

Sept. 29, 1931.

W. S. ROWLEY ET AL

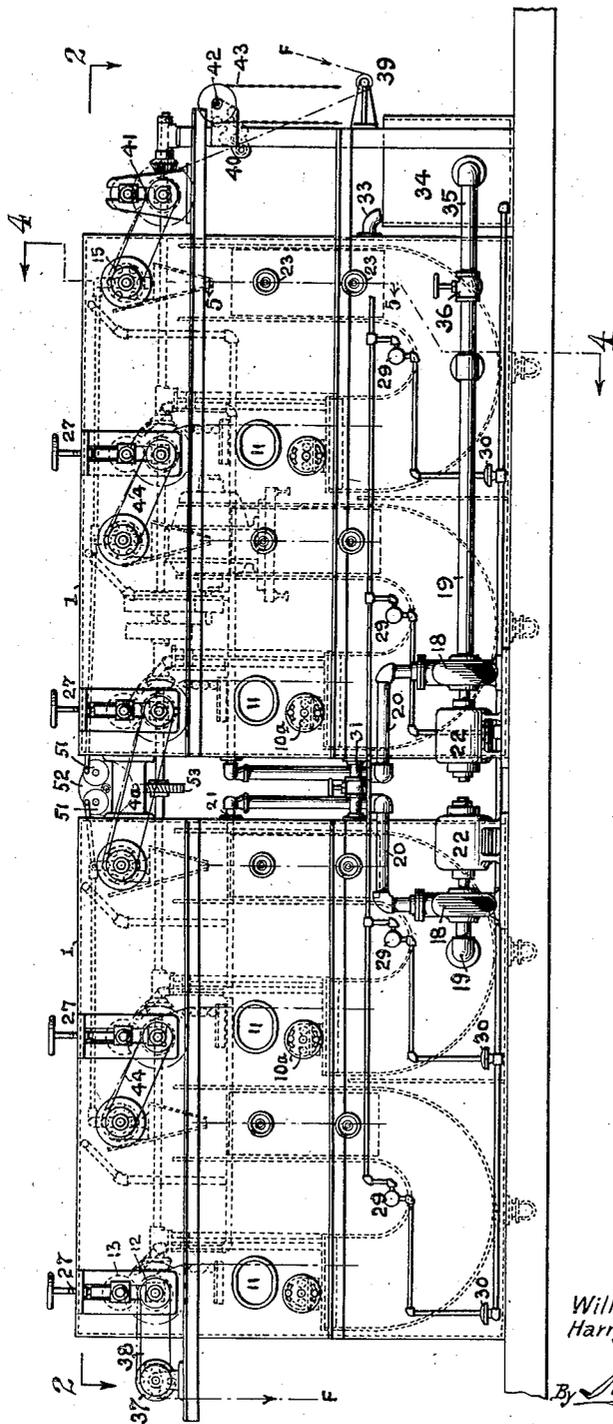
1,825,478

METHOD AND MEANS FOR TREATING TEXTILE FABRICS

Filed April 12, 1926

3 Sheets-Sheet 1

FIG. 1.



INVENTORS.  
William S. Rowley  
Harry W. Butterworth Jr.  
By *[Signature]*  
Attorney.

Sept. 29, 1931.

W. S. ROWLEY ET AL

1,825,478

METHOD AND MEANS FOR TREATING TEXTILE FABRICS

Filed April 12, 1926

3 Sheets-Sheet 2

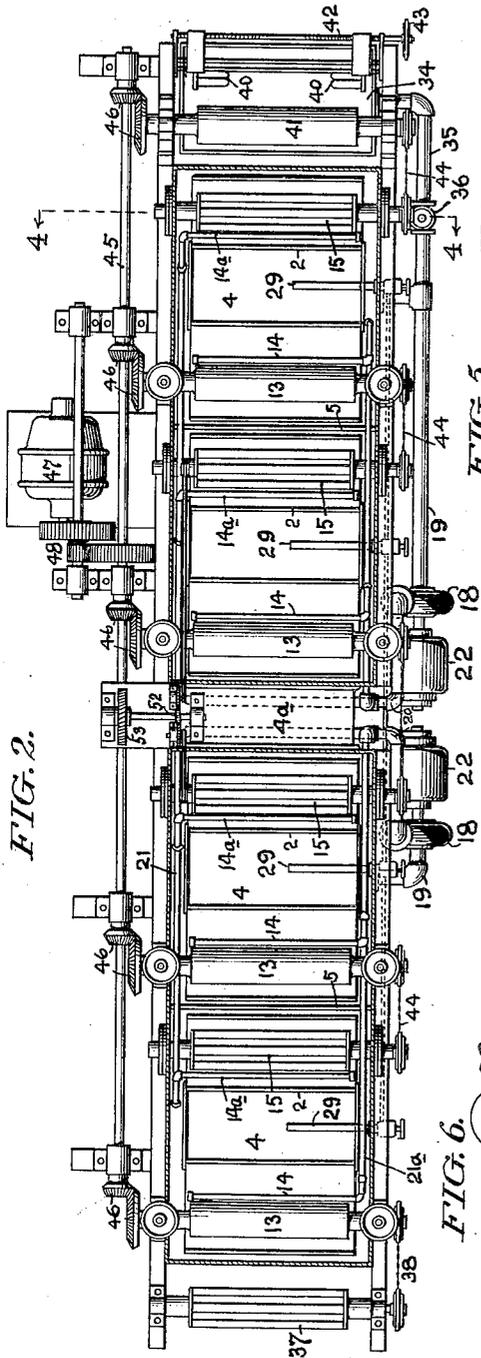


FIG. 2.

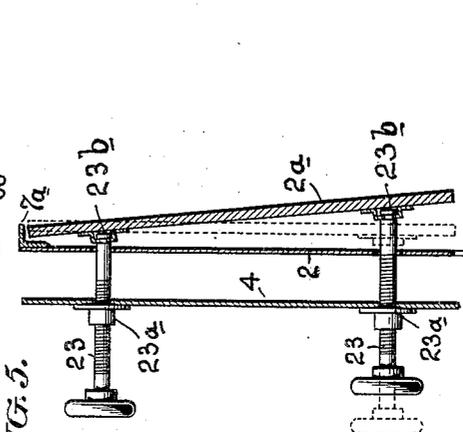


FIG. 5.

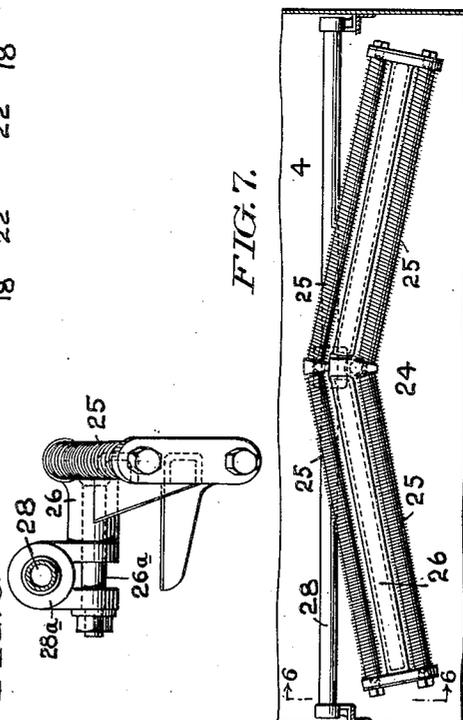


FIG. 6.

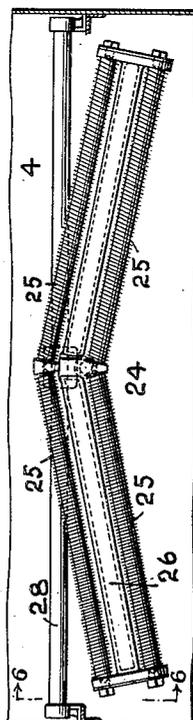


FIG. 7.

INVENTORS.  
William S. Rowley & Harry W. Butterworth Jr.

By *[Signature]*  
Attorney.

Sept. 29, 1931.

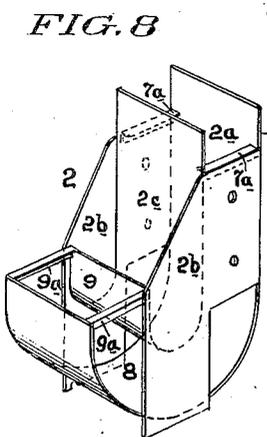
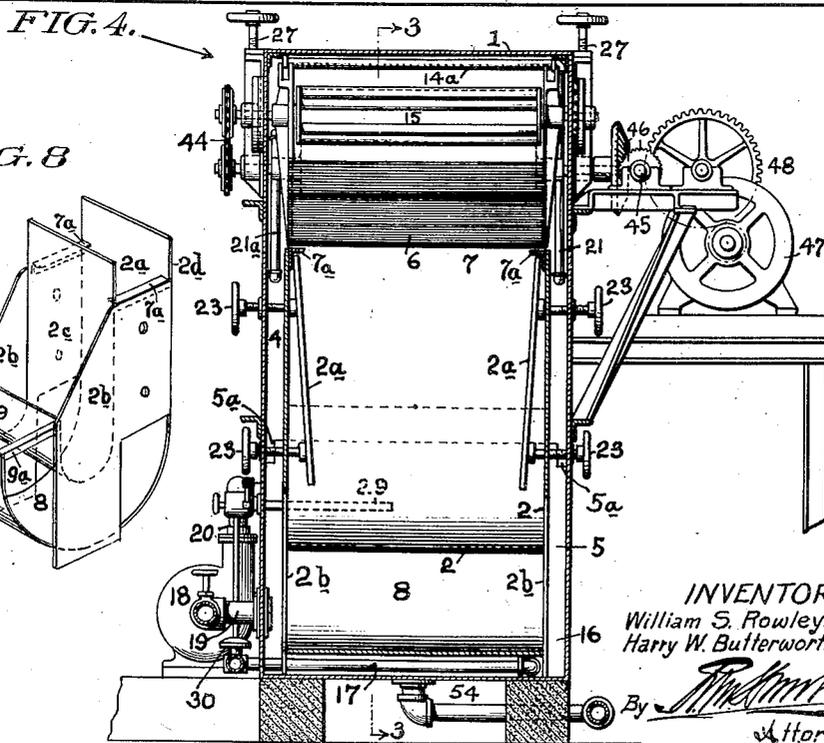
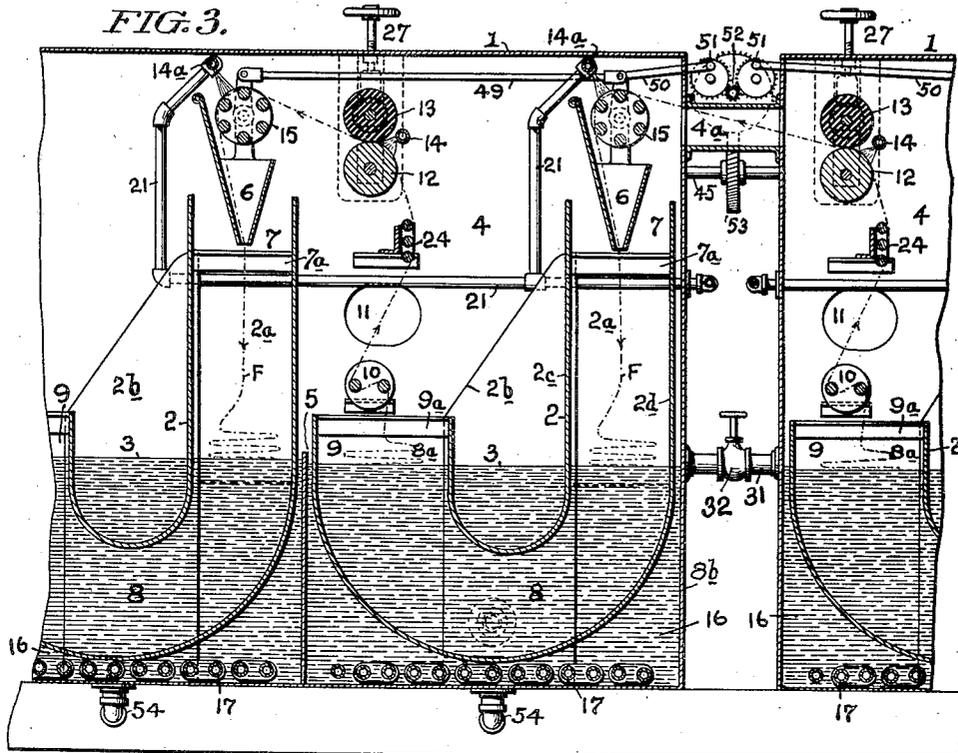
W. S. ROWLEY ET AL.

1,825,478

METHOD AND MEANS FOR TREATING TEXTILE FABRICS

Filed April 12, 1926

3 Sheets—Sheet 3



INVENTORS.  
William S. Rowley,  
Harry W. Butterworth Jr.

By *[Signature]*  
Attorney.

## UNITED STATES PATENT OFFICE

WILLIAM S. ROWLEY AND HARRY W. BUTTERWORTH, JR., OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO H. W. BUTTERWORTH & SONS COMPANY, A CORPORATION OF PENNSYLVANIA

## METHOD AND MEANS FOR TREATING TEXTILE FABRICS

Application filed April 12, 1926. Serial No. 101,245.

The invention of the present application is an improvement upon the features of construction and mode of operation of the kier set out in our former application Serial No. 739,285, filed September 23, 1924, now Patent No. 1,741,338, dated December 31, 1929, for providing a preliminary treatment to textile material, comprising boiling in an alkaline liquor, spraying and squeezing which shall cleanse the fabric and put it in such condition that after thorough washing it is suitable for the bleaching, dyeing or other operation to which it is to be subjected. The alkaline fluid employed is usually a weak caustic solution.

As set out in our previous application, the improvements primarily have for an object the overcoming of the difficulties which have heretofore been inherent to the boiling in a kier in which the cloth is gathered into rope form and laid in such rope form in all directions upon itself within the tank or kier, with the object of packing it as uniformly as possible, and thereafter subjecting it to the caustic solution in which it is submerged and boiled; and in which process, the treatment is frequently not uniform over the entire fabric notwithstanding the excessively long time required for the boiling, necessitating in some cases a second boiling operation.

The improvements embodied in our special construction of kier, forming the subject matter of the present application, enables the manipulation of the goods throughout the treatment without any personal handling by the attendants and the avoidance of all entangling of the fabric or irregularity in the treatment over different parts of the fabric, whereby the passage of the fabric once through the machine in a continuous manner enables the treatment required to be completed and definitely "bottomed".

The special feature of our improvements resides in the fact that the goods may be treated in a continuous manner with as many repetitions of the treatment as desired and at whatever speeds the conditions may require, the fabric between each spraying and squeezing operation being subjected to a boiling in a weak caustic alkaline solution for

any predetermined period which may be necessary.

A still further object of our improvements is to eliminate entirely the necessity of boiling under pressure, because every part of the length of the fabric is subjected to exactly the same treatment in the boiling caustic solution, and consequently pressure to insure circulation is not necessary.

With the above and other objects in view, the nature of which will be more fully understood from the description hereinafter, the invention consists in the novel method and means for treating textile fabrics, as hereinafter more fully described and defined in the claims.

Referring to the drawings: Fig. 1 is a side elevation of our improved kier when formed in cooperative sections; Fig. 2 is a horizontal sectional view taken on line 2—2 of Fig. 1; Fig. 3 is a vertical section through a portion of the apparatus taken on line 3—3 of Fig. 4; Fig. 4 is a vertical cross section of the apparatus taken on line 4—4 of Figs. 1 and 2; Fig. 5 is a vertical section of a part of the apparatus taken on line 5—5 of Fig. 1; Fig. 6 is an end view, with part in section, on line 6—6 of Fig. 7, showing the "evener boy"; Fig. 7 is a front elevation of the same; and Fig. 8 is a perspective view of one of the J boxes employed within the kier.

As shown in Fig. 1, our improved apparatus is illustrated as made up of two main sections or units each of which constitutes a kier arranged for subjecting the fabric to two treatments by the caustic solution, the fabric passing into and out of the kier in a continuous manner, though remaining in contact with the caustic solution for a predetermined period to insure a thorough cleansing action of the chemicals constituting the solution, and, moreover, the coupling of two such kier units, whereby the fabric, after treatment in one of the units, is automatically fed into and through the other unit, undergoes a similar treatment as carried on in the first unit. In the particular apparatus shown, the fabric is subjected to four treatments by the caustic solutions and subjected to a squeezing ac-

tion between nip rolls intermediate of said treatments and after the final treatment.

Referring more in detail to the apparatus, each of the units constitute an enlarged chamber having from its bottom an upwardly extending division plate 5 and forming two tanks 16 for containing the caustic solutions, the same being to substantially the level indicated at 3. The bottom of each tank is provided with steam heating coils 17 which may be supplied with steam under any suitable control. In the present case, I have indicated automatic steam valves 30 for controlling the supplying of steam to the coil 17, and said automatic valves 30 being controlled by thermostatic elements 29, one for each tank, whereby the fluid within the respective tanks is maintained at a substantially constant temperature, the degree of which is predetermined and insured by the operation of the thermostatic control device.

Arranged within each of the tanks 16 and extending upwardly into the compartment 4 above the same are J shaped passages 8 formed by metal work 2, said passages extending upwardly at the intake end considerably above the liquid level of the tank as shown at 7, where as the outlet end 9 extends very slightly above the liquid level. The metal work 2, constituting this J shaped passage, consists of the inner and smaller J shaped plate 2c and the outer and larger J shaped plate 2d, the same being connected at their lower parts by a plate 2b to hold them in proper relative positions, and said plate 2b may extend upwardly above the liquid level sufficient to support the entire upper portions of the plate 2c. Furthermore, the plates 2c and 2d may be connected together at the intake end and at the outlet end by the side connecting plates 7a and 9a respectively. It will be understood that this J shaped structure will constitute a J box such as illustrated, for example, in Fig. 8, and, moreover, will have the side portions 2b open below the liquid level, to permit free entrance and circulation of the caustic fluid. The transverse width of the J boxes, measured from plate 2b on one side to the corresponding plate 2b at the other side, is less than the total width of the tank 16, as will be understood by reference to Fig. 4, so that the fluid in the tank may find easy access through the curved passage 8 of the J box and into thorough contact with the fabric which may be contained therein and move gradually through the box.

Arranged above the inlet end 7 of the J box is a transverse reel 15 over which the fabric F is fed and delivered downward into the J box. Where the goods being treated is in the web or woven form, it is desired that it shall remain of that form and of full width in passing through the kier. It is, therefore, desirable that where the fabric passes to the

first reel 15 within the tank, it shall be subjected to a folding action. In the means shown for this purpose, the following instrumentalities are employed. The fabric F passes under the guide roll 39, thence upward between the nip or feed rolls 41 by which it is delivered into the tank over the first feeding reel 15. Between the guide roll 39 and the feed rolls 41, the selvages of the fabric are subjected to the action of the well known "Foxwell" guiders for stretching the goods transversely just before the same is nipped by the feed rolls 41. In this manner, the fabric is not only stretched to its full width, but is also centralized and properly guided to the kier. These guiders are well known devices used on tentering machines and various other machines where it is necessary to maintain the fabric in a lateral stretched condition during its forward feeding, and comprising essentially two pairs of rolls 40 arranged at a slight angle to the direction of travel of the fabric and provided with means for causing the said rolls to nip the fabric whenever the selvages or either of them approach too near the central line of travel. So far as the present invention is concerned, they may be considered as forms of stretching means for the fabric. As fabrics of various widths may be treated in our improved kier, it is desirable that the two sets of "Foxwell" guiders 40 shall be adjustable to or from each other, to suit the width of the fabric being treated, and this is accomplished by means of the feeding screw 42 having right and left hand threads and operated by a chain wheel and chain 43. In place of the use of these "Foxwell" guiders, the form of stretching device, commonly known as "evener boy" and shown in Figs. 6 and 7, may be employed and which will be further referred to when describing the means within the enclosed compartments.

Hinged to the axis of the reel 15 is a frilling folder which is oscillated back and forth within the inlet end of the J box, the said frilling folder having a width substantially equal to the width of the J box and provided with walls which incline toward each other at the bottom to form a narrow guiding passage for the fabric. As this frilling folder swings back and forth, it causes the fabric passing through it to be folded in a zigzag or back and forth manner, as is indicated in dotted lines.

As the fabric is folded into the receiving end of the J boxes, its central position is insured by the guide plates 2a, 2a, extending downward from the level of the bottom of the folder 6 to the liquid in the tank 16, said guide plates being adjusted at an angle to each other so that they are nearer together at the lower portions than at the upper portions where the fabric is received, as will readily be understood by reference to Fig. 4.

These plates 2a may be suspended in any suitable manner, but in the construction shown, they are connected to the ends of adjusting screws 23 by adjustable joints 23b, the said screws 23 extending through threaded hubs 23a (Fig. 5) secured to the sides of the tank 4 and adapted to be operated from without for positioning the upper and lower portions of said plates to insure them having any particular angle desired, according to the width of the fabric passing through the J boxes. As shown, there are two of these adjusting screws for each plate, said screws being connected to the upper and lower portions of each of the plates. While we have found this method of supporting and adjusting the plates 2a satisfactory in practice, we do not, however, limit ourselves to the specific means for such adjustment which is shown in Figs. 4 and 5. It will be understood that the construction employed may broadly be considered as a pivoting means for the upper parts of the plates while the lower parts may swing with a considerable movement, as is indicated in Fig. 5; but by making the upper hinge portion also an adjustable screw 23, the upper parts of the opposite guide plates 2a may be adjusted toward or from each other to suit fabrics of various widths, but in all such cases, the lower parts of the guide plates 2a will be nearer together than the upper parts.

The fabric which has passed through the J box leaves its outlet end 9 and passes about tension bars 10 to put upon it a drag. The fabric is thence drawn upward by and between nip rolls 12 and 13, the latter being preferably rubber covered. In the upward passage of the fabric, under the action of the nip rolls, it is drawn tightly against the lateral stretcher and centering means 24, the function of which is to spread the fabric and even its selvage so that it passes in a proper manner to the nip rolls. The "evener boy" may be of any suitable construction and, by way of example, we have illustrated in Figs. 6 and 7, a suitable form, the same consisting of a transverse bar 28 sustained within the compartment 4 and to the middle of which is secured a frame 28<sup>a</sup>, to which a frame 26 is pivoted at 26<sup>a</sup>, said frame being somewhat of inverted V shape (Fig. 7). This frame 26 supports rolls 25 which are screw threaded and also arranged in pairs in V shaped relation above and below the said frame 26. When the cloth is drawn over these screw threaded rolls 25, the action of the screw threads is to spread the fabric from the center outward toward the selvages, with the result that the fabric is freed from wrinkles and is more or less evened at the selvages. The oscillations of the frame 26 and the screw or spirally threaded rolls 25 adapt themselves to the conditions of the fabric according as to whether it extends more to one side of the

pivot than the other and is automatic, as is well known in this type of evener.

We do not limit ourselves to the particular details of the lateral stretcher and centering means, as this structure may be modified so long as it performs the function of laterally spreading and evening the fabric before it passes to the nip rolls. It will be manifest that in place of the lateral stretcher and centering means shown in Figs. 6 and 7, for use within the compartment, "Foxwell" guiders similar to those indicated at 40 may be employed, but because of the moist and alkaline atmosphere within the compartment, we prefer to employ the simpler construction of the stretcher and centering means shown for use at this part of the apparatus.

The amount of drag which is to be put upon the fabric by the drag bars 10 may be adjusted to suit the requirements by means of the adjusting heads 10<sup>a</sup> (Fig. 1), such adjustment permitting the bars to be set at different angles about a transverse axis between them for varying the amounts of friction put upon the fabric in passing over and under said bars.

The amount of tension which is put upon the nip rolls 12 and 13 may be regulated by means of the pressure adjusting devices 27 which move the upper or rubber covered roll 13 to or from the roll 12. It will be understood that these nip rolls not only squeeze the caustic solution backward from the fabric as it passes between the said rolls, but also acts as a feeding means for feeding the fabric from J box to J box within the kier. It will be also understood that the rolls 12 and 13 are driven by power and the means for operating them will be later described.

In front of the nip rolls 12 and 13 a transverse spray pipe 14 is arranged to spray the fabric with the caustic solution just before it passes between the two rolls, more particularly for washing the fabric from excess of caustic or other materials which might be stocking to the surface, all excess of solution together with impurities being squeezed back by the nip rolls as the fabric passes on.

We have also shown a transversely arranged spray pipe 14a positioned to spray caustic solution upon the fabric as it passes over the reel 15 preliminary to its entrance into the inlet end of the J box so that the fabric is thoroughly impregnated with the caustic solution before it actually descends into the tank fluid.

While we have thus described the various elements which cooperate in connection with one of the J boxes, it will be understood that there are similar devices for each of the J boxes and, therefore, in the particular apparatus shown in Fig. 1, there would be four sets of these devices.

The means for circulating the caustic fluid for spraying it upon the fabric from the

spray pipes 14 and 14a may consist of the following devices. Considering one of the units, there is provided a pump 18 which may be driven by an electric motor 22, said pump sucking the caustic solution from the lower part of one of the tanks 16 through a suction pipe 19 and delivering the solution through a feed pipe 20 which connects with branch pipes 21 for supplying solution to the spray pipes 14a, and branch pipe 21a for supplying solution to the spray pipes 14. In this manner, it will be understood that the solution is circulated under the action of the pump and spray pipes, and it is preferable that the suction to the pump be connected with the tank of the unit through which the fabric first passes. Each unit is supplied with a circulating pump and pipes corresponding to those above described, and as there are two units shown in Figs. 1 and 2, it follows that there are two sets of pumps and operating means.

It will be further seen that where the two units are employed, the upper parts of the compartments 4 are connected by a horizontal passage 4a, as shown in Fig. 3, the said passage permitting the fabric to pass from the last nip rolls of the first unit to the first reel of the next unit. It will also be seen that the adjacent tanks 16 of the first and second units are connected by means of a pipe 31 provided with a valve 32, so that the level of the fluids may equalize themselves in the different units and, furthermore, the scum or surface impurities may pass from the second unit into the first unit through the said pipe 31 and ultimately discharged by an overflow pipe 33 at the feeding end of the first unit, the discharge from which overflow pipe is received in a tank 34. To permit the gradual passage of the scum from the tanks in the direction from the discharge end of the apparatus to the intake or feeding end and also to guide the said scum as much as possible out of the direct passage of the fabric, we provide the transverse division plates 5 at their upper corners with notches 5a (Fig. 4), which notches extend above and below the level 3 of the fluid, and said scum passes along each side of the tank between the J boxes and the walls of the tank, and in that manner gradually passes to the discharge or overflow pipe 33 into the tank 34. The fluid received in the tank 34, when freed of the accumulated scum, may be re-circulated in the first unit by providing communication between the suction pipe 19 and the tank 34 through a pipe 35 and valve 36. In this manner, the contents of the tank 34 may be returned to the main tanks in which the J boxes are arranged, and re-circulated as spray fluid.

The fluids which are to be supplied to the tanks 16 or discharged therefrom may be handled through a system of pipes 54 which may deliver to a reservoir (not shown) in the

manner set out in the former application referred to, and similarly, the contents of said tank may be supplied to the tanks 16 when necessary. Furthermore, as set out in the former application, the waste fluids may be discharged to a sewer or other place for reclamation, if so desired.

We will now refer to the power means for driving the feed reels and nip rolls and also for reciprocating the folder guides. 45 is a longitudinal shaft which, by means of bevel gears 46 at intervals along its length, causes the rotation of the lower rolls 12 of the nip rolls and said shaft is rotated by means of speed reducing gearing 48 operated by an electric motor 47. The upper rubber covered nip rolls 13 are driven by frictional contact with the nip rolls 12, the pressure of said contact being regulated by the screws 27. As shown, all of the nip rolls are driven at the same speed. The feed reels 15 are driven by means of sprocket wheels and chains 44 which derive power from the lower nip roll shaft immediately preceding, as will be readily understood by reference to Figs. 1 and 5. The speeds of rotation of the reels 15 are preferably substantially the same as the speeds of rotation of the nip rolls where they are of the same diameter, and should they be made of different diameters, the sprocket chain drive should be such that the surface speeds of the rolls 12 and reels 15 are substantially the same. The folder guides 6 are preferably pivoted concentric with the axes of the feed reels 15 and are oscillated by means of links 49, links or bars 50 and cranks 51, and these cranks may be rotated by gearing 52 which, in turn, is driven by spiral gearing 53 driven from the longitudinal shaft 45. Any other suitable means for operating the frillers may be employed, if so desired.

Upon the fabric being fully treated, it leaves the last J box of the series and is delivered by the nip rolls to a delivery reel 37 which is driven by a sprocket wheel and chain 38, as indicated in Fig. 1, said driving means being operated from the shaft of the nip roll 12. The fabric F descends from the delivery reel 37 and may be received in a J box or any other receptacle, or may be fed to other apparatus, as may be desired.

We have described our improved method and means in that particularity which we deem to be the best exposition of our invention, and that which we prefer in commercial practice, but we do not restrict or confine ourselves to the minor or secondary details, as such are susceptible of modification which may be resorted to as matters of mechanical skill and without a departure from the spirit of the invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. The herein described method of treat-

ing textile fabric which consist in passing the fabric through a heated fluid in a tank or compartment and during the passage into and out of the fluid piling the fabric upon itself above the fluid, causing the piled fabric as it accumulates to pass downwardly into the fluid and thence laterally and upwardly through and approximately to the level of the same under the action of gravity produced by the accumulating piled fabric being fed toward and into the fluid, withdrawing the upper or leading portion of the piled fabric in a substantially vertical direction as it rises toward the level of the fluid, subjecting the rising fabric to a pressure between rolls whereby the excess of fluid is squeezed therefrom and caused to flow downward upon the fabric, applying friction to the fabric immediately as it leaves the fluid whereby said fabric between the point of the application of the friction and the squeezing action is put under tension capable of stretching the same in the direction of its length, applying to the stretched fabric a spreading friction in a lateral direction from the middle toward the selvages to centralize the fabric web, and subjecting the fabric after being stretched longitudinally and centralized laterally to a spraying and washing operation immediately before being subjected to the squeezing pressure.

2. In an apparatus of the character stated, the combination of a chamber shaped to provide a liquid holding tank at its lower part, combined with a J-shaped guiding passage arranged within the tank and having a short leg portion opening upward at substantially the level of the fluid in the tank and a long leg portion extending considerably above the fluid and into the upper part of the chamber, steam heating pipes arranged in the tank portion of the chamber below the J-shaped passage, means for feeding a textile fabric downward and into the upper end of the long portion leg of the J-shaped passage whereby it is piled therein and caused to be moved through the fluid under gravity action, squeeze rolls arranged above the open short leg portion of the J-shaped passage, means immediately above the said short leg portion of the J-shaped passage for putting upon the fabric a dragging tension whereby the combined action thereof and that of the squeeze rolls maintains a considerable vertical portion of the fabric under tension and in a stretched condition, means between the dragging tension applying means and the squeeze rolls for adjusting the fabric laterally to centralize it, and spraying means for subjecting the stretched fabric between the squeeze rolls and the lateral stretching means to a spraying and washing operation, the same occurring immediately before the fabric is subjected to a squeezing action by the squeeze rolls.

3. In a kier of the character described, the

combination of a tank structure with means providing two J-shaped frames of different sizes, spaced one relatively to the other to form a J-shaped passage between them and having its lower curved part arranged within the tank structure, side plates arranged between the two J-shaped frames adjustable relatively toward and from each other for adjusting the width of the J-shaped passage, and means for feeding the fabric to be treated through the J-shaped passage said adjustable side frames provided with means for their adjustment obliquely along their length whereby the width of the passage between them may be tapered.

4. In an apparatus of the character stated, the combination of a chamber having at its lower part a tank structure and a plurality of curved passages respectively extending down into the tank structure and each passage having its end opening upwardly, separate means for feeding a textile material downward and into the receiving open end of the respective curved passages comprising a reel over which the fabric is fed and a swinging folder guide for laying the fabric in a zigzag form and whereby it is piled within the curved passage and by gravity caused to move through the curved passages, and separate means for withdrawing the piled fabric from the delivering open ends of the respective curved passages comprising squeeze rolls and means acting upon the fabric between the open end of the passage and the squeeze rolls to centralize it, and wherein further, the curved passages are respectively provided on each side of their receiving ends with adjustable side plates extending between the folder guide and the curved passages in the tank structure for guiding the fabric in a central position between the sides of the curved passages.

5. In an apparatus of the character stated, the combination of a chamber having at its lower part a tank structure and a plurality of curved passages respectively extending down into the tank structure and each passage having its end opening upwardly, separate means for feeding a textile material downward and into the receiving open end of the respective curved passages comprising a reel over which the fabric is fed and a swinging folder guide for laying the fabric in a zigzag form and whereby it is piled within the curved passage and by gravity caused to move through the curved passages, and separate means for withdrawing the piled fabric from the delivering open ends of the respective curved passages comprising squeeze rolls and means acting upon the fabric between the open end of the passage and the squeeze rolls to centralize it, and wherein further, the receiving ends of each of the curved passages are provided with side plates

for centrally guiding the fabric, and adjusting means are also provided for adjusting the plates bodily to and from each other and also changing their obliquities.

5 6. In an apparatus of the character stated, the combination of a chamber having a tank structure at the bottom, a curved passage wholly within and extending down into the tank structure and having its ends opening  
10 upwardly, separate means for feeding a textile material downward and into the receiving open end of the curved passage whereby it is piled therein and by gravity caused to  
15 move through the fluid in a submerged condition, separate means for withdrawing the piled fabric from the delivering open end of the passage and subjecting it to a squeezing operation within the chamber, spreading  
20 means arranged within the chamber for spreading the fabric to full width immediately before it is squeezed, and means for feeding the fabric to the feeding means within the tank comprising a pair of feed rolls and spreading means for stretching the fabric  
25 to its full width and centralizing it immediately to being received by said feed rolls.

7. The invention according to claim 6, wherein further, the means for spreading the fabric before being delivered to the feed rolls  
30 comprises a pair of guiding means respectively arranged to act upon the selvages of the fabric.

8. In a kier of the character described, the combination with a tank structure, of a  
35 curved passage within the same and consisting of two J-shaped sheet metal parts of different sizes spaced one within the other to form a J-shaped passage open at its sides, said J-shaped plates connected into a unitary  
40 structure by vertical plates respectively at each side but of a width to leave the side spaces between the J-shaped plates more or less open for circulation of fluid and the total  
45 width of said curved passage structure being less than the width of the enclosing compartment so as to permit the circulation of fluid between the walls of said compartment and the curved passage structure.

9. The invention according to claim 8, wherein the side plates extend below the J-shaped plates to act as supports for the curved passage structure and to provide a  
50 space in the tank between the bottom of said curved passage structure and the bottom of the tank, and wherein further, heating pipes are arranged at the bottom of the tank and  
55 below the curved passage structure.

In testimony of which invention, we hereunto set our hands.

60 WILLIAM S. ROWLEY.  
HARRY W. BUTTERWORTH, JR.