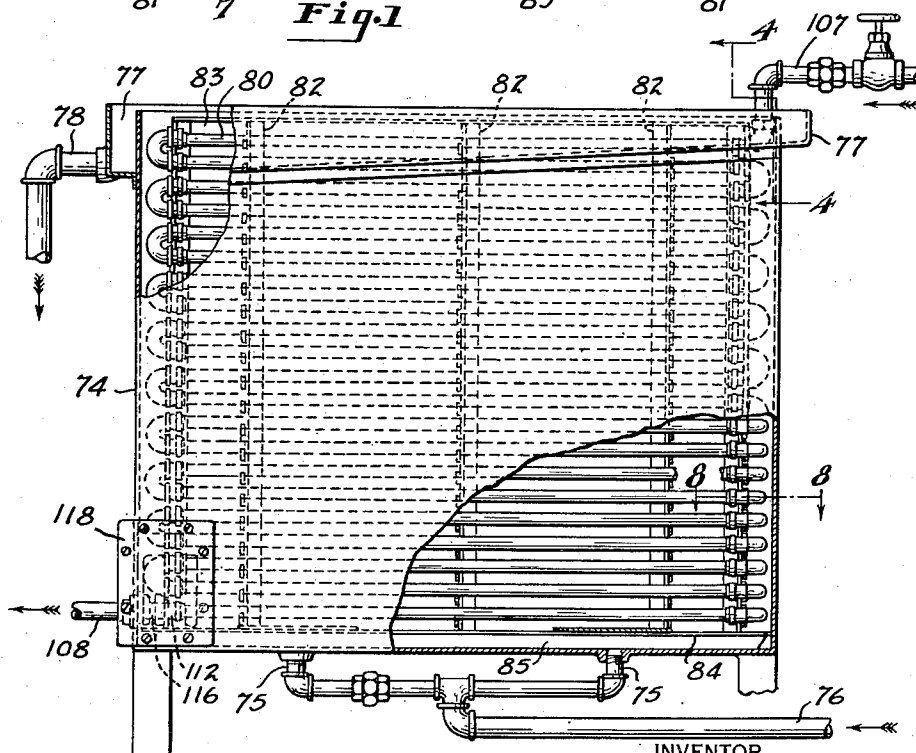
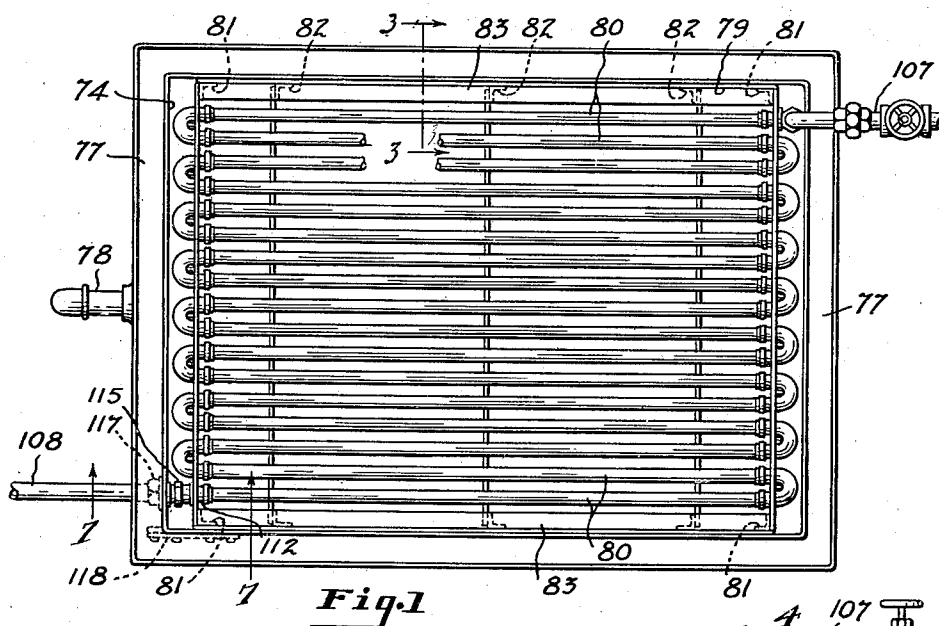


July 11, 1944.

R. I. NEWCOMB
APPARATUS FOR RELEASING THE FIBERS FROM
STRAW, OR OTHER FIBROUS MATERIAL

2,353,489

Original Filed Jan. 31, 1939 3 Sheets-Sheet 1



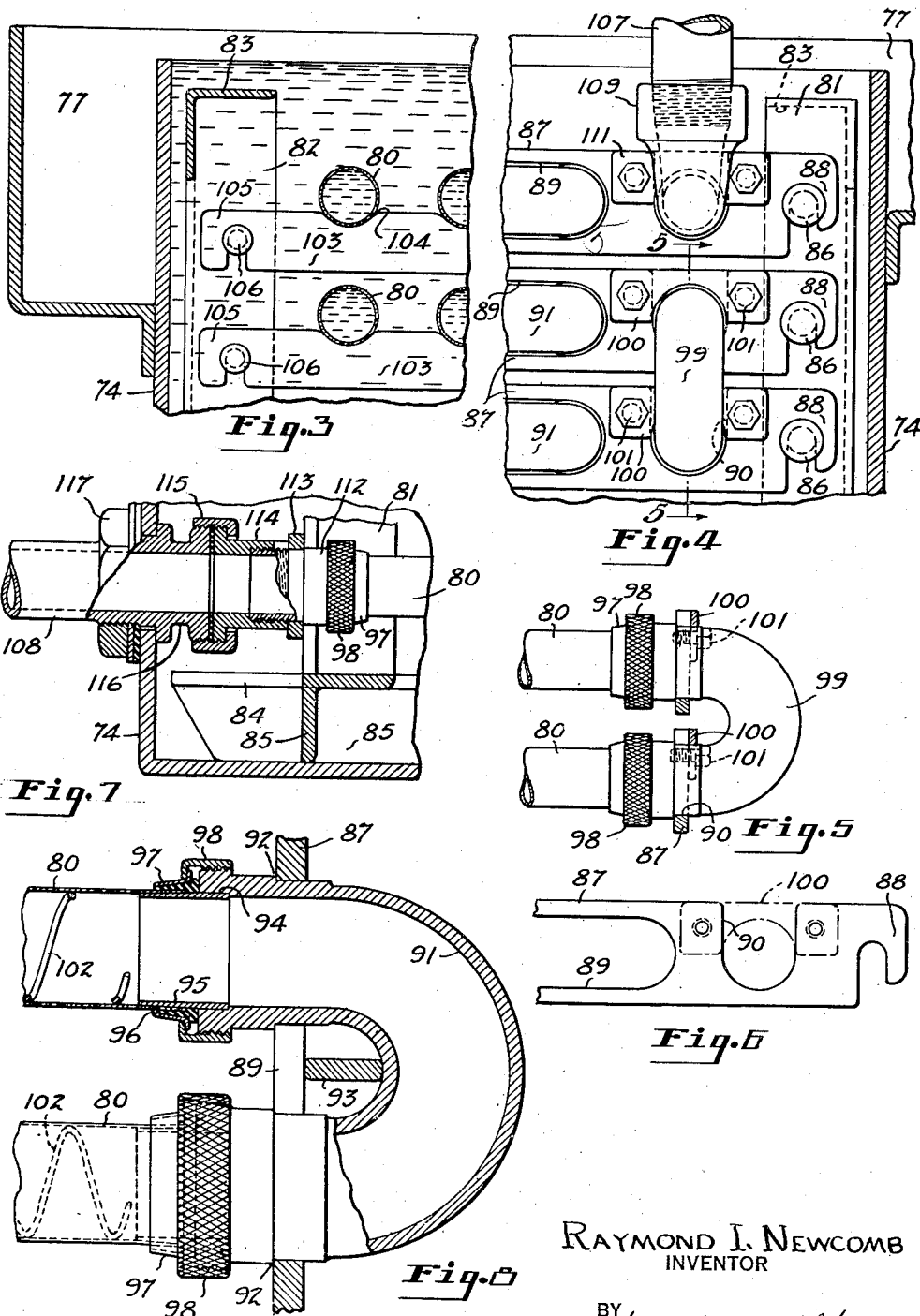
INVENTOR
RAYMOND I. NEWCOMB
BY
Freeman, Swart, Albright, and Wideman
ATTORNEYS

July 11, 1944.

R. I. NEWCOMB
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RAYMOND I. NEWCOMB
INVENTOR

BY *Freeman, Sweet, Albrecht, and Weidner*
ATTORNEYS

July 11, 1944.

R. I. NEWCOMB
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3 Sheets-Sheet 3

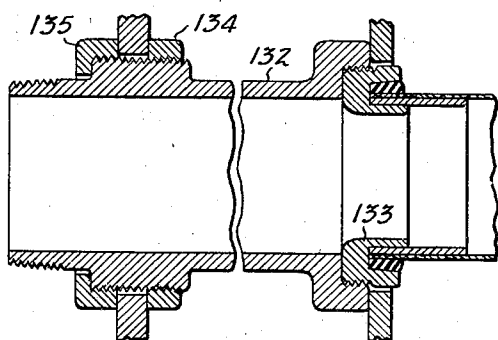


Fig. 9

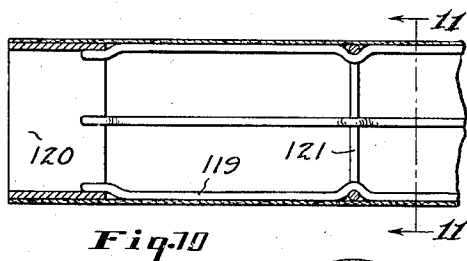


Fig. 10

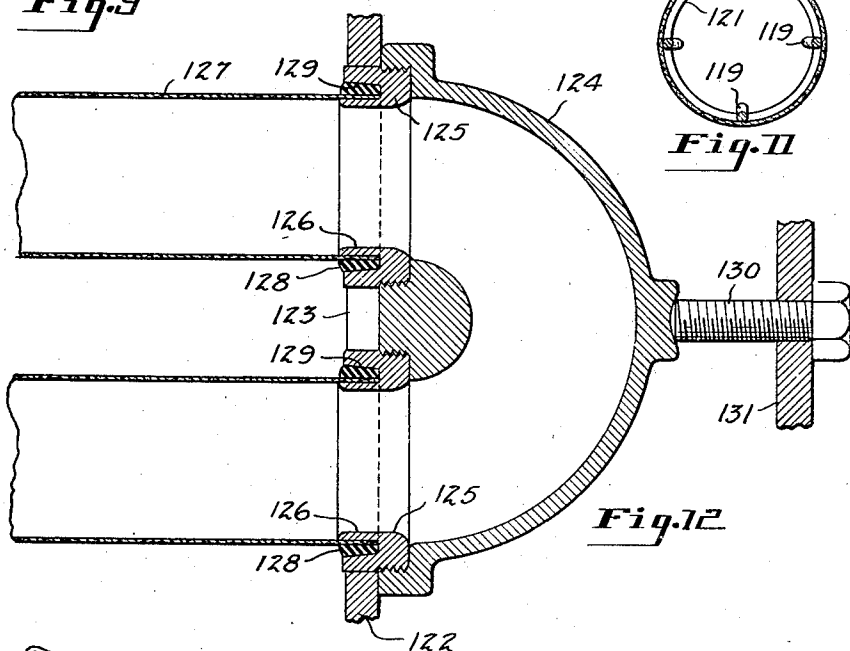


Fig. 11

Fig. 12

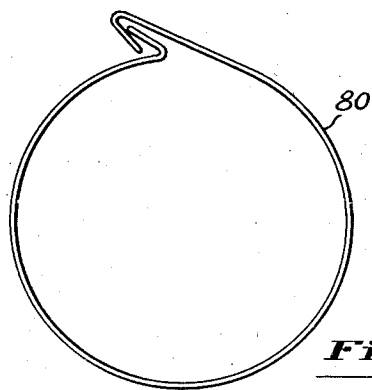


Fig. 13

RAYMOND I. NEWCOMB
 INVENTOR

BY *Freeman, Smith, Albert, and Wickman*
 ATTORNEYS

UNITED STATES PATENT OFFICE

2,353,489

APPARATUS FOR RELEASING THE FIBERS
FROM STRAW OR OTHER FIBROUS MA-
TERIAL

Raymond I. Newcomb, Chicago, Ill.

Substituted for abandoned application Serial No.
253,824, January 31, 1939. This application
July 6, 1942, Serial No. 449,900

3 Claims. (Cl. 210—8.5)

This invention relates to a process and apparatus for releasing the fibers from straw, or other fibrous material, and has for an object the provision of a new and improved process and apparatus of this character.

Another object of the invention is to provide a process and apparatus capable of rapidly, efficiently, and economically handling very large quantities of raw material, whereby the completed product may be produced at greatly decreased cost, and sufficiently cheaply for commercial purposes.

Still another object of this invention is to provide efficient means for efficiently recovering relatively costly processing materials to enable them to be used over and over again, and at the same time segregate valuable by-products, thus additionally greatly reducing the cost of the processing operation.

Other and further objects of the invention will be apparent to those skilled in the art from the following description, and the drawings, in which:

Figure 1 is a top plan view of a dialyzing apparatus according to the invention;

Figure 2 is a side elevational view, partly in vertical section, with portions of the casing broken away, of the dialyzing apparatus shown in Figure 1;

Figure 3 is an enlarged, fragmentary, transverse vertical sectional view, corresponding substantially to the line 3—3 of Figure 1;

Figure 4 is an enlarged, fragmentary, transverse vertical sectional view, corresponding substantially to the line 4—4 of Figure 2;

Figure 5 is an enlarged, fragmentary, vertical sectional view, corresponding substantially to the line 5—5 of Figure 4;

Figure 6 is an enlarged, fragmentary, side elevational view of a portion of one of the rack members employed in connection with the invention;

Figure 7 is an enlarged, fragmentary, longitudinal vertical sectional view, corresponding substantially to the line 7—7 of Figure 1;

Figure 8 is a greatly enlarged, part sectional, part elevational, view of tube means forming part of the dialyzing construction, and corresponding substantially to the line 8—8 of Figure 2;

Figure 9 is an enlarged, fragmentary, vertical sectional view of a different type of connection for a dialyzer tube;

Figure 10 is an enlarged fragmentary longitudinal sectional view of a different type of dialyzer tube;

Figure 11 is a transverse sectional view corre-

sponding substantially to the line 11—11 of Figure 10;

Figure 12 is an enlarged fragmentary vertical sectional view of a different type of tube connection, while

Figure 13 is an enlarged end view of one of the tubes used in connection with the invention, and showing the manner in which the meeting edges thereof are secured together.

The embodiment of the invention selected for illustration includes the oblong rectangular tank 74, open at the top, the bottom of the tank 74 having spaced water inlets 75, supplied by a supply pipe 76. The upper end of the tank 74, along its outer edge, is provided with an overflow trough 77, into which water from the tank overflows, and is drained off through the drain 78, the trough 77 preferably extending completely around the upper edge of the tank 74, as best shown in Figures 1 and 3.

Adapted for insertion into the tank as a unit is a skeleton supporting frame 79, carrying a plurality of tubes 80 of parchment paper, or other suitable material (Figures 1 through 8 and 13), the tubes 80 being arranged to form a continuous circuitous conduit.

The supporting frame 79 includes four vertically arranged angle members forming corner posts 81, and, as shown, three pairs of spaced angle members 82, the upper ends of the members 81 and 82 being secured in position by upper angle members 83, while the lower ends of the angle members 81 and 82 rest upon, and are secured to, the horizontally disposed flanges of bottom angle members 84, the vertically disposed flanges 85 of which project downwardly and support the frame 79 on the bottom of the tank 74. As best shown in Figure 4 the pair of corner posts 81 at each end of the frame are provided at spaced vertical intervals with horizontally aligned pairs of headed studs 86, each pair of studs supporting a rack member 87, each end of each of which is hooked, as at 88, for detachable engagement with its related stud 86.

At intervals along each rack member 87, the rack member is provided with alternated horizontally extending slots 89 and relatively deep, upwardly opening notches 90, the slots 89 and notches 90 in one set of rack members at one end of the frame being horizontally and vertically aligned with those of the set of rack members at the opposite end of the frame, as will be understood. Each of the slots 89 is adapted to accommodate a U-shaped conduit fitting 91, having ends shouldered, as at 92, for abutment with the inner

surface of the related rack member 87, and adapted to be detachably held in position by a wedge key 93 wedged between the bight of the fitting 91 and the adjacent outer surface of the rack members. The interior of each end of the fitting 91 is socketed, as at 94, for the reception of one end of a metallic ring 95, about the exterior surface of which is disposed one end of a tube 80, and surrounding the exterior surface of the tube 80 there is a packing member 96 having a wedge-shaped outer surface cooperable with a wedging ring 97 adapted to be actuated by an actuating ring 98 threaded onto the end of the fitting 91, all of the tubes 80 associated with the fittings 91 being secured and rendered water-tight in a manner similar to that just described. Each pair of vertically aligned notches 90, at each end of the frame, is adapted for the reception of a U-shaped fitting 99, the legs of the fitting being detachably secured in their related notches by clamping plates 100 secured in position by screw bolts 101, as best shown in Figures 4 through 6, the tubes 80 being fastened to the ends of the fittings 99 in the same manner described in connection with the fittings 91.

The tubes 80 may be made up from oblong sheets of parchment paper, and their meeting edges folded over as shown in Figure 13, and cemented together, and such tubes being of considerable length, means are employed to give them some longitudinal, and considerable circumferential strength, each tube having extended through its interior from end to end, a helical spring member 102 as best shown in Figure 8. Additionally to support the tubes 80 intermediate their ends, each horizontal tier of tubes 80 is supported at intervals by tiers of cross racks 103 underlying the related tubes 80, these racks having shallow notches 104 for the reception of the tubes, and each having hooked ends 105 adapted to hook over headed studs 106 arranged appropriately along each of the vertically extending angle members 82, and as best shown in Figure 3.

When the tubes 80 are assembled in the manner described, they form a continuous conduit from the inlet pipe indicated at 107 in Figure 1, to the outlet pipe indicated at 108. As before stated, the frame 79 is adapted to be set into the tank 74 as a unit, and when so positioned, connection may be had with the inlet pipe 107 by means of a fitting 109 (Figure 4) the fitting 109 comprising an elbow connected to the inlet pipe 107 and having an angular portion seated in a notch of the uppermost rack member 110 and held in place by a clamping plate 111, connection being effected with the related inlet tube 80 by an arrangement similar to that described in connection with Figure 8. The outlet tube 80 from the bank of tubes is provided at its outlet end with a nipple 112 secured to the outlet end of the pipe 80 by an arrangement similar to that shown in Figure 8, and the nipple 112 is held in position by a shoulder 113. The nipple 112 has threaded thereon a shouldered nut 114, carrying a clamping ring 115, adapted to be detachably threaded onto a fitting 116, permanently secured to the wall of the tank 74. The fitting 116 is shouldered for abutment with the inner surface of the tank wall, and outwardly of this wall is threaded for the reception of a securing nut 117, a washer and packing being interposed between the nut 116 and the adjacent wall of the tank, the fitting 116 continuing as a discharge pipe leading to a storage tank. A removable plate 118 is provided at the bottom of the tank 74 adjacent to the fitting 116, and associated

parts, to give access to the interior of the tank 74 when desired. With the described arrangement, it will be apparent that it is a simple matter to renew or replace injured, worn, or defective tubes, by first removing the assembly from the tank, making the needed repairs merely by detaching and replacing any tubes desired, without disturbing the assembly as a whole.

The liquid to be dialyzed, commonly referred to as "black liquor" is introduced to the bank of tubes 80 through the inlet fitting 109, passes through the tubes 80, and is finally discharged through the outlet fitting 116. During travel of the "black liquor" through the bank of tubes 80, water is introduced into the tank through the supply pipe 78, traveling thence through the water inlets 75, discharging at spaced points into the tank 74, the water rising in the tank 74, passing over the parchment tubes 80, and finally reaching a level where the water, with its entrained reclaimed caustic, spills over into the recovery trough 77, leaving through the trough outlet 79, whence it may be conducted to one or more reclaiming units.

The water as it passes over the parchment tubes 80, through osmotic action, entrains the caustic ingredient for delivery to the trough 77, while the lignin, and some waste matter, travel downwardly through the bank of tubes 80, discharging from the apparatus through the outlet fitting 116, being led thence from the outlet fitting 116 to a suitable storage tank.

Thus it will be apparent that the relatively expensive caustic ingredient in the black liquor is almost completely reclaimed for further use, and in addition the by-product lignin is segregated and is ready for a great variety of uses.

As shown in Figures 9 through 12, a somewhat different embodiment of the tube construction and the manner of detachably supporting the tubes 80 are disclosed. The tube construction as disclosed in Figure 10 comprises a skeleton frame work including longitudinally disposed spaced rods 119 extending between, and secured to, end sleeves 120, the rods 119 being braced at intervals by rings 121 fitted into notches in the rods and secured thereto, as by welding. With this construction the tubes are rendered substantially longitudinally incompressible. The different embodiment of the supporting means for the tubes comprises rack members 122 similar to those already described, having a slot 123 with which a U-fitting 124 is adapted to register. The U-fitting 124 in this instance has end portions of a size which will not pass through the slot 123 but will abut the outer surface of the rack member 122, the bifurcated ends of the fitting, however, each having a threaded socket for the threaded reception of a nipple 125, both of which extend through the slot 123 and slightly beyond the inner surface of the rack member. Each of the nipples 125 is provided on its face with a boss 126 about which the end of the tube 127 fits, and outwardly of the boss 126 is cut out to form a space for the reception of a packing ring 128, which fits about the end of the tube 127 and is tightly clamped in position by the inclined wall 129 of the cut-out when pressed home. The fitting 124 is held against the rack member by a set-screw 130 threaded through an angular part 131 secured to the rack member. In this construction it will be a simple matter to remove the fitting 124 from the outside of the rack member when it becomes necessary to re-

place a tube or tubes. In Figure 9 a fitting 132 is shown similar to the outlet fitting 116 already described, except that in this case the fitting 132 carries a nipple 133 similar to the nipple 125, for connection to the outlet tube, and the fitting 132 is held in position by a nut 134 threaded on the nipple and abutting the end wall of the tank, a nut 135 serving to clamp the fitting 132 to said wall.

This application is a substitute for my earlier filed application Serial Number 253,824, filed January 31, 1939.

Without further elaboration the foregoing will so fully explain my invention that others may, by applying knowledge at the time of application, readily adapt the same for use under various conditions of service.

I claim:

1. Dialyzing equipment comprising: a series of tubes of osmotically permeable flexible material arranged in a plurality of banks; each bank comprising a plurality of horizontal tubes set side by side in the same horizontal plane; a unitary framework including a pair of spaced end plates; each end plate carrying U-shaped tubular connecting members; each connecting member positioned and arranged to establish connection between two adjacent tubes; said tubes being thus interconnected in a single series; said framework including supporting members for engaging each of said tubes at a plurality of points intermediate its ends; a skeleton reinforcing frame inside each tube to keep the tube from collapsing; a stationary tank adapted to receive said framework and tubes; connections for delivering extracting water to said tank; means for delivering charged extracting water from said tank; and connections for passing liquor containing a solute and another ingredient capable of separation by dialysis through said series of tubes; said connections being arranged to cause said liquor and water to move in counterflow relationship, with said water moving substantially vertically around all said tubes.

2. Dialyzing equipment comprising: a series of

tubes of osmotically permeable flexible parchment paper arranged in a plurality of banks; each bank comprising a plurality of horizontal tubes set side by side in the same horizontal plane; a unitary framework including a pair of spaced end plates; each end plate carrying U-shaped tubular connecting members; each connecting member positioned and arranged to establish connection between two adjacent tubes; said tubes being thus interconnected in a single series; a stationary tank adapted to receive said framework and tubes; connections for delivering extracting water to the bottom of said tank; overflow means for delivering charged extracting water from the top of said tank; and connections for passing liquor containing a solute and another ingredient capable of separation by dialysis into the top of said series of tubes and out at the bottom; said connections being arranged to cause said liquor and water to move in counterflow relationship, with said water moving substantially vertically around all said tubes.

3. Dialyzing equipment comprising: a series or tubes of osmotically permeable flexible parchment paper arranged in a plurality of banks; each bank comprising a plurality of tubes set side by side; a unitary framework including a pair of spaced end plates; each end plate carrying U-shaped tubular connecting members; each connecting member positioned and arranged to establish connection between two adjacent tubes; said tubes being thus interconnected in a series; a stationary tank adapted to receive said framework and tubes; connections for delivering extracting water to the bottom of said tank; overflow means for delivering charged extracting water from the top of said tank; and connections for passing liquor containing a solute and another ingredient capable of separation by dialysis through said series of tubes; said connections being arranged to cause said liquor and water to move in counterflow relationship, with said water moving substantially vertically around all said tubes.

RAYMOND I. NEWCOMB.