

Dec. 23, 1930.

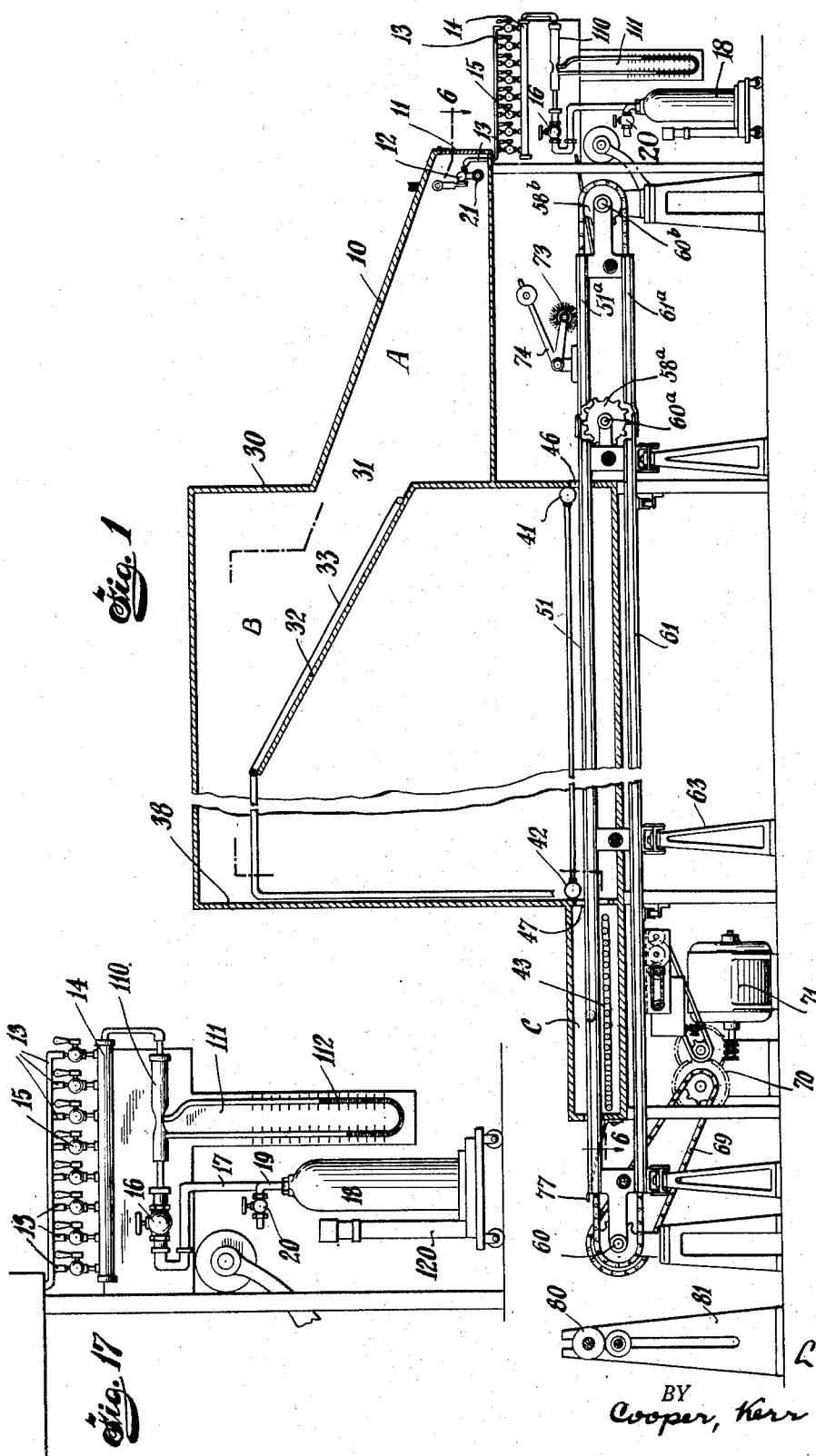
L. C. SCOTT

1,786,031

APPARATUS FOR DYEING, COLORING, AND COATING

Filed April 6, 1926

6 Sheets-Sheet 1



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APPARATUS FOR DYEING, COLORING, AND COATING

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6 Sheets-Sheet 2

Fig. 3

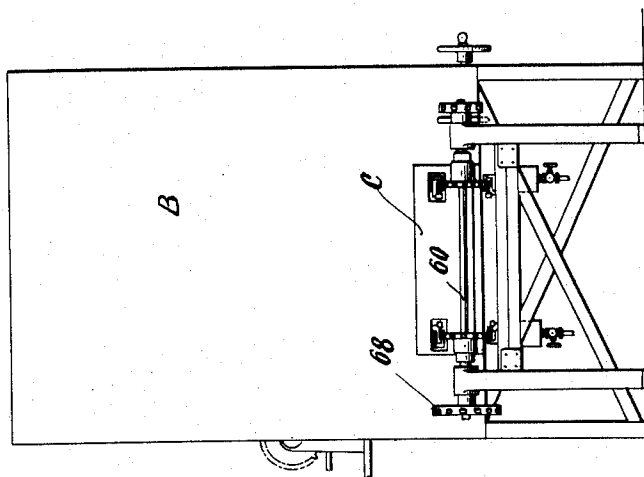
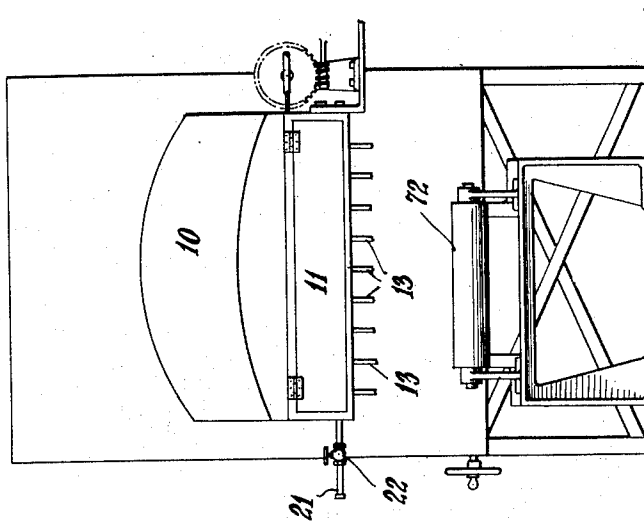


Fig. 2



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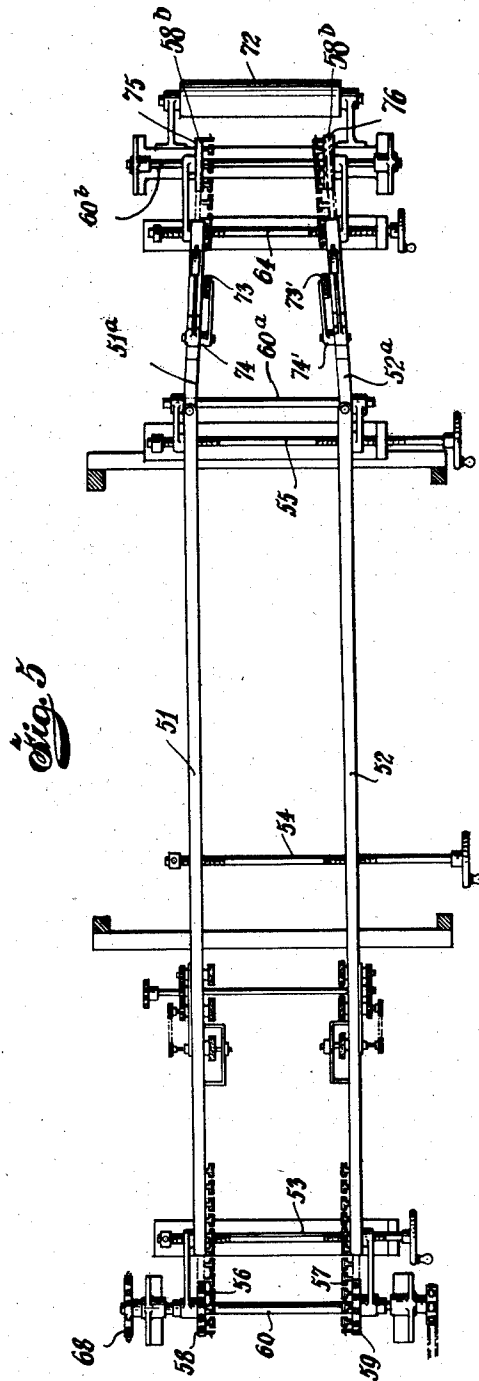
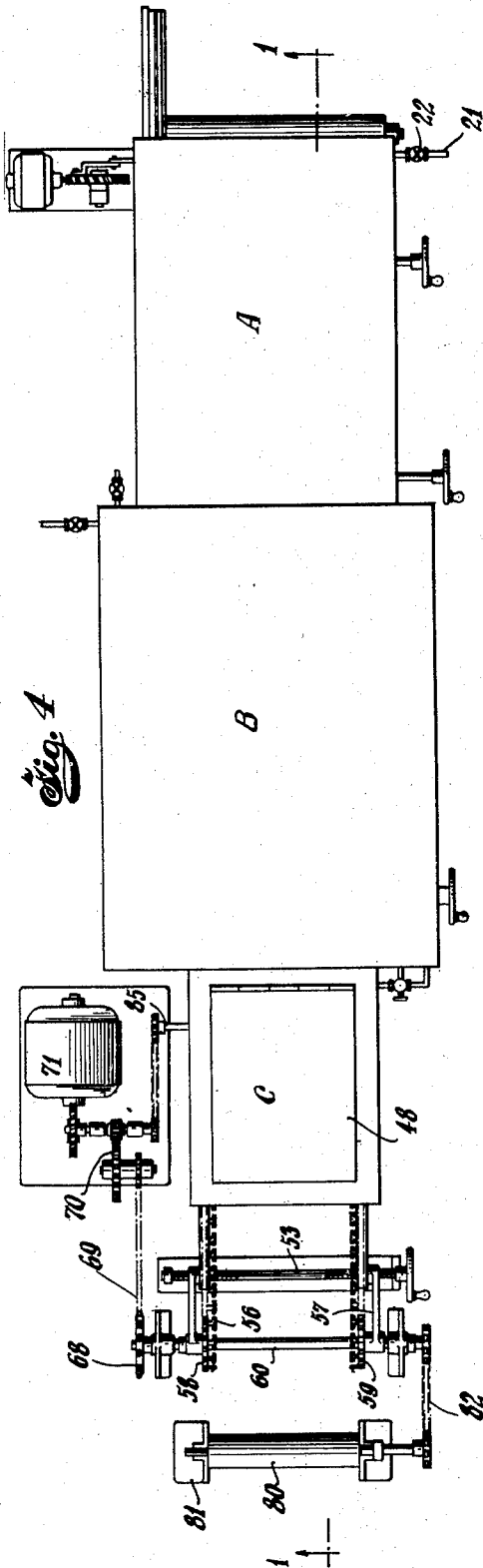
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6 Sheets-Sheet 3



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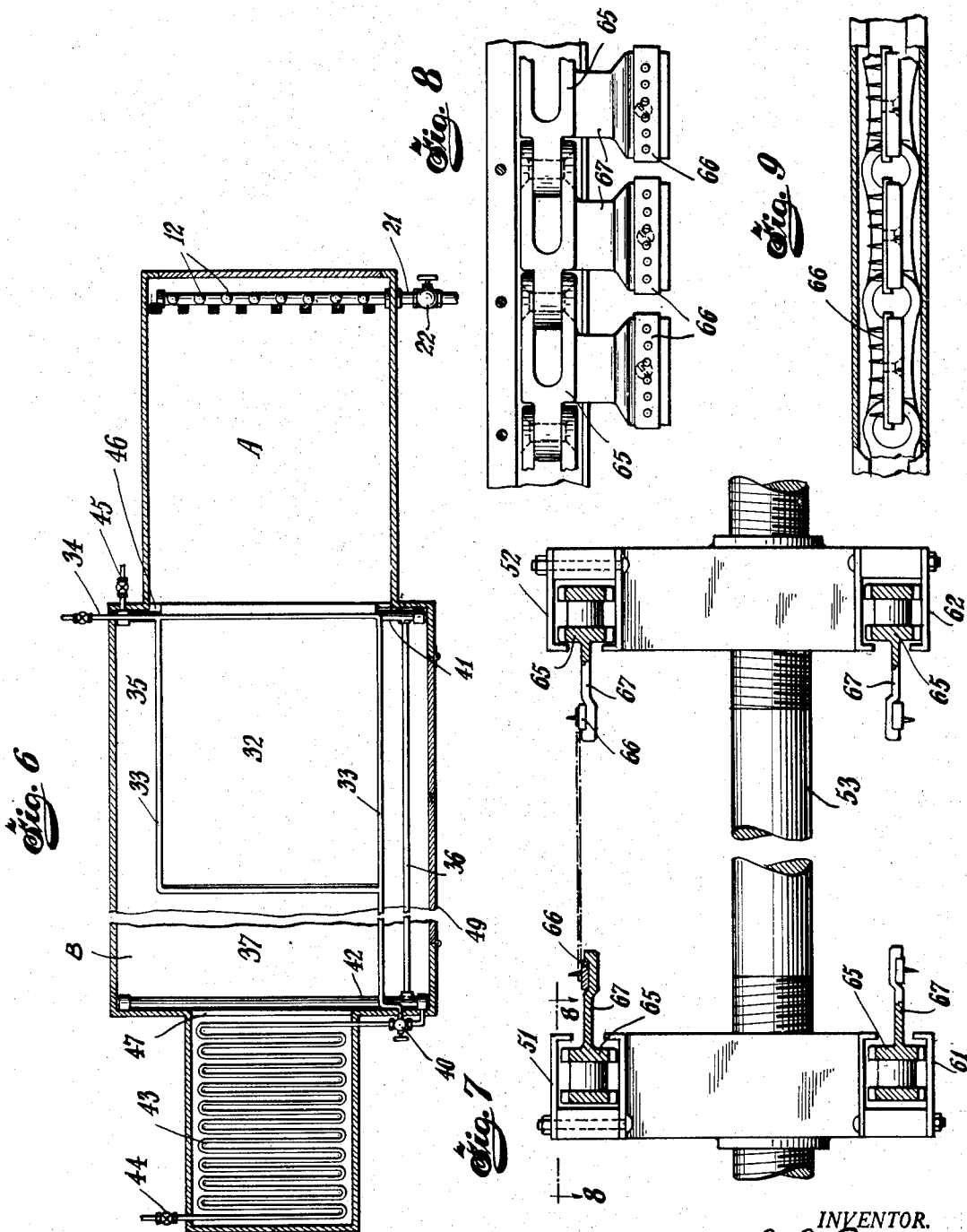
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APPARATUS FOR DYEING, COLORING, AND COATING

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6 Sheets-Sheet 4



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APPARATUS FOR DYEING, COLORING, AND COATING

Filed April 6, 1926

6 Sheets-Sheet 5

Fig. 13

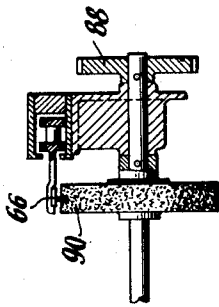


Fig. 12

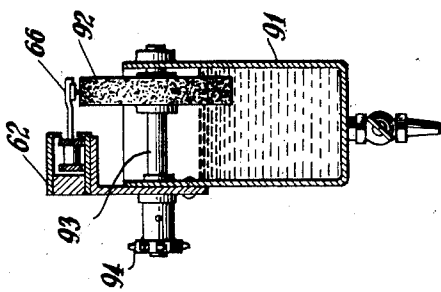


Fig. 10

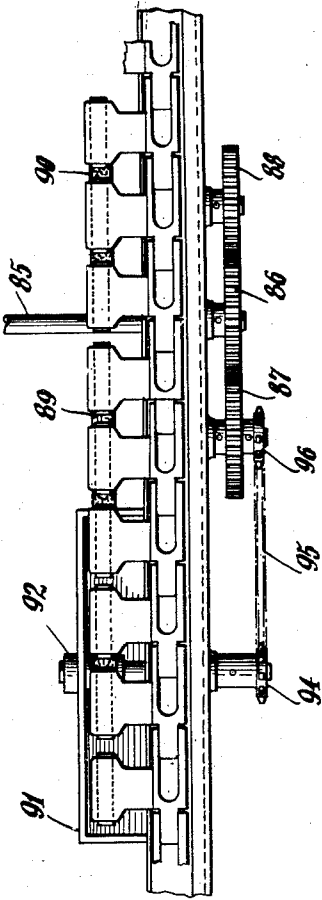
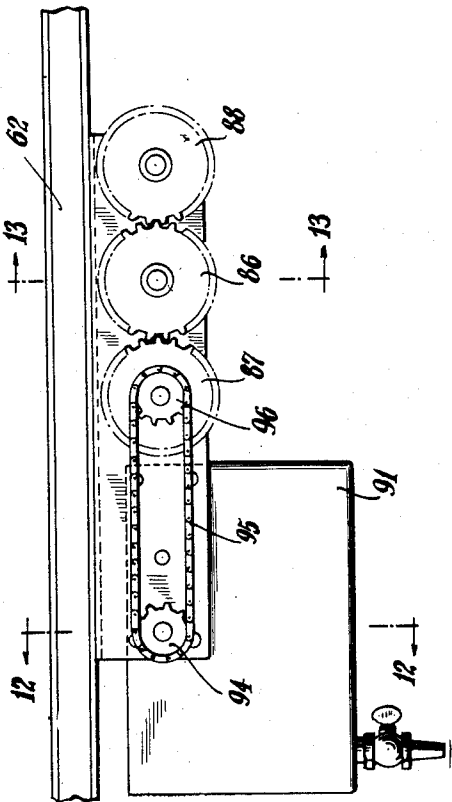


Fig. 11



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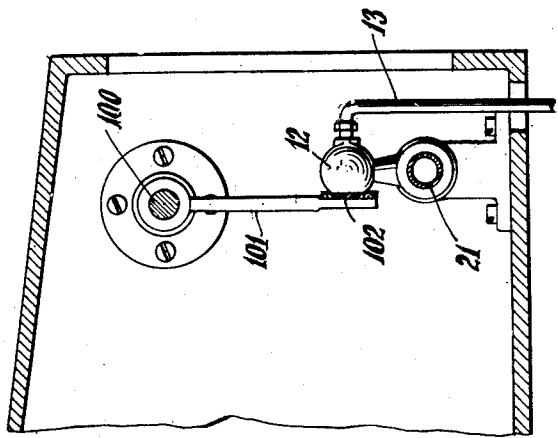
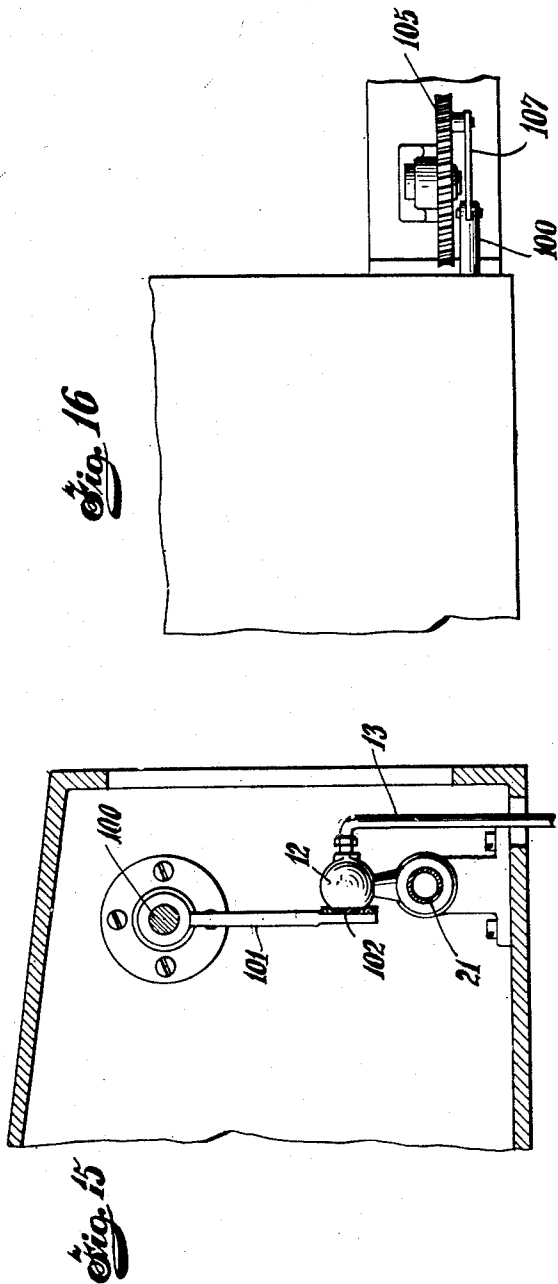
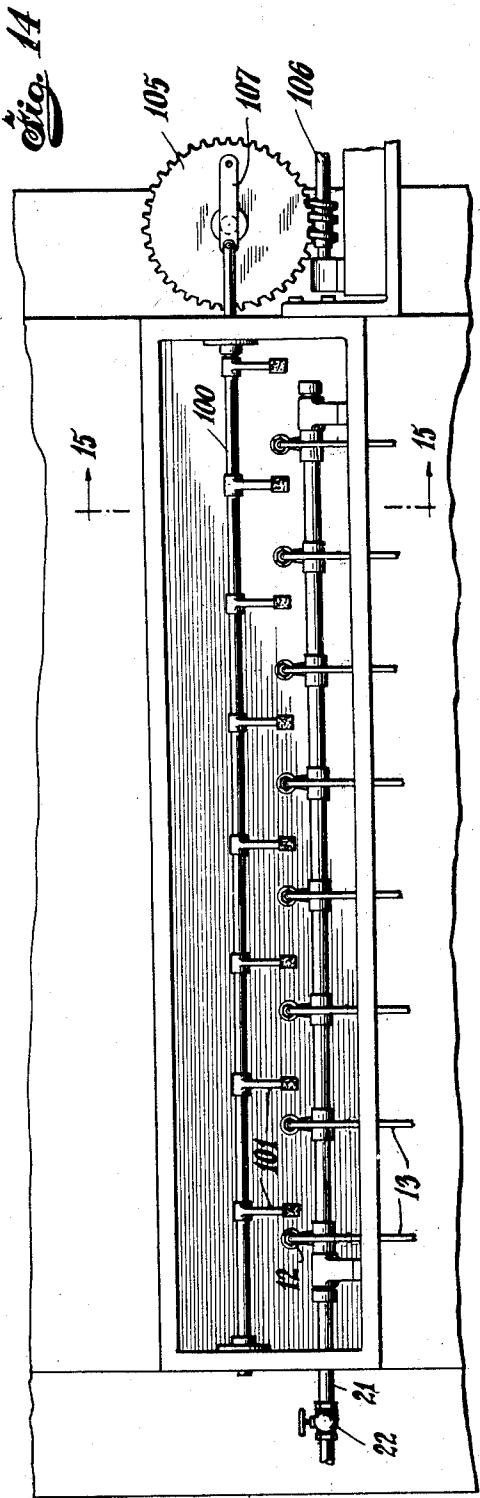
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APPARATUS FOR DYEING, COLORING, AND COATING

Filed April 6, 1926

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

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APPARATUS FOR DYEING, COLORING, AND COATING

Application filed April 6, 1926. Serial No. 100,046.

This invention relates to an improved process for dyeing or coloring fabrics such as textile fabrics and relates more particularly to an improved process of dyeing such materials preferably in the form of a continuous strip or web, such as continuous pieces of cotton, linen, silk, ribbon and the like. The process is also applicable to the coloring or coating of articles or materials with liquids of all forms and descriptions.

The invention also relates to an improved apparatus for dyeing or coloring materials or articles and more particularly to an improved apparatus for dyeing textile materials. The invention also relates to apparatus for uniformly coating webs of fabric or for uniformly coating articles. The improved process and apparatus is particularly applicable for the dyeing of textile fabrics either on one or both sides thereof, either with the same color or with different tones of the same color, or with different colors on the respective sides.

Among the objects of the invention, it is the purpose to provide an improved process and apparatus for uniformly dyeing a textile fabric either on one or both sides thereof, while positively controlling the amount of color being applied to the web of textile fabric or other article being treated. A further object of the invention is to provide an improved process and apparatus adapted for continuous operation, and utilizing a so-called color cloud of minute particles of atomized dye liquor, coloring matter or other liquid without the formation of drops or objectionable spots upon the article undergoing treatment. A further object of the invention is to provide a color-cloud composed of extremely fine particles of the color dye solution.

A further object of the invention is to feed the material to be treated, such as textile fabric relative to the color cloud in such manner that the material presents a flat surface to such color mass while exposed thereto. A further object of the invention is to stretch the textile fabric longitudinally while subjecting it to the action of the color cloud. A further object is to provide means for exposing

substantially the whole transverse surface including the selvages of the stretched textile fabric to the color cloud while being subjected and exposed thereto.

A further object of the invention is to provide a method and means for removing any of the color which may have been deposited on the stretching and traversing means for the textile fabric while such means has been exposing the fabric to the color cloud.

A further object is to provide a method and means for maintaining constant the proper functioning of the atomizing device and furthermore to do this automatically.

A preferred embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a longitudinal section in elevation of the complete apparatus;

Fig. 2 is an end view of the entering end of the machine in elevation;

Fig. 3 is a similar end view of the exit end of the machine;

Fig. 4 is a plan view of the machine;

Fig. 5 is a detailed view of the traversing mechanism as it would appear removed from the machine;

Fig. 6 is a section taken on line 6—6 of Fig. 1, showing the arrangement of the interior chambers of the machine in plan view;

Fig. 7 is a detailed view on a large scale of the traversing conveyor with the adjustable chains;

Fig. 8 is a detailed view in plan of the pin clip links of the conveyor;

Fig. 9 is an end view of the conveyor pin clips;

Fig. 10 is a plan view of a detail of the lower section of the conveyor chain above the cleaning arrangement;

Fig. 11 is a side elevation showing the cleaning device for the pin clips;

Fig. 12 is a cross-sectional view in elevation through the cleaning bath of the cleaning device;

Fig. 13 is a detail of the cleaning device showing a drying brush;

Fig. 14 is a view in elevation of the nozzle cleaning arrangement;

Fig. 15 is a cross-section on line 15—15 of Fig. 14;

Fig. 16 is a fragmentary detail of the drive for the nozzle cleaning device, and

Fig. 17 is an enlarged detailed view of the venturi arrangement for maintaining constant and controlling the formation of the dye cloud.

Referring to the drawings, the complete mechanism comprises broadly the cloud generating means A, the dye application chamber B and the drier C. A cloud of minute particles of atomized dye liquor or coloring matter in solution, is generated in chamber A, passes to the dye chamber B where it is permitted to deposit on the fabric, and the fabric thereafter is dried in passing through the drier C. The cloud generating chamber A is provided with a roof 10 which is curved as shown in Fig. 2, and which inclines towards the forward or entering end of the machine and is there provided with a hinged glass door or window 11, affording a view into the cloud generating chamber. Just within this hinged door 11 is a bank of atomizing nozzles 12, which nozzles serve to atomize the dye color solution or dye liquor or coating liquid, and break it up into extremely minute particles to form a cloud in the chamber A. Chamber A is not only the cloud generating chamber, but furthermore serves in part as a separating chamber, being of such length between the nozzles 12 and the dye chamber B that heavy particles of the dye liquor which may pass out of the nozzles or may be formed during the operation of the nozzles, drop on the floor of the chamber A, while the lighter particles in the form of a dye cloud pass upwardly into chamber B. Each of the nozzles 12 is connected by individual pipes 13 with a header 14, affording passage of the dye color solution through the individual pipes to the respective nozzles. The supply of the dye solution to each nozzle is individually controllable by the valves 15, one in each pipe 13. A needle valve 16 in the supply line to the header controls the total amount of the dye solution being supplied to the nozzles for the formation of the dye cloud. This valve 16 affords fine adjustment of the total quantity of the dye liquid passing to the atomizers from the dye tank 18 through the pipe 17. Pipe 19 controlled by valve 20 admits air under pressure to the top of dye tank or reservoir 18 so that the supply of solution therein is under a predetermined pressure. The compressed air for the atomizing nozzles is connected to the bank of nozzles through pipe 21 shown in Fig. 6, and this compressed air is regulable through the valve 22.

The roof of chamber A slopes upwardly toward the end wall 30 of the chamber B, and this wall of chamber B is provided with an opening 31 affording communication to

the chamber A, through which opening the dye cloud of atomized color passes from the cloud generating chamber to the dye chamber. The lower part of the end wall of the chamber B below the opening 31 forms a baffle to prevent any large drops from passing from chamber A to chamber B. To further prevent any drops of the liquor color which may possibly have passed from the nozzles or may possibly have been formed in the cloud generating chamber from dropping onto the textile fabric or the like in the bottom of the dye chamber B, there is provided a shield 32. This shield projects into chamber B and extends upwardly therein from the lower edge of the opening 31. The edges of the shield 32 are provided with steam pipes 33 receiving steam from supply pipe 34 and exhausting through valves 44 and 45. The provision of steam pipes around the edges of the shield prevents the formation of drops on the edges of this shield, and if any drops should be formed there or should by chance be deposited there, the steam causes such drops to be evaporated.

Referring to Fig. 6, it will be noted that the dye chamber B is wider than the cloud generating chamber A, and that although the shield 32 is substantially the same as the width of chamber A, the increased width of chamber B provides spaces 35 and 36 at each side of the shield 32 between the longitudinal walls of the dye chamber and the shield so as to permit the dye cloud to pass downwardly from the upper part of chamber B to the lower part of such chamber. Similarly, as the shield 32 extends into chamber B only part way, a similar space 37 is provided beyond the end of the shield and the end wall 38 of chamber B to similarly permit the dye cloud to pass downwardly to the lower part of the dye chamber.

The steam pipes 33 around the sides, edges and ends of the shield or apron 32 lead to a valve 40 through which valve the flow of steam to the headers 41 and 42 located at the fabric entrance and exit slots of the dye chamber respectively is controlled. Valve 40 also controls the flow of steam through the steam coil 43 affording the heating means in the drier C. Valves 44 and 45 afford control for the exhaust steam as may be found necessary. In the lower portion of the end wall 30 of the dye chamber, there is a long narrow slot 46 through which slot the material and the traversing machinery enters the dye chamber. The further end wall 38 of the dye chamber B has an elongated opening 47 for the exit of the material from the dye chamber and the entrance of the same into the drying chamber C.

The drying coils 43 in the drying chamber C are located so that the dyed material passes above them in traversing such chamber. Chamber C is provided with a hinged door

48 at the top thereof providing easy access to the chamber when necessary and also affording means for inspection. Access to the dye chamber B may be had when necessary by means of the doors 49 located in the side of such chamber and shown in Fig. 6.

Both the dye chamber B and the drying chamber C are traversed in succession by an endless conveyor system. This conveyor system or tentering mechanism carries the web of textile fabric flat and, being supported under tension by traveling adjustable tentering means, keeps such fabric webs transversely stretched.

The parts of the conveyor system traversing the chambers B and C comprise parallel chain ways 51 and 52 extending longitudinally through the two compartments mentioned. These chain ways are supported in any suitable manner, but capable of being adjustable to accommodate fabrics of different widths by means of the worm adjusting means 53, 54 and 55. Guided within each chainway 51 and 52 is an endless chain 56 and 57, respectively, drawn by sprockets 58 and 59 mounted on the shaft 60 (see Figs. 4 and 5), and passing over a series of guide sprockets 58a, 58b on shafts 60a, 60b. The lower portion or return of each of the respective chains 56 and 57 are guided in guideways 61 and 62 respectively, which guideways pass underneath the chambers C and B. The four chainways 51, 52, and 61 and 62 extend forwardly to the extreme end of the machine under the cloud generating chamber, being properly supported by brackets 63. The ends of the chainways 51, 52, 61 and 62 terminate in parts 51a, 52a and 61a, which are pivoted thereto near the point where the material is taken on so that by means of the worm adjustment 64 the ends of the chainways and consequently the chains guided thereby may be arranged closer together at the point where the material is fed to the tentering mechanism so that the fabric is gradually stretched to the full desired width just before it enters the dye chamber B (see Fig. 5).

Referring particularly to Figs. 7, 8 and 9 inclusive, each of the supporting chains is built up of pin carrying links 65. Each of these links carries a plate 66, which plate is secured by screws or the like to an inwardly extending integrally formed arm 67 of each link 65. Upon each of the plates 66 is set a group of pins very slightly inclined in a direction opposite to the pull of the fabric, thereby affording positive engagement and obviating the tendency of slippage. The shaft 60 is provided with a sprocket 68 to which is connected a chain 69 driven through suitable reduction gearing 70 from an electric motor 71.

The textile material is fed to the tentering mechanism either by hand or by any known form of suitable fabric feeding means. The

only requirement is that the selvedge of the goods only be picked up by the pins of the clips as they come up from the lower flight of the chainways. Whether the material is fed by hand or whether automatic machinery of known type is employed, the material first passes over a spreader roll 72 so as to be presented smoothly and flat to the pins of the tentering clips. The spreader roll 72 is merely shown diagrammatically and may be of any well known type. To assist in maintaining the selvedge of the fabric secure on the pins, brushes of stiff bristles 73, 73' pivoted on bell crank levers 74, 74' located respectively over the chainways 51 and 52, each press their bristles from above directly down and in line with the selvedge of the incoming material. These brushes thus assure that the fabric is properly caught and held by the pins of the clips. At the incoming end, the fabric after leaving the spreader roll 72 first rides on the inclined ramps 75 and 76 located respectively in line with the chainways 51 and 52. These ramps of flat smooth metal guide the material downwardly and into contact with the pin clips. Similar ramps 77 are provided at the take-off end of the tentering mechanism to gradually raise the fabric off from the pins of the pin clips as the fabric approaches the take-off end of the tentering mechanism. The fabric as it comes from the tentering mechanism is wound on a take-off roll 80 rotating in brackets 81, shown in Fig. 1 of the drawings. The take-off roll 80 by means of proper belt or chain connection 82 is driven to rotate with the shaft 60 of the tentering mechanism (Fig. 4).

The pin clips of the tentering chains being exposed to the deposit of the color cloud thereon, while traversing the dyeing chamber B are colored by such dye and carry such color with them after releasing the web of fabric at the take-off end. Due to the small collecting area of the pins the amount of liquid color deposited thereon is ordinarily insufficient to run down and "spot" the fabric, but the deposit is nevertheless objectionable in that it may cause spotting on the edges of the next piece of material applied to the tenter frame, especially when this next piece is to be dyed a different color or shade from the preceding, and accordingly, it has been found advantageous to clean the pin carrying clips before such clips can enter the dyeing chamber. This cleaning mechanism is indicated in detail in Figs. 10-13 inclusive, and comprises primarily a series of brushes which wipe across the pin carrying plates on the lower flight of the tentering chains. On each of the lower chainways 61, 62, of the tentering mechanism, there is journaled a shaft 85 suitably driven from the motor 71 and extending across the lower chainways 61 and 62. On this shaft 85, outside of each of the chainways 61, 62, the shaft is provided with a gear wheel

such as 86. This gear wheel 86 meshes at each side along the longitudinal length of the chainways with similar gear wheels 87 and 88 each of which latter wheels is secured to stub shafts carrying on their inner ends stiff
 5 bristle brushes 89 and 90 respectively. Immediately in front of the brush 89, that is, towards the take-off end of the machine, there is located a tank 91 containing a cleaning
 10 solution such as a soap solution. Dipping into the solution contained in this tank is a rotatable brush 92 on a short stub shaft 93 which shaft on its outer end outside of the chainway carries a sprocket 94 connected by means of
 15 a chain 95 to a similar sprocket 96 on the shaft carrying the spur gear 87. Each of the brushes 89, 90 and 92 is in engagement at its uppermost point with the pin carrying plates 66 of the pin clips as these plates in the lower-
 20 most flight move from the take-off end forwardly to the forward end of the tentering mechanism. The pin carrying plates in their movement first get in contact with the rapidly rotating moistened brush 92 which wipes off
 25 the color deposited on the pin carrying plates and then these plates in their further movement pass over and contact with the rapidly rotating drying brushes 89, 90 to become thoroughly cleaned from any color or dye deposited on them. By this means, the pin carrying
 30 plates are assured of again appearing at the forward end of the tentering mechanism devoid of any objectionable coloring matter.

It will be noted that the cloud generating
 35 chamber A and the upper portion of the dye chamber B provide a long path for the cloud particles coming from the bank of atomizing nozzles 12. Obviously when these particles
 40 leave the atomizers they have a certain velocity. It has been noted that when these particles are under a substantial velocity and meet obstructions, they tend to coalesce on the
 45 obstruction, forming drops which may be carried by the pressure obtained in chamber A into the dye chamber B. If the particles
 50 are of substantial size so as to actually form liquid drops and being under considerable velocity, they would form objectionable spots on any object or obstruction which they would
 55 strike. It is, therefore, an important feature of the invention that the particles of cloud under substantial velocity do not come into contact with any obstructions. To this end, the
 60 chamber A has been made of such length, that is, the distance from the nozzles 12 to the wall 30 of chamber B is such, that the compressed air used in the atomizing nozzles will not project any liquid particles beyond such distance and that, therefore, a cloud is completely
 65 formed within such length. By the time the particles of cloud are within the chamber B, they have substantially lost their velocity and pass downwardly in that chamber under gravity. While it has been described how drop formation or coalescing on

the wall 30 has been avoided, any drops if they should form by condensation, for instance, do not fall upon the fabric because if formed within the chamber A they merely are deposited on the floor of such chamber, while if formed on the wall 30 within the chamber B they become evaporated by the steam header 41 extending across the opening 46, through which opening the web of material enters the dye chamber.

While any suitable atomizing device may be employed which will produce a finely divided spray and complete atomization and cloud formation, it has been found preferable to employ atomizing nozzles which are permanently set. The advantage in using such nozzles is that as they do not require setting, as is the case with air brushes of other types, it becomes far easier to properly regulate and measure the total amount of dye solution which is being atomized by the nozzles at any particular time and to again reproduce such conditions of atomization or rate of atomization at a future time if desired.

Sometimes when using particularly heavy solutions of dye or dyes of certain quality, clogging up of the atomizer orifices takes place. This clogging of the atomizer orifices can be obviated, of course, by maintaining the orifices clean, and to do this under operating conditions, the atomizer orifices cleaning device shown in Figs. 14-16 inclusive has been devised. In these views, the atomizer nozzles are shown at 12, each connected by the respective pipes 13 to the header 14 and the compressed air being supplied through pipe 21 from the source of compressed air. Immediately above and slightly in front of the bank of nozzles 12, there is a reciprocating bar 100, from which bar there are dependent a number of wiper arms 101 equal in number to the number of nozzles in the bank. Each of these wiper arms 101 is provided at its lowermost end with a felt pad 102. Each pad as the arm 101 is reciprocated touches and wipes past the orifices of its respective nozzle 12. The distance between the wiper arms 101 is progressively greater than the distance between each of the nozzles 12, so that only one nozzle at a time is momentarily touched and wiped by its particular wiping pad. The bar 100 may be reciprocated by any suitable mechanism. As shown in the drawing, the mechanism employed comprises a gear 105 driven by a worm 106. This gear by means of a short crank 107 eccentrically connected to the gear at one end and to the bar 100 at the other end causes such bar to reciprocate as the gear rotates. The worm 106 may be rotated by any suitable means; that is, either from the same motor 71 which drives the tentering mechanism, by an independent motor or even by hand. The exact means of rotating worm 106 being immaterial, no particular means is illustrated.

In the form of the invention illustrated, the atomizing medium, such as compressed air, is supplied at high pressure, about 115 to 120 lbs. per square inch, whereby the liquid issuing from the atomizing nozzle is immediately broken up into extremely minute particles. It has been found desirable to feed the liquid from the dye tank 18 under pressure to the atomizing nozzles; it has been found that a pressure of about 40 lbs. per square inch is sufficient. This pressure is preferably constant, and as here illustrated is obtained by admitting compressed air at the desired pressure to the top of the dye-tank by means of cock 20 (Fig. 17). It is to be noted that both the air and the liquid dye solution are under positive control, due to the valves 22 in the air line and the valves, particularly 16, in the conduits through which the dye solution passes. Thus the amount of liquid is at all times accurately regulatable and determinable. Therefore, the amount of liquid does not depend upon the amount of compressed air supplied, nor does it depend upon the pressure of such compressed air. The quantity of dye solution which is supplied to the nozzles to form the cloud is at all times under the positive control of the operator.

The nozzles being of the constant set type, it is obvious that any predetermined condition of atomization to produce a particular desired color or shade is readily reproducible. Having determined that a supply of dye solution flowing at a certain rate to the nozzles and there being atomized will produce a cloud in the dye chamber B which on a certain kind of material will produce a certain shade or color, it is obvious that the same shade or color will be reproduced on the same material at another time provided only that the rate at which the material is passed through the chamber, or the time during which the material is exposed to the cloud is the same as in the previous operation and moreover also providing that the total quantity of dye constantly being atomized to augment the cloud is the same over the same interval of time.

To accurately measure the regulatable predetermined quantity of dye solution which is being atomized by the bank of nozzles, it has been found advantageous to insert in the liquid dye solution line some form of measuring device or to provide some means for accurately measuring the amount of dye solution being atomized per given time interval. To this purpose the apparatus shown at the righthand end of Fig. 1 and on enlarged scale in Fig. 17 has been found to operate most successfully. In the liquid supply line to the header 14, there is inserted a Venturi tube 110; that is, a section of conduit having a gradually constricted and then again flaring cross section. At this venturi, there is inserted a known form of mercury or other manometer 111 or U-tube of small cross section.

This tube in known manner is connected by one arm to the venturi where there is no constriction and by the other arm to a constricted portion of the venturi. A flow of liquid through the venturi produces a pressure on one side, the left hand side of the manometer as shown and a consequent rise in the mercury or other liquid 112 in the U-tube. Having determined that with a certain difference between the two columns of liquid in the U-tube a certain desired amount of color dye solution is being supplied to the atomizing nozzles, the same amount can be supplied with assurance to the bank of nozzles by regulating the valve 16 until the same difference of pressure is indicated by the manometer.

In addition, it has been found desirable to check the amount of dye liquor which is being supplied to the atomizing nozzles by noting the different amounts of liquor by weight which are atomized in successive time intervals of equal length. To this end, the tank 18 containing the color dye solution is placed on a small platform balance or scale 120 and after the compressed air has been turned on and the dye solution directed to flow to the header 14 and through the individual pipes to the nozzles 12, the weight of the dye tank is ascertained at successive equal time intervals. In practice it has been found sufficient, having ascertained the weight of the tank at the beginning of the operation to note the weight at the end of every one minute that the color cloud is being formed. If the amount of dye liquor being utilized in forming the cloud is the same as shown by the constantly equal decrements of weight, the operator is assured that equal amounts of solution are being atomized in equal time intervals and that the rate of color cloud formation is being maintained constant.

Proceeding now to describe the operation of the improved process employing the apparatus hereinbefore described, the desired amount of color to be used having been determined, the atomizing nozzles are set in operation by turning on the compressed air at valve 22 and the color dye solution by the respective valves in the conduits to the nozzles 12 and to the header 14; compressed air admitted to the top of dye container 18 by cock 20 forces the dye solution from the container 18 to nozzles 12, where the atomizing air at once atomizes the same to form a cloud in the chamber A. The valve 16 is manipulated until the pressure as shown by the manometer 111 is that having been predetermined as the proper one to produce the particular color desired. With some or all of the atomizers in operation depending upon the quantity of color required to form the cloud desired, the cloud as stated form-

ing in chamber A, flowing over and into chamber B through the opening 31.

The material to be colored or dyed is not fed into the machine until a balanced cloud is built up, or stable condition has been attained, in the dye chamber B. By a balanced cloud is meant a cloud in which the amount of atomized color or dye which is being fed into the cloud or formed into cloud is substantially the same as the amount of color or dye which is being deposited on the bottom of the dye chamber B. Such a stable condition or balanced cloud takes an appreciable time to form, but experience soon enables the operator to determine the requisite time interval. The operator by keeping the pressure as shown by the manometer 111 constant, and knowing that the weight of the dye solution is decreasing with equal regularity over a determined time interval as determined by platform scale 120, may assume that stable conditions in the dye chamber B have been attained. The production of a stable or balanced condition in the dye chamber is exceedingly important, because if at the beginning of the dyeing operation the cloud is too thin, or the mass too light, that portion of the fabric which first enters the dye chamber will be dyed lighter than the portions of fabric which enter the dye chamber at some later time. The fabric to be colored is only fed into the machine; that is, to the tentering mechanism, when the desired stable condition has been reached.

The material to be dyed having first been ironed or smoothed to prevent wrinkles is fed from a usual supply roll over the spreader roll 72 to be picked up by the pin clips of the tentering machine and drawn into the dye chamber through the slot 46. The material passes along the bottom of the dye chamber B and is exposed to the homogeneous cloud of finely atomized coloring matter in such chamber, the minute particles of which are deposited thereon and build up a color surface thereon. The amount of impregnation of the fabric is proportional to the time that the fabric is exposed to the cloud. Thus, if it is desired to have the color penetrate clear through the fabric, it is necessary that the fabric be exposed to the cloud a longer interval than if it is desired that the color merely penetrate part way from the upper surface downward. Similarly, the depth of the shade of the color is dependent to a certain extent on the length of time that the fabric is exposed to the color cloud. In any event, the rate of travel of the tentering mechanism and, consequently, of the material gripped thereby is such that the desired shade and amount of penetration is secured when the material has reached the end of the chamber B and is about to enter the drying chamber C. Passing through the drying chamber C, the material is dried due to the

steam pipes 43 in that chamber and then, passing out of the drier, it is automatically removed from the pins of the tentering mechanism and is wound up on the take-off roller 80.

In winding up the dyed material on the take-off roller 80, it has been found desirable to interpose a web of dry, preferably undyed material between the windings of the dyed fabric. This interposing of the undyed material prevents the partially dried color appearing on the dyed fabric from rubbing off or discoloring the other or undyed side of the fabric which has passed through the apparatus. After the material has been dyed on one side thereof, it can be dyed in a similar apparatus with a different color or different shade of the same color on the other side thereof. After dyeing whether on one or both sides, the material is steamed in a form of steamer commonly used in the art of printing textile materials. It is important, however, to know that the material must be kept flat during the steaming operation, and it is preferable that the steam shall be "wet". The steaming operation may be carried on without separating the dyed fabric from the take-off roll; that is, the steaming may be done with the interposed undyed fabric in the windings of the take-off roll. The purpose of the steaming is to set the dye and to make the color fast into the fibres.

Owing to the fact that the tentering mechanism holds the material substantially flat (with or without actually stretching, as desired) it cannot shrink and form wrinkles which may result in an uneven and unsatisfactory coloration. Thus, the combination of dyeing with a tentering mechanism is extremely valuable for the coloring of silk and thin material such as crêpe de Chine. It is, however, also valuable for fabrics of any kind, since no creases are formed during the dyeing operation. Owing to the particular form of the tentering mechanism employed, substantially the whole upper surface of the material is exposed to the dye cloud and there is no light colored or different colored selvedge as would be formed if a "gripping" clip were used in the tenter frame. It is to be noted that in the apparatus described the color cloud formed in front of the atomizing nozzles is in the form of extremely fine particles uniform in character, which particles do not tend to coalesce and that if, due to "spitting" of the atomizers, large particles of color or drops of solid matter are projected from the atomizer, these cannot enter the chamber B, due not only to the length of the chamber A, but also due to the baffle formed by the lower edge of the opening 31 and the apron or shield 32. Thus no large particles can fall upon the fabric and cause spots. It has been previously described how any drops of the color which may form on the edges of

the apron 32 or the edges of the slot 46 and 47 are immediately evaporated by the steam pipes surrounding and adjacent such edges. The homogeneous color cloud devoid of spitting particles is continuously formed by the bank of atomizing nozzles and continuously being depleted of color which settles by gravity in the dye chamber B on the material as it is moved across the bottom or such chamber.

It will be appreciated that although the filtered color is supplied to the atomizers in the form of concentrated solution, the described apparatus of the present invention provides a true homogeneous color cloud capable of dyeing without the formation of drops; that is, the concentration of sufficient color to pass entirely through the fabric and to form a spot on the fabric at such point which is differentiated in color from the color field or color ground around it. To this end, this specification intends to distinguish and to differentiate between "drop" and the minute particles which make up and constitute the homogeneous color cloud; and also between "spots" on the textile fabric and the minute deposited particles of the color cloud on the dyed fabric.

While the improved process, apparatus and product have each been described with reference to the preferred embodiment herein disclosed, it will be obvious to those skilled in the art that modifications and variations of each may be imported into such process, apparatus and product without departing from the scope of the invention.

What is claimed is:

1. A dyeing or coloring apparatus comprising a dye chamber, a tenter frame mechanism in said dye chamber including a plurality of pin clips, and means for cleaning said clips.

2. A dyeing or coloring apparatus comprising a dye chamber, means for forming a color cloud in said chamber, a drying chamber and tenter frame mechanism of pin clips for traversing the material through the dye chamber and the drying chamber and means for cleaning said clips.

3. A dyeing or coloring apparatus comprising a dye chamber, means for forming a color cloud in said chamber, a drying chamber and tenter frame mechanism of pin clips for traversing the material through the chambers, and means for cleaning said clips located to function after said clips leave the drying chamber and before they reenter the dyeing chamber.

4. A dyeing or coloring apparatus comprising a dye chamber, tentering mechanism composed of pin clip carrying endless chains for traversing material through the dye chamber, and means for cleaning said pin clips.

5. An apparatus for dyeing or coloring textile material comprising in combination a dye chamber and an endless traveling chain for passing the material through the cham-

ber, and means located outside said chamber to remove the dye from the chain.

6. In an apparatus for dyeing or coloring textile material having a dye chamber and an endless traveling chain for passing the material through the chamber, means located outside said chamber to remove the dye from the chain, said means comprising a brush in contact with the chain.

7. In an apparatus for dyeing or coloring textile material having a dye chamber and an endless traveling chain for passing the material through the chamber, means located outside said chamber to remove the dye from the chain, said means comprising a rotatable brush in contact with the chain.

8. In an apparatus for dyeing or coloring textile material having a dye chamber and an endless traveling chain for passing the material through the chamber, means located outside said chamber to remove the dye from the chain, said means comprising a brush constantly supplied with cleaning liquid and in contact with the chain.

9. In an apparatus for dyeing or coloring textile material having a dye chamber and an endless traveling chain for passing the material through the chamber, means located outside said chamber to remove the dye from the chain, said means comprising a source of cleaning liquid and a rotating brush supplied with liquid from said source and said brush being in contact with the chain.

10. In an apparatus for dyeing or coloring textile material having a dye chamber and an endless traveling chain for passing the material through the chamber, means located outside said chamber to remove the dye from the chain, said means comprising a source of cleaning liquid and a rotating brush supplied with liquid from said source, said brush being in contact with the chain, and a second drying brush also in contact with said chain.

11. In an apparatus for dyeing or coloring textile material having a dye chamber and an endless traveling chain for passing the material through the chamber, means located outside said chamber to remove the dye from the chain, said means comprising a source of cleaning liquid and a rotating brush supplied with liquid from said source, said brush being in contact with the chain, and a second drying brush also in contact with said chain, both said brushes being rotary brushes.

In testimony whereof I hereto affix my signature.

LESTER C. SCOTT.