

J. F. WHITE.
 APPARATUS FOR TREATING FIBER WITH LIQUIDS.
 APPLICATION FILED JAN. 3, 1911.

994,625.

Patented June 6, 1911.

2 SHEETS-SHEET 1.

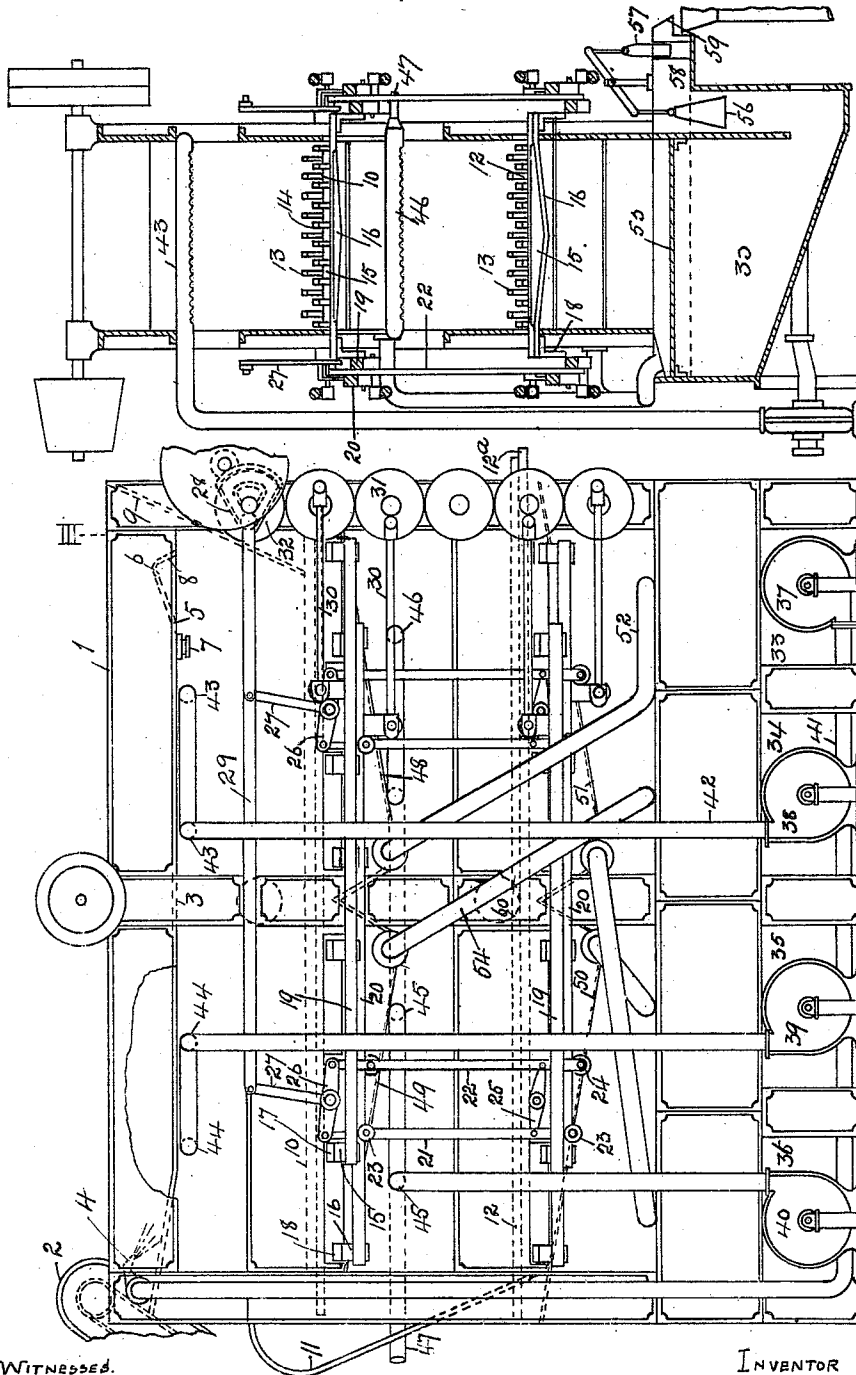


FIG. 3.

FIG. 1.

WITNESSED.

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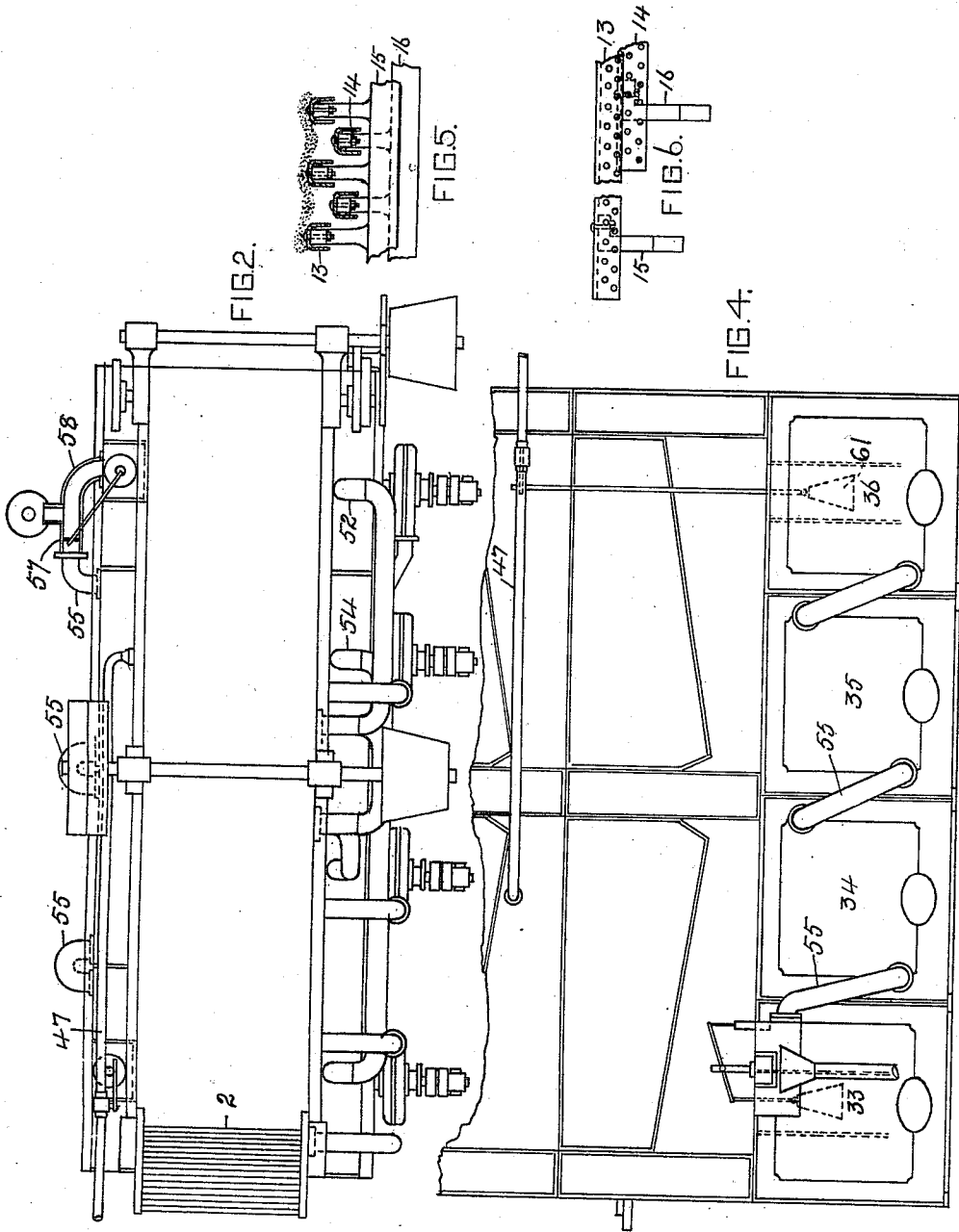
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APPARATUS FOR TREATING FIBER WITH LIQUIDS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN FRANCIS WHITE, a subject of the King of Great Britain, residing at Bradford, in the county of York, England, have invented certain new and useful Improvements in Apparatus for Treating Fiber with Liquids, of which the following is a specification.

This invention relates to improved apparatus for enabling fiber to be sprinkled upon by liquids and the resulting liquids recovered for subsequent treatment as in the recovery of potash from wool prior to being treated in the usual wash bowl, and the process known as carbonization and the like, as distinguished from the simple process of washing which is usually done in so-called wash bowls.

The object of the invention is to provide apparatus whereby the fiber is more thoroughly and uniformly penetrated by the liquid and in which the fiber is forwarded and supported in a manner to facilitate the liquid coming into contact with every single fiber and so more effectively acting on the same and as the case may be more thoroughly dissolving out the potash or in the case of carbonizing more thoroughly attacking the vegetable fibers.

A further object of the invention is to arrange the circulation of the liquid so as to insure a more constant overflow of the final liquid which in the case of the recovery of potash is led off for subsequent treatment.

The invention is shown in the accompanying drawings in which—

Figure 1 is a side elevation. Fig. 2 a plan view. Fig. 3 a section on the line III—III of Fig. 1. Fig. 4 a side elevation showing the opposite side from that in Fig. 1. Figs. 5 and 6 are detail views of the forwarding tables.

In these drawings the machine consists of a suitable casing 1 into which the wool is led by any suitable conveyer 2 so as to fall into an immersing canal or duct 3 which is supplied with liquor as hereinafter described from a spray 4. This canal or duct 3 has a bottom which slopes to its deepest point 5 near the overflow 6 and is here provided with a drawing off and sludge plug 7. At the overflow 6 there is provided a lip 8 for guiding the wool which is soaked in the duct and carried along thereto. The

wool falls against a baffle 9 and is thereby guided on to the upper 10 of two forwarding tables along which it travels and from which it falls against the baffle 11 and on to the under forwarding table 12 along which it also travels till it passes out of the apparatus at 12^a.

The forwarding tables 10 and 12 are each formed of supporting surfaces in the form of longitudinal members preferably in the form of inverted and perforated channel irons 13 and 14, Figs. 5 and 6. The alternate longitudinal members of these tables are connected together and mounted each set 13 and 14 on a series of cross bars 15 and 16 in such a way that any motion imparted to the different series of cross bars 15 and 16 will be imparted to the respective sets of longitudinal members 13 and 14 carried thereby. The cross bars 15 and 16 of each series of cross bars project through the sides of the casing 1 and all of those forming one series 15 or 16 are connected by suitable elbow pieces 17 or 18 to one horizontal rail 19 or 20 outside the casing 1 and on each side of the same. From the foregoing it will be obvious that there will be one rail in connection with each set of longitudinal supporting members 13 and 14 on each side of the machine. On each side of the machine there are a series of vertically arranged lift rods 21 and 22 carrying rollers 23 and 24 upon which the respective rails 19 and 20 rest. These lift rods 21 and 22 are arranged in sets of two, and are connected by rocking levers 25 at their lower ends and by inverted T or double bell crank levers 26 at their upper ends. The central arms 27 of the respective double bell crank levers 26 are connected to a horizontal cam rod 29 which is reciprocated by a double acting cam 28 mounted at one end of the apparatus.

By the foregoing arrangement it will be obvious that by the reciprocation of the cam rod 29 the double bell crank levers 26 will be caused to rock and so reciprocate the vertical lift rods 21 and 22, the two connected lift rods in each case always being reciprocated in opposite directions so that the rails 19 and 20 and therefore the longitudinal supporting means of the tables will be reciprocated vertically in opposite directions. The two rails 19 and 20 on each side of the casing are connected by means of

connecting rods 30 to rotating crank disks 31 which are either connected to toothed wheels or are formed with teeth upon their peripheries and intermesh the one with that immediately above it, the top toothed wheel 31 intermeshing with a toothed wheel 32 connected to the double acting cam 28 above described. The whole system of toothed wheels is driven by any suitable means. The first two toothed wheels 31 immediately below the cam toothed wheel 32 on each side are connected to the two rails 19 and 20 of the upper table 10 while the lowest two toothed wheels 31 on each side are connected to the rails of the lower table 12 in such a way that the rails 19 and 20 in connection with each table are always moved in opposite directions.

It will be noted that the cam 28 is so shaped that the reciprocations of the cam rod 29 will take place when the connecting rods 30 are at the dead centers of the crank disks 31 and therefore the lift or fall as the case may be of the channel irons forming the forwarding tables will take place when the channel irons are practically stationary so far as their horizontal reciprocation is concerned and further the channel irons will be stationary so far as their vertical reciprocation is concerned when they are being reciprocated in the horizontal direction so that the channel irons are given what may be practically termed a square motion and all rubbing of the under surface of the fibers by the upper surface of the channel irons practically avoided so that as a consequence the balling and rolling of the fibers which is apt to take place when the longitudinal members are given what is practically a vertical or oval motion, is eliminated.

Arranged underneath or in suitable proximity to the casing 1 are a series of say four tanks, 33, 34, 35, 36 for holding liquid for treating the wool and collecting the same after it has dissolved or washed out the suint. The liquid in these tanks varies in strength decreasing gradually from the first tank 33 to the second, to the third and to the fourth. Pumps 37, 38, 39 and 40 are arranged in each of the tanks. That in the first tank 33 is connected by pipe 41 to the spray 4 above referred to and leading into the duct 3. That in the second tank 34 is connected by pipe 42 to a spray or sprays 43 acting on the first half of the upper table 10. The pump 39 in the third tank 35 is connected to a spray or sprays 44 acting on the second half of the upper table. The pump 40 in the fourth tank 36 is connected to a spray or sprays 45 acting on the first half of the lower table 12 while a spray or sprays 46 are arranged to act on the second half of the under table 12 which sprays 46 are supplied with pure water by a pipe 47. Underneath each half of the tables 10 and 12 is arranged a collector

or tank forming in all four collectors 48, 49, 50 and 51, two under each table. The pipe 52 from the first collector 48 is led down so as to lead the liquid in to the first tank 33 which is provided as are the other tanks with a strainer 53, while the pipe 54 from the second collector 49 leads the liquid into the second tank 34 and so on to the last collector 51 and the last tank 36.

Overflow pipes 55 are arranged from the point at which it is desired the level of the liquid shall be in each tank to near the bottom of the succeeding tank while the first tank 33 is provided with a hydrometer device 56 which controls a small weir or gate 57 in a duct leading to the pipe 55 leading from the first tank 33 to the second 34. This duct 58 is provided with branch 59 between the gate or weir 57 and the first tank 33 which branch leads away to a suitable receptacle for the concentrated liquid. The outlet to this branch 59 leads out of the pipe at a level somewhat above that of the duct 58 so that when the weir is open the overflow of liquid from the first tank 33 will simply flow to the bottom of the second tank 34, but when the weir is partially or wholly closed some or all of the liquid will pass from the first tank 33 to the receptacle for the collection of the concentrated liquid. The pipes 55 connecting the different tanks are preferably so arranged that the respective levels of the liquids in the tanks decrease somewhat from the first tank to the fourth tank. The level in the fourth tank 36 is kept constant by means of the float device 61 which controls the flow of fresh water through the pipe 47 on to the wool located above the collector 51. The action of the apparatus as a whole is as follows:—

The raw wool is projected by means of the conveyer 2 into the immersing duct 3 and in falling into the liquid contained therein it is naturally opened and practically every fiber is saturated before the wool or fiber reaches the outlet of the immersing duct. This presents a great advantage over previous apparatus of this type in that it takes advantage of the well-known fact that wool is very difficult to penetrate with a liquid by simply spraying upon the same but that when it has once been saturated in an open condition water will pass through the same much more easily. The wool when it arrives at the outlet of the immersing duct falls upon the first of the forwarding tables and is worked along the same by means of the double reciprocations imparted to the different sets of perforated channel irons forming the table and at the same time is sprinkled upon by the sprinklers 43 and 44. When it reaches the end of the first table it falls down on to the second table and in so falling is turned over or at any rate the relative positions of the different fibers are so

changed that a new surface is presented to the next set of sprinklers 45 and 46 so that according to the present apparatus the wool is first thoroughly saturated and then sprinkled upon then turned over and then sprinkled upon again, the final sprinkling being preferably with clean water.

With regard to the circulation of the liquid all the pumps in the different tanks are set going. The pump 37 in the first tank 33 forces the liquid by pipe 41 to the spray 4 and so into the canal or duct 3 where the incoming wool is thoroughly soaked and carried along to fall with the liquid on to the table 10. The pump 38 from the second tank causes the liquid therefrom to spray over the first half of the upper table 10 and such liquid as finds its way through this portion of the table before it reaches the second half falls into the first collector 48 and so into the first tank 33. That which passes through the wool after it has passed the center of the table 10 together with such of that from the third tank 35 as passes through the wool in this portion of the table is collected in the second collector 49 and passes back to the second tank 34, while that which passes through the wool on the first portion of the under table 12 from the fourth tank 36 passes to the third tank 35 and that which passes through the second portion of the under table from the pure water supply 47 passes to the fourth tank 36. In action it is found that tank 33 will receive back considerably more liquid than is pumped out of it so that the liquid will tend to normally flow by the connecting pipe 55 from the top of this tank to the bottom of the second tank 34. As the liquid which flows into the first tank 33 will contain a considerable amount of suint it will be somewhat heavier than the liquid already in the tank and will tend to lie at the bottom of the same. The overflow will therefore consist of the weaker portion in this tank and this weaker portion will be passed on to tank 34. The same action takes place between tanks 34 and 35, and 35 and 36. On however the liquid in tank 33 reaching a predetermined strength the hydrometer 56 will be raised and so allow the gate or weir 57 to drop so that some or all of the liquid as will tend to overflow from tank 33 will be led away to the receptacle for the subsequent treatment for the recovery of the potash. Obviously in the normal running of the machine after the liquid in the tank 33 has got up to the desired degree of concentration there will be very little overflow back from the same into tank 34. The level in the tank 34 however will be kept up by the liquid caught in the second collector 49 which will comprise a considerable proportion of the water which has been sprayed in the first half of the table 10 but has not yet passed through the

wool till it has reached the second half of the table and a proportion of liquid which has been pumped out of the tank 35. The third tank 35 will be kept up at its normal level owing to its receiving back liquid from the third collector 50 which will receive water sprayed on the second half of the table 10 which has not managed to pass right through the wool, until it has fallen down on to the second table together with a proportion of the liquid which is pumped out of tank 36 and been caught by the third collector 50. Tank 36 will have its level kept normal by means of the liquid coming from collector 51 which will consist largely of the pure water sprayed on the second half of the under table 12 from the pipe 47. It will be obvious by this arrangement of parts that in any overflow which will take place in the tanks from 33 to 34, 34 to 35, 35 to 36 (and which will take place more particularly in the earlier running of the machine) the weakest liquid will pass from each tank and as this weakest liquid from one tank will be stronger than the liquid in the succeeding tank it will tend to remain at the bottom of the same so that the overflow in every case is the weakest portion which means that the difference in concentration between the different tanks will be kept fairly constant and the liquid in the first tank 33 will reach the desired degree of concentration comparatively quickly.

If it be desired to press somewhat upon the wool before leaving the different tables so as to insure a large amount of liquid being recovered from the same a stationary roller 60 could be mounted in bearings, which are normally pressed down by springs in any suitable maner and at such a height above the table that the longitudinal members in lifting the fiber would press the same somewhat against the under side of the roller. Such rollers could be located wherever found desirable in the machine. It will be obvious by the foregoing arrangement that not only is the wool as described continually being opened while being sprayed upon but it is also turned over when passing through the machine so that both surfaces of the layer of wool are sprayed upon and it is generally treated in a much more open condition than has hitherto been possible as there is not any formation of a so-called "blanket" of considerable thickness which is pressed down and compacted and in fact almost felted by a series of rollers which press down upon the usual brattice carrying the wool.

It will be obvious that the foregoing apparatus could also be used in cases where it is desired to replace potash in the wool by sprinkling the wool with a strong solution of the potash, or impregnate or treat the same or other fibers with different liquids

which it is desirable to spray on to the fiber and then collect, for instance, acid in the case of carbonizing.

I declare that what I claim is:—

5 1. In apparatus of the character described an immersing duct, means for supplying liquid to said immersing duct and for lead-
 10 ing the fiber placed in said duct to the outlet of the same, supporting and forwarding means receiving fiber from said duct, means
 15 for sprinkling liquid over the fiber located on said forwarding means, collectors for the liquid under said forwarding means, tanks connected by pipes to said collectors and pumps between said tanks and said sprin-
 20 klers.

2. In apparatus of the character described an immersing duct, for receiving the fiber to be treated, means for supplying liquid to
 20 said duct, forwarding and supporting means for the fiber falling from said duct located underneath said duct, means for projecting series of sprays of liquid on to the fiber lo-
 25 cated and conveyed along said supporting means, means for collecting the liquid sprayed upon the fiber resting on said for-
 30 warding means, tanks for receiving said liquid and means for returning the liquid from said tanks to said duct and to said sprinkling means.

3. In apparatus of the character described means for first thoroughly soaking and im-
 35 pregnating the fiber to be treated, superposed forwarding tables receiving said fiber one from the other, perforated pipes forming spraying means located over the said forwarding tables, collectors under each for-
 40 warding table for liquid passing through said forwarding tables, a tank connected up to each of said collectors, a pump located in each of said tanks and connections from each of said pumps to one of said pipes forming said sprinkling means.

4. In apparatus of the character described
 45 an immersing duct, means for feeding liquid to and causing a flow of liquid along said duct, a perforated forwarding table located under said duct adapted to receive at its forward end fiber discharged from said duct, a
 50 second forwarding table under said first forwarding table adapted to receive at its front end fiber discharged from said first forward-
 55 ing table, a perforated pipe forming sprinkling means at the front end of said immersing duct and over each half of each forward-
 60 ing table, a collector under each half of each forwarding table, a series of tanks corresponding in number to the number of collectors, a pipe from each collector to one of said tanks, pumps connected to said tanks, connections between the pumps in the tanks connected to the collectors under the first and second halves of the first forwarding table and the sprinkling means over the im-
 65 mersing duct and the first half of the first

forwarding table, connections between the pump in the tank receiving liquid from the first half of the second table and the spray-
 70 ing means located over the second half of the first table, connections between the pump located in the tank receiving liquid from the second half of the second table and the spraying means over the first half of the second table and means located over the
 75 second half of the second table for spraying clean water on to the fiber passing there-
 over.

5. In apparatus of the character described forwarding means composed of longitudi-
 80 nal members arranged in sets to which a combined horizontal and vertical reciproca-
 85 tion is given to forward the fiber resting thereon, perforated pipes located over said forwarding means to form spraying means, means for supplying liquid to said perfo-
 90 rated pipes, a series of collectors under said forwarding means, separate tanks for receiving liquid from each of said collectors, and pumps in each of said tanks connected to said perforated pipes.

6. In apparatus of the character described forwarding means for the material to be treated said forwarding means consisting of longitudinally arranged perforated in-
 95 verted channel irons, means for supporting alternate members of said channel irons, means for raising and lowering and giving a forward and backward motion to said channel iron supporting means, means for
 100 sprinkling liquid on fibers located on said forwarding means, a series of collectors under said forwarding means, separate tanks for receiving liquid from each of said collectors, and means for returning liquid from
 105 said tanks to said sprinkling means.

7. In apparatus of the character described forwarding means for the fiber to be treated, said forwarding means consisting of longi-
 110 tudinally arranged inverted perforated channel irons, two sets of cross bars, each set supporting alternate members of said inverted channel irons, longitudinal rails connecting and supporting cross bars of each set of cross bars, means for imparting a harmonic hori-
 115 zontal reciprocation to each of said supporting rails, means for quickly raising and holding said rails in an elevated position and means for lowering and holding said rails in a depressed condition, means for
 120 spraying liquid on to the fiber supported by said forwarding means, a series of collectors underneath said forwarding means, and means for returning the liquid from each of said collectors to said spraying
 125 means.

8. In apparatus of the character described supporting and forwarding means for the fiber to be treated, a series of liquid col-
 130 lectors located under said forwarding means, a series of perforated pipes located over said

forwarding means and means for supplying liquid to the perforated pipes to form sprays one of said perforated pipes being located over each of said collectors, means 5 for collecting the liquid from the said collectors and returning it to the spraying means.

9. In apparatus of the character described, an immersing duct, longitudinal perforated 10 channel irons forming tables located one below the other and below the immersing duct, means for operating said channel irons to forward material located thereon in a different direction on each table, means for sprinkling liquid on to the material forwarded 15 along said tables and means for collecting liquid passing through the said material located on said tables.

10. In apparatus of the character described a series of tanks, a pump located in each of said tanks, a pipe leading from the pump in the first tank to an immersing duct, superposed forwarding tables under said immersing duct, a collector under each half 20 of each of said forwarding tables, a pipe connected to the pump in the second of said tanks, means for spraying liquid upon the material located on the first half of the upper forwarding table, means for permitting 30 fiber and liquid to overflow from the immersing duct on to the front portion of the upper of said forwarding tables, means for collecting liquid passing through the first half of said upper forwarding table and 35 conveying it to the first tank, connections between the subsequent of said pumps and the subsequent of said tanks to spraying means located over the second half of the upper forwarding table and the first half of 40 the lower forwarding table, collectors under the second half of the upper forwarding table and the first half of the lower forwarding table, connections leading into the second and third tanks respectively, means for 45 spraying clean liquid over the second half of the lower table and means for collecting liquid under the second half of the said lower table, means for conducting the liquid from this last collecting means to the fourth 50 tank, overflow pipes from the top of the first tank to the bottom of the second tank, from the top of the second tank to the bottom of the third tank, from the top of the third tank to the bottom of the fourth tank, 55 means for permitting overflow of liquid from the first tank on said liquid reaching a predetermined strength.

11. In apparatus of the character de-

scribed means for simultaneously soaking and opening fiber to be treated, means for 60 dropping said material on to a forwarding table, means for spraying fiber located on said forwarding table, a lower forwarding table, means for dropping fiber from said forwarding table on to said lower forwarding 65 table, means for spraying fiber with liquid on said lower forwarding table, means permitting the flow of liquid through said forwarding tables, means for collecting the liquid passing through said forwarding tables 70 means for returning said liquid to said spraying means, means for permitting the withdrawal of a portion of said liquid on the same reaching a predetermined strength.

12. In apparatus of the character described superposed forwarding and supporting means for fiber, means for spraying liquid on to the fiber on said forwarding and supporting means, a series of collectors 80 under said forwarding means, tanks connected to said collectors, pumps in said tanks connected to said spraying means, and means for guiding the fiber from one forwarding and supporting means on to the forwarding and supporting means immediately below. 85

13. In apparatus of the character described means for spraying liquid on to the fiber to be treated, means for conveying a layer of fiber under said spraying means, means for turning over the layer of fiber on 90 said conveyer means and lowering it on to further conveying means, means for spraying liquid on to the turned fiber on said further conveyer means, and means under each of the conveying means for collecting 95 the liquid resulting from said spraying action, and returning it to said spraying means.

14. In apparatus of the character described a duct for liquid, means for continuously supplying liquid to said duct and causing a slow current of liquid along said duct, means for placing fiber to be treated in said duct, subsequent means for receiving and supporting a layer of fiber from said 105 duct and conveying the layer of fiber, means for spraying liquid on to the layer of fiber on said supporting means and means for collecting the liquid resulting from said spraying action. 110

In testimony whereof I affix my signature in presence of two witnesses.

JOHN FRANCIS WHITE.

Witnesses:

HUBERT PUMPHREY,
CHAS. HIBBERT.