bowls or tanks containing the scouring liquid and in which the wool is carried through these bowls by reciprocating rakes, the wool passing through pressing rolls located between the bowls. More particularly the invention relates to a means whereby the liquid within the bowls is caused to pass from bowl to bowl in a direction reverse to the direction of travel of the wool as it passes through the bowl to thus provide means whereby the soapy liquid in the last bowl of the series may be carried back from bowl to bowl to the first bowl of the series and from thence discharged to a drain or to means whereby it may be afterwards treated to separate the grease therefrom.

Another object is to provide means of this character by which the level of the liquid in any particular bowl may be kept at a predetermined depth and in this connection to provide a tank for each bowl mounted upon the side of the bowl and communicating with the interior of the bowl at a point below a screen therein, this tank being divided into two portions by a transverse vertically adjustable partition, the liquid overflowing the upper edge of the partition being carried off by a pump and discharged into the entrance end of a succeeding tank.

Other objects will appear more fully hereinafter.

My invention is illustrated in the accompanying drawings wherein:

Fig. 1 is a fragmentary top plan view of two tanks of a series and Fig. 1ª is a top plan view of two further tanks of the same series.

Fig. 2 is a side elevation of the tank shown in Fig. 1 and Fig. 2ª is a side elevation of the tank shown in Fig. 2, it being understood that Figs. 1 and 1ª are to be read together and Figs. 2 and 2ª also are to be read together.

Fig. 3 is a vertical sectional view on an enlarged scale of means for feeding fresh water into the last bowl of the series, the side wall of the bowl being broken away.

Fig. 4 is a fragmentary elevation of one of the bowls partly broken away and showing the depth controlling tank of that bowl and a portion of the pipe leading to the succeeding pump.

Fig. 5 is a fragmentary side elevation of two adjacent bowls showing a modification of the piping to the pump.

In Figs. 1 and 1ª and 2 and 2ª I have illustrated a plurality of bowls. These bowls in actual practice are of different lengths. The bowls are indicated as 1, 2, 3 and 4 for successive bowls, the bowl 1 being the bowl into which the wool enters, as indicated by the arrow *a*. The bowls are filled with liquid and the wool is fed along these bowls by the rakes 5 operated by any suitable mechanism such as commonly found in wool scouring machines, these rakes moving longitudinally, then lifting vertically, moving rearward and then again moving downward into the wool. Inasmuch as these rakes are commonly found in wool scouring machines, I have not considered it necessary to illustrate the particular means whereby the rakes are operated. There is a set of these rakes for each one of the bowls.

At the outlet end of each bowl there is a pair of squeeze rolls designated 6 and 7 whereby the liquid is squeezed from the wool and the wool is then carried upon a conveyor 8 and discharged into the entrance end of the next succeeding bowl. This also is a common mechanism and requires no specific description as it forms no part of my invention. These squeeze rolls and the means for operating them and the conveyor and its operating means may be of any suitable construction.

The bowl 4 which is assumed to be the last bowl of a series through which the wool successively passes is supplied with fresh, clean water by the means shown in Fig. 3. In this figure, 9 designates a supply pipe and 10 a vertical pipe which at its lower end is laterally bent or extended and opens into the bowl 4. Disposed within this vertical pipe 10 is a valve (not shown in detail) controlled by a float 11 pivoted upon a bracket 12. When this float rises, it cuts off the supply of liquid to the lower end of the pipe 10 from the supply pipe 9. When it falls, liquid is allowed to flow into the bowl. The ball 11 floats upon liquid contained in a float tank 13 which has an opening or passage 14 communicating with the interior of bowl 4 below the normal level of liquid in this bowl, thus the liquid in the tank 13 will have exactly the same height as the liquid in the bowl 4.

Disposed within each bowl is a longitudinally extending screen 15, as shown in Fig. 3 and in dotted lines in Figs. 2 and 2ª, and the wool travels above this screen. Preferably the pipe 14 which connects the tank 13 to the interior of the bowl 4 opens into the bowl 4 below the level of the screen 15 so that the wool will not in any way obstruct the passage of water from the bowl 4 into the tank 13.

For the purpose of conveying water from the

bowl 4 to the bowl 3, I provide a tank 16, as shown in Fig. 4, which has an upstanding partition 17 at the middle of the tank. Mounted upon this partition 17 for vertical adjustment is a plate 18 which constitutes a part of the partition so that in effect the partition is vertically adjustable as to height. I have shown the partition plate 18 as mounted by means of a screw upon the partition 17, but I do not wish to be limited to this as other means for adjusting the extension 18 might be used. Entering the inlet side of the tank 16 is a pipe 20 which opens into the bowl at a point below the screen 15, as shown in Fig. 4. From the outlet end of the tank 16 there leads a pipe 21 which, as shown in Fig. 2, discharges into a pan 22 disposed below the squeeze rolls 6 and 7 which in turn are disposed between the bowl 4 and the bowl 3. Liquid is taken from the pan 22 by means of the pipe 23 to a pump 24, as shown in Fig. 2, and from this pump a pipe 25 leads upward and forward and discharges into the forward end of the bowl 3.

The bowl 3 is also equipped with a tank 16, as shown in Fig. 4, and connected to the bowl 3 in the same manner that the tank 16 is connected to the bowl 4, and from this tank leads a pipe 21 to a second pan 22. From this second pan 22 there leads a pipe 23 such as previously described, to a pump 24 which in turn discharges through a pipe 25 into the forward end of the bowl 2. The same mechanism is applied to bowl 1.

It will be seen that this piping system as described causes the liquid discharged from the bowl 4 to be passed forward to the entrance end of bowl 3 and the liquid from bowl 3 is in turn carried back and discharged into the forward end of the bowl 2 and this liquid from bowl 2 is in turn discharged into the forward end of bowl 1 but that there is no flow of the liquid in the reverse direction from bowl to bowl. In other words, fresh water enters at the final bowl of the series, which is the rinsing bowl. This relatively clean water is carried back from the bowl 4 to the entrance end of bowl 3, the water from bowl 3, after it has done its work, is carried back to the bowl 2, and the water from bowl 2 is in turn carried back and discharged into the bowl 1 or first bowl of the series. Thus by passing the liquid from the last bowl of the series to the first bowl of the series and saponifying the liquid by the several pumps, all of the grease is carried back to the first bowl of the series where it may be discharged from the waste pipe and saved. All of the soap formed by the combination of alkali with grease is carried back into the first bowl of the series. Thus the water in the succeeding bowls and particularly the last bowl of the series is kept cleaner and does away with the necessity of drawing off the liquid from the bowls as often as is necessary under the old system.

It will be seen that the adjustment of the partition extension 18 controls the level of the water retained in any bowl so that the water in the bowl remains at all times at a predetermined level. The excess water is discharged over the partition extension 18 and is carried on back and discharged into the next preceding bowl. In general use an alkali is put into the first and second bowls of the series and a certain amount of this alkali with the wool will pass to the succeeding bowls. The last or fourth bowl is used primarily as a rinsing bowl and this bowl is where the clean water is controllably admitted by the valve mechanism shown in Fig. 3. The alkali that is put into the wash bowls cuts the grease in the wool and the grease and alkali together make a soap with which to scour the wool and by passing the liquid from bowl to bowl by the action of the pumps 24, all the grease flows back to the first bowl of the series and is discharged through the waste pipe or drain pipe 26 which leads from the last tank 16 of the series. In the first bowl of the series, the soapy liquid is continually being discharged through the overflow pipe 26. By passing the liquid through a pump before discharging the liquid into the forward end of a bowl, the pump acts to break up the mixture and saponify the liquid. In some cases a pump may be connected with the overflow pipe 26 so that the overflow therefrom which contains a great amount of grease may be piped to a centrifugal separator which will separate the wool grease from the alkali, the wool grease being used to make lanoline and various other compounds where a penetrating grease is required. The object of this system primarily is to save soap and alkali by passing this soap formed by the combination of the alkali with the grease back into the first bowl of the series. The system helps to provide a cleaner liquid in the last bowl of the series which prevents the necessity of drawing off the liquid from the bowls as often as is necessary where the old way of scouring is used. It will be seen that the mechanism for drawing off the liquid and carrying it back to the preceding bowl is all on the exterior of the bowls so that it does not in any way interfere with the free operation of the conveying rakes nor the free movement of the wool. Of course, the object of the screen 15 is to prevent wool from being drawn into the inlet pipe 20 of the tank 16 and thus obstructing the passage of liquid through this tank. I have illustrated in Fig. 2 a final pair of pressing rolls 6 and 7 with the conveyor 8 and a pan 22 from which liquid is taken by a pipe 23 extending to a pump 24 and discharging this liquid by a pipe 25 to the inlet end of the tank 4. Thus the water which is finally squeezed out of the wool after it passes from the fourth tank is returned to the intake end of the tank 4.

While in Figs. 1 to 4, the pipes 23 are shown as taking water each from a pan 22, I do not wish to be limited to this as each pump inlet pipe 23 may be connected directly with the discharge pipe 21 of the successive tank 16 by a pipe connection 27, the pump being also connected to the successive pan 22 by a connection 28. This is illustrated in Fig. 5.

While I have shown four tanks and illustrated these tanks as of the same length, it is to be understood that there may be more than four tanks and that these tanks will be preferably of different lengths. Thus these bowls may vary in length from 16 to 32 ft. and a line of scouring bowls generally consists of four to five bowls, the first bowl being 16 ft. long, the second 21 ft., the third 27 ft., and the fourth 32 ft.

I have not attempted to show the mechanism for driving these squeeze rolls, placing pressure thereon or operating the rakes as this is old and well known.

What is claimed is:

1. A wool scouring machine, including a series of washing bowls, each having a transversely extending screen, means for supplying clean liquid to the last bowl of the series, means for causing

the wool to pass from the first bowl of the series to and through the other bowls of the series in succession, and means for taking liquid from below the screen of each bowl and discharging all of the liquid from said bowl successively into the next preceding bowl.

2. A wool scouring machine, including a series of washing bowls each having a transversely extending screen, means for causing the wool to travel successively in one direction through each bowl, means for transferring the wool from a preceding bowl to a successive bowl, means for supplying clean liquid to the last bowl of the series and means for pumping liquid from each bowl below the screen thereof and discharging all of the pumped liquid into the forward end of the next preceding bowl of the series.

3. A wool scouring machine, including a series of washing bowls each having a transversely extending screen, means for causing the wool to travel successively in one direction through each bowl, means for transferring the wool from a preceding bowl to a successive bowl, means for supplying clean liquid to the last bowl of the series and means for pumping liquid from each bowl below the screen thereof and discharging all of the pumped liquid into the forward end of the next preceding bowl of the series, said means including a tank for each bowl and connected to the corresponding bowl below the screen thereof, the tank having a partition extending upward from the bottom of the tank and having a height equal to the predetermined height of the liquid in the bowl from which the tank takes liquid.

4. A wool scouring machine, including a series of washing bowls each having a transverse longitudinal screen, means for causing the wool to travel in one direction through each bowl, means between the bowls for squeezing the liquid out of the wool and transferring the wool to the next succeeding bowl, a pan disposed beneath each squeezing and transferring means, a tank associated with each bowl and having a partition extending upward to a height equal to the predetermined height of the liquid in that bowl, the tank having an inlet pipe connection leading from a point below the screen of the corresponding bowl and an outlet pipe connection on the other side of said partition leading to a preceding pan, a pump for each bowl having an inlet pipe connection leading from the succeeding pan and a discharge pipe connection leading to the forward end of the bowl with which the pump is associated, and means for discharging liquid into the last bowl of the series.

5. A wool scouring machine, including a series of washing bowls each having a transverse longitudinally extending screen, means for causing the wool to travel successively through each bowl above the screen thereof, means at the discharge end of each bowl for squeezing the liquid from the wool and conveying the wool to the inlet end of the next successive bowl, a pan disposed beneath each squeezing and conveying means, means for discharging liquid into the last bowl of the series, and means for causing liquid to travel from the last bowl of the series successively through preceding bowls and be discharged into the first bowl of the series, comprising a tank mounted upon each bowl, each tank having a vertical partition having a vertically adjustable extension at its upper end, each tank having an inlet pipe leading from the interior of the corresponding bowl below the screen thereof into the tank on one side of said partition and an outlet pipe leading from the tank on the other side of the partition and discharging into the next preceding pan, a pump associated with each bowl, each pump having an inlet pipe communicating with the successive pan, and a discharge pipe discharging into the inlet end of the corresponding bowl, the tank associated with the first bowl of the series having a final discharge pipe.

FRANK L. FURBUSH.