

July 10, 1934.

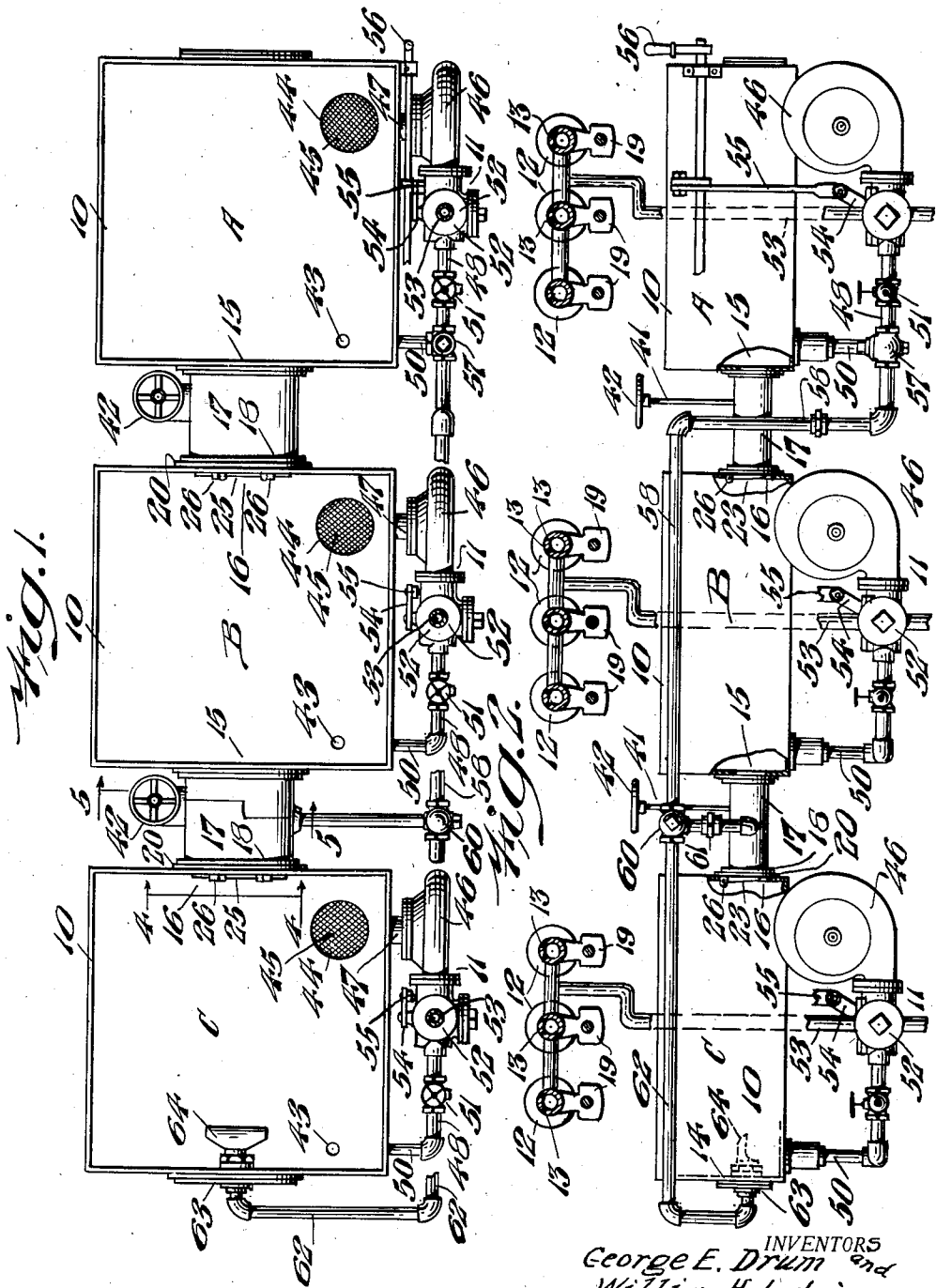
G. E. DRUM ET AL

1,965,694

DYEING MACHINE

Filed Jan. 28, 1932

3 Sheets-Sheet 1



INVENTORS
George E. Drum and
William H. Jaxheimer,
BY
Robert M. Barr
ATTORNEY.

July 10, 1934.

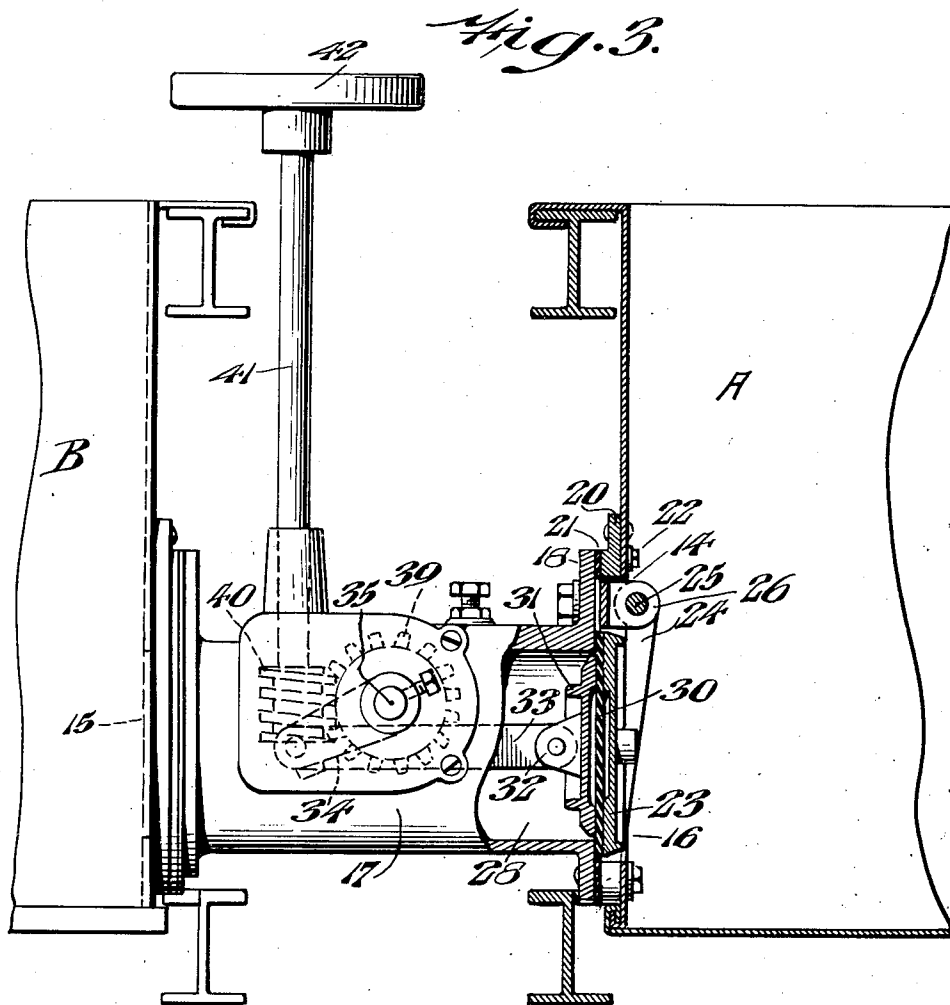
G. E. DRUM ET AL

1,965,694

DYEING MACHINE

Filed Jan. 28, 1932

3 Sheets-Sheet 2



INVENTORS,
George E. Drum and
BY William H. Jaxheimer,
Robert M. Davis
ATTORNEY.

July 10, 1934.

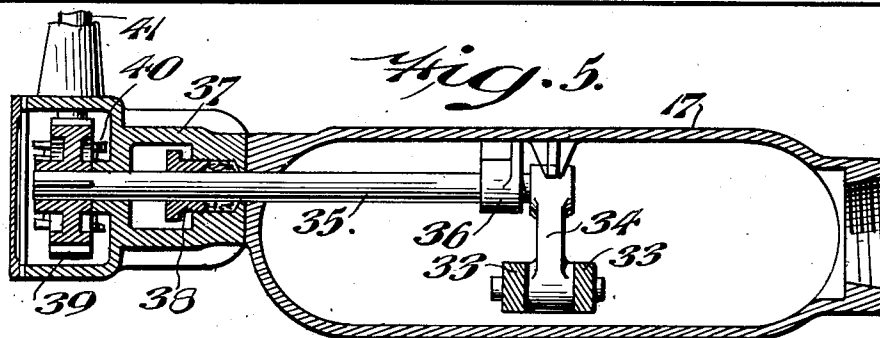
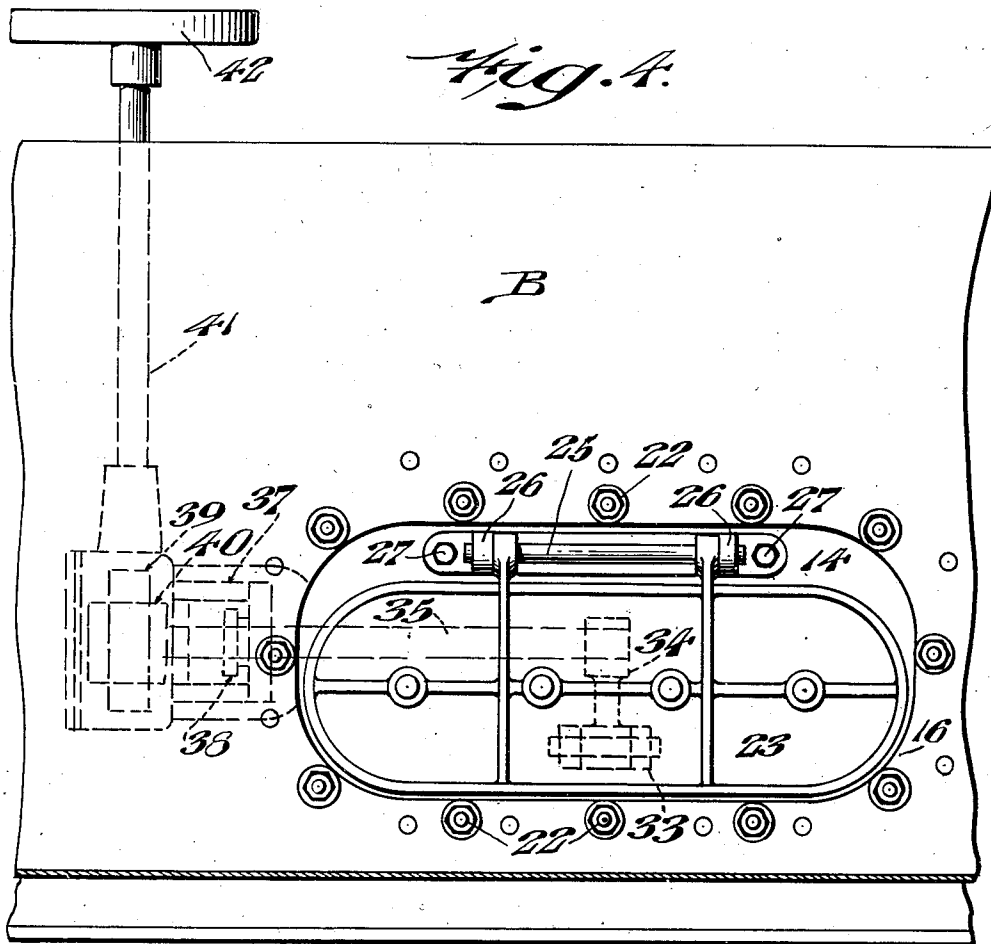
G. E. DRUM ET AL

1,965,694

DYEING MACHINE

Filed Jan. 28, 1932

3 Sheets-Sheet 3



INVENTORS
George E. Drum and
William H. Jaxheimer,
BY Robert M. Barr
ATTORNEY.

UNITED STATES PATENT OFFICE

1,965,694

DYEING MACHINE

George E. Drum and William H. Jaxheimer, Philadelphia, Pa., assignors to Smith, Drum & Company, Philadelphia, Pa., a corporation of Pennsylvania

Application January 28, 1932, Serial No. 589,378

7 Claims. (Cl. 8—19)

The present invention relates to fabric and yarn treating machines and more particularly to machines for dyeing skeins of yarn, piece goods, or any other material.

In dyeing or otherwise treating yarn skeins it has been the general practice to build individual machines with varying capacities for the work and the user has therefore been obliged to purchase a small capacity machine or a large capacity machine and hence an inefficient situation exists in that the owner of a small machine is instantly handicapped when production calls for more than his small machine can take care of, or on the other hand the owner of a large machine may be required to operate it at say one-third capacity while still maintaining maximum capacity operating costs. One of the objects of the present invention is to overcome such disadvantages and provide a dyeing or skein treating machine which is flexible in use and makes possible a wide range of capacity while maintaining efficient operation regardless of varying capacity.

A further object of the invention is to provide a novel control coupling for two or more dyeing units whereby selective operation of a unit or units can be obtained at will.

A still further object of the invention is to provide a new and efficient mixing means of the dye or treating liquor for dyeing or other treating machines whereby complete circulation and agitation is obtained giving a resulting uniform product in a period of time not heretofore possible.

Other objects of the invention will hereinafter appear.

In the accompanying drawings Fig. 1 represents a plan of a number of interconnected dyeing machines embodying one form of the present invention, certain parts thereof being omitted for more clearly illustrating the invention; Fig. 2 represents a rear elevation of the same; Fig. 3 represents an enlarged detail of the novel coupling means, the same being partly broken away; Fig. 4 represents a section on line 4—4 of Fig. 1; and Fig. 5 represents a section on line 5—5 of Fig. 1.

Referring to the drawings Figs. 1 and 2 illustrate a series of connected dyeing units each complete as a separate entity and consisting generally of a tank 10, a solution mixing and circulating system 11, and supporting devices 12 for the material to be dyed or otherwise treated. In the preferred form of the invention the devices 12 are for supporting skeins of yarn in sus-

ended relation above the tanks 10 and are each of tubular form for carrying the treating liquid and discharging it through perforations 13 against the skeins. Also provision is made for lifting the skeins from the supporting tubes when desired by rotatable lifting members 19 which are specifically described and claimed in co-pending applications. The machines or units are sold separately as complete dyeing machines and by way of the example here described each has three skein support arms. Thus by coupling two machines together a six arm machine is made possible, and by coupling three machines together a nine arm machine is obtained. This arrangement gives a wide range and flexibility in use, reduces manufacturers' costs, and makes it possible for the small user to obtain the latest dye equipment at little expense. Thus the small user may only purchase one unit with three arms; another may purchase two such units and couple them together so that if need be four, five or six skein supports can be brought into use; and still another may purchase a three arm unit and a five arm unit to give a combined capacity of eight arms.

In order to make possible selective intercommunication between two of the unit tanks 10 each is provided at opposite ends respectively with openings 14 and 15 preferably of elongated shape having the long axis generally horizontal. Cover plates 16 are supplied with each unit for bolting or otherwise removably fastening such plates over the openings 14 and 15 in leak-proof relation when a tank 10 is to be used as a single machine. When two or more units are to be connected together to provide a machine of larger dyeing capacity the machines are delivered with a coupling 17 in the form of a pipe section having end flanges 18 designed to be clamped against a seat ring 20 in place of the plate 16. The ring 20 is riveted or otherwise made fast to the end of the tank bounding the opening 14, and a packing ring 21 is interposed between the ring 20 and the flange 18. Preferably bolts 22 serve to anchor either the plate 16 or the coupling flange 18 to the tank 10 according to which is to be used. It is to be understood that both ends of the coupling 17 are secured in a like manner so that the coupling can serve as a conduit for liquid traveling from one tank 10 to the next tank.

As a means for shutting off communication from one tank to the other by way of the coupling 17, a flap valve 23 is carried by arms 24 which are pivoted on a rod 25 mounted in hanger brackets 26 attached by bolts 27 to the outer face

of one of the flanges 18. The flap valve 23 is of a size to close the end of the conduit 28 and carries a packing disc 30 so that the latter seats upon the end of the coupling 17 and seals the conduit 28 when the valve is closed. This disc 30 is clamped between the flap valve 23 and a back plate 31 which latter is provided with outwardly extending ears 32 for pivotally mounting one end of an operating link 33, the opposite end of which is pivotally attached to a crank arm 34 which is keyed or otherwise made fast to an actuating shaft 35. The shaft 35 is journaled at its inner end in a bearing 36 attached to the inner wall of the coupling while the opposite end of the shaft 35 is journaled in a housing 37 exterior of the coupling 17 and protected from leakage by a stuffing box structure 38. A worm gear 39 is geared or otherwise made fast to the shaft 35 and meshes with a worm 40 secured to a rotatable spindle 41 projecting to a convenient level where it terminates in a hand wheel 42 by means of which motion is transmitted to the worm 40 and its associated parts to open and close the flap valve 23. It will be noted that the flap valve 23 plus its associated operating arms 24 and pivotal mountings 26 therefor have a transverse dimension such as to allow the assembled structure to enter the opening 14 in the tank while the flange 18 of the coupling abuts the ring 20 and holds the parts in leak-proof operative position. Turning of the hand wheel 42 will transmit motion to the valve 23 so that it can be opened when it is desired to establish communication between two adjacent tanks and can be closed when such communication is to be cut off.

It will be apparent from the foregoing that this coupling construction and liquid circulation control makes a very flexible arrangement possible in that the user of the machine can treat a large quantity of material at full capacity or a small quantity of material with restricted capacity of the machine. Thus if the material to be dyed is only sufficient to fill the material supporting devices 12 in one tank, the user can close the valves 23, shut down all but one of the pumps 26 and so operate one tank as a unit while leaving the other tank or tanks idle and inoperative. Again if more material is to be treated than can be taken care of by one unit, one valve 23 can be opened and two tanks thrown together in series to act as one machine, or both valves 23 can be opened and three tanks thrown together to act as one machine. Further with the tanks shut off from each other three classes of dyeing can be carried on simultaneously with each unit operating separately.

For the purpose of mixing the treating solution in an efficient manner to produce a uniform character to the final treating solution each tank 10 is provided with an inlet 43 and an outlet 44 both preferably in the bottom of the tank and located at opposite sides of the tank in order that the body of liquid can circulate entirely around and across the tank to leave by the outlet 44. A strainer or screen 45 of suitable mesh is located over each of the outlets 44 to prevent sediment or other substances from entering the respective pumps 46 and obstructing circulation through the pipes 47, 48 and 50. Thus it will be seen that each tank 10 has its own pump and circulating system for causing the treating liquid to be drawn from the tank, returned thereto, and efficiently and uniformly mixed for use. A drain valve 51 is placed in each of the pipes 48 and can be opened when-

ever necessary to drain the contents from the respective tanks as will be understood.

In the type of dyeing apparatus to which the present invention is applied the treating liquid is sprayed upon the material (such as skeins of yarn) and that this may be accomplished in an effective manner the discharge end of each of the pumps 46 communicates with a separate three-way valve 52 which functions in one position to permit independent mixing and circulation of the treating liquid in each of the tanks, and in its other position cuts off such mixing and circulation and diverts the stream of liquid from the several pumps 46 upwardly by pipes 53 leading respectively to the distributing heads of the material supporting devices 12. The valves 52 are arranged for separate control by means of support arms 53, connecting links 55, and operating handles 56, the respective parts being pivotally interconnected and suitably journaled on the frame of the machine so that the handle 56 of each machine is in a convenient position for operating its valve 52 when occasion arises.

When two or more units are interconnected for use as a single large machine it has been found that the initial mixing of the treating liquor to produce uniformity is difficult to accomplish by the independent circulation of the liquor in the separate circulating systems and in order to overcome this disadvantage a means has been devised for causing a series circulation of the liquor through all of the tanks 10 while at the same time maintaining the primary circulation in certain of tanks 10. One construction for bringing about this function consists in locating a three-way valve 57 as a junction between the pipes 48 and 50 of the first tank 10 so that one outlet is by way of pipe 50 and the other outlet by a conduit 58 connecting to a three-way valve 60. An outlet pipe 61 leads from the valve 60 to the coupling 17 between the second and third tanks, and the other outlet pipe 62 leads to a closure fitting 63 projecting through and secured in leak-proof fashion over the opening 14, but terminating in a discharge nozzle 64 inside of the third tank 10 and directed toward the bottom thereof. When the valve 57 is turned to cut off the pipe 50 from the pipe 48 the discharge from the first pump 46 follows the pipe 58 to the valve 60 and then either enters the second or intermediate tank 10 by way of the pipe 61, or enters the third tank by way of the pipe 62 according to the set position of the valve 60 and whether or not two or three tanks are to be included in the system. If the valve 60 is in position to cut off the line 61 it will establish communication between the pipes 58 and 62 and there will be a circulation of liquor from the pump 46 of the first tank by way of the line 58 and 62, discharge nozzle 64, through the three tanks successively and return to the first tank 10. Incidental to this series circulation of liquor, there is also maintained a separate agitation of the liquor in two of the tanks 10 by the operation of the two pumps 46 for these tanks.

In describing the operation of the machine it will be assumed that three of the separate units A, B and C are connected together in intercommunicating relation so that the assembly represents a single machine of maximum capacity. To make the several units so operative the two hand wheels 42 are turned to bring the two flap valves to open position so that a series flow of liquor can take place through the connected units. Also the valve 57 is set to cut off the pipe 50 from the discharge pipe 48 and to establish communi-

cation of the latter with the pipe 58. The valve 60 is set to establish communication between the pipes 58 and the pipe 62 and to cut off the pipe 61 from the pipe 58. The dye liquor is now placed

5 in the several tanks and mixed by starting the three circulating pumps 46 so that the solution is withdrawn from the tanks and in the case of the tanks B and C is recirculated by way of the pipes 50, but in the case of the tank A the solution is withdrawn therefrom and returned to the tank C to travel through tank B back to tank A. Thus there is a direct flow of solution through tanks A, B and C in series as one complete cycle while auxiliary thereto there are two cross circulations independently caused by two separate circulating means acting in tanks B and C. As a result there are no dead spots in which the dye can collect to prevent a uniform mixing and eventually produce streaks in the material. In some instances tank A may have an initial circulation through pipe 50 before the latter is cut off and the circulation transferred to the three tank cycle. Upon the completion of the mixing, which takes a very short time compared to the prior mixing methods, the three valves 52 are turned so that the discharge from each of the pumps 46 is shifted into the respective pipes 53 and is led to the jet delivering supports 12 upon which the material is suspended.

30 Under some conditions it has been found advisable to entirely close the valve 57 of the tank A, due to the fact that the discharge into tanks C and B is not recirculated fast enough to maintain a substantially constant level in all of the tanks. In other words there is danger that the mixing liquor in tank A will be nearly drawn off while the liquor in tank C will rise to an undue level. For this reason the valve 57 is, under such conditions, open sufficiently as to by-pass and return some of the liquor to the tank A and maintain an auxiliary circulation in that tank as well as in tanks B and C, and this partial opening of the valve 57 can be adjusted until the circulation is so uniformly distributed as to maintain a common level in all of the tanks. In connection with the nozzle 64 it should be noted that this directs the liquor downwardly and in such a manner as to distribute it over the bottom and toward the corners so that there are no dead spots or segregated eddies which interfere with uniform mixing.

50 While only a single form is shown in which this invention may be embodied, it is to be understood that the invention is not limited to any specific construction, but might be applied to various forms without departing from the spirit of the invention or the scope of the appended claims.

Having thus described our invention, we claim:

60 1. A material treating machine comprising two intercommunicating tanks containing treating liquid, a valve for cutting off communication between said tanks, and separate means for respectively causing circulation of liquid in said tanks.

65 2. A material treating machine comprising two intercommunicating tanks, a piping system including a pump for causing circulation of liquid in one of said tanks, a second piping system including a pump for causing a circulation of liquid

in the other tank, a pipe connected with the discharge of one of said pumps and forming a communication with the tank of the opposite pump, a valve in said pipe for selectively controlling the discharge of said pump to one or the other of said tanks, and a valve for controlling communication between said tanks.

3. A material treating machine comprising the combination of two tanks containing treating liquid, material supports respectively above the liquid in said tanks, liquid spraying devices associated with said supports, a pump having a discharge communicating with both of said tanks and with one of said material supports, a valve for selectively controlling said discharge for causing a circulation through all of said tanks, or through one of said tanks, or through said support, a pump arranged to cause a circulation of liquid through one of said tanks and through the material support of that tank, and a valve for selectively controlling the discharge from said last pump.

4. A material treating machine comprising a plurality of tanks connected in series for intercommunication, means to cause a circulation of treating liquid from one tank to the next throughout the series, separate means for causing a cross circulation of said liquid in each tank, material supports respectively above the liquid in said tanks, and means for by-passing the liquid from one of said circulating means through said supports.

5. A material treating machine comprising a plurality of tanks connected in series for intercommunication, means to cause a circulation of treating liquid from one tank to the next throughout the series, separate means for simultaneously causing a cross circulation of said liquid in each tank, material supports respectively above the liquid in said tanks, and means for by-passing the liquid from one of said circulating means through said supports.

6. A material treating machine comprising a plurality of tanks connected in series for intercommunication, a pump having an inlet connected with one end tank and an outlet connected with the opposite end tank for causing a circulation of liquid through all of said tanks, a supplemental discharge from said pump leading into the end tank in which said inlet is located, control means for selectively regulating said two outlets, means for respectively causing a cross circulation of said liquid in each of the other tanks, material supports respectively above the liquid in said tanks, and means for by-passing the liquid from one of said circulating means through said supports.

7. A material treating machine comprising a plurality of tanks connected in series for intercommunication, means to cause a circulation of treating liquor from one tank to the next, supports respectively arranged above the liquid in said tanks to suspend material, and means for causing a circulation of liquid from each tank to the suspended material.

GEORGE E. DRUM.
WILLIAM H. JAXHEIMER.