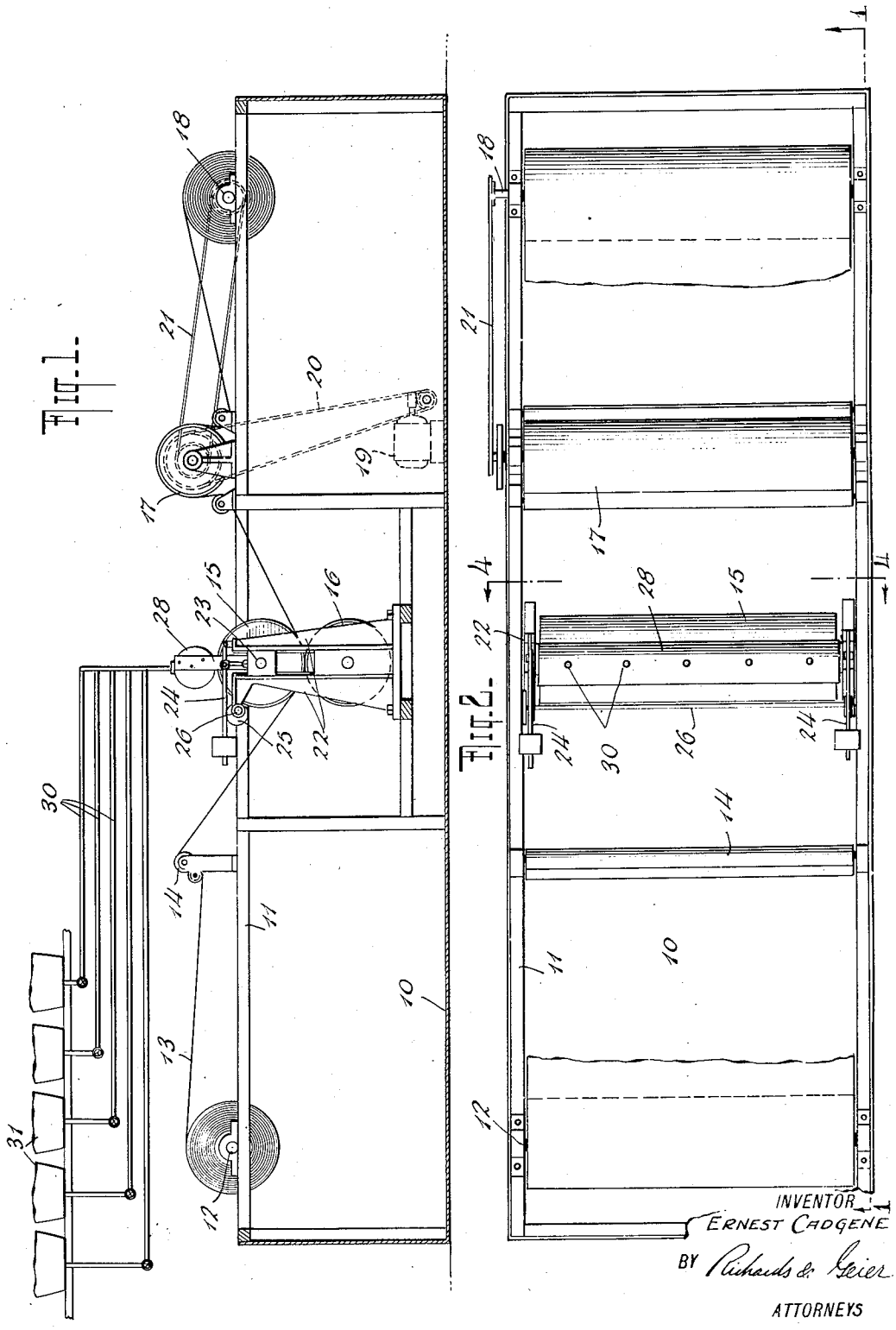
Aug. 19, 1930. E. CADGENE 1,773,169

METHOD AND APPARATUS FOR DYEING FABRICS

Filed Nov. 13, 1926 2 Sheets-Sheet 1



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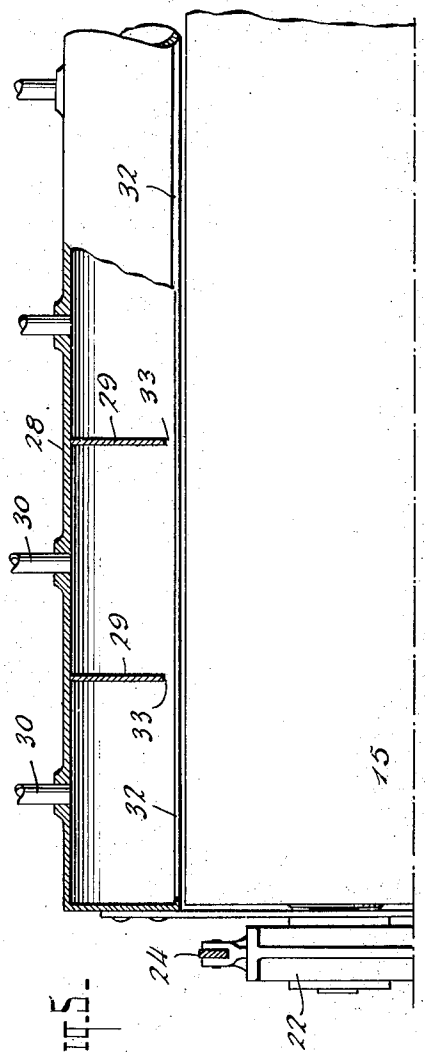


FIG. 5.

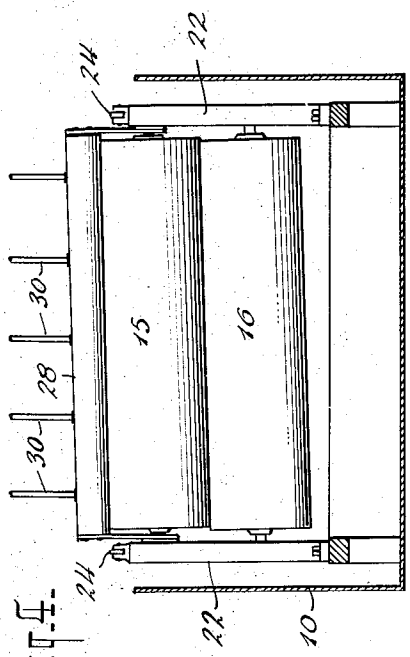


FIG. 4.

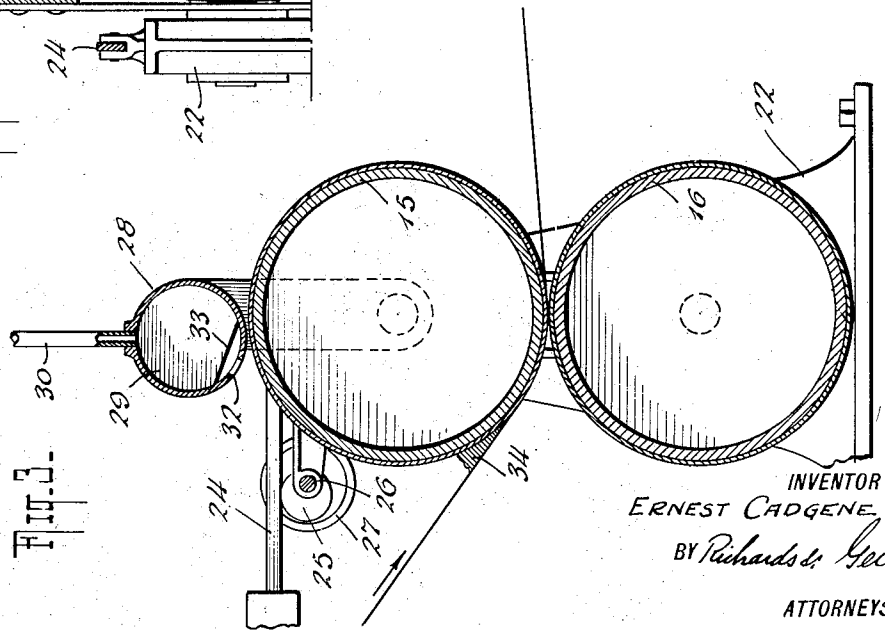


FIG. 3.

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METHOD AND APPARATUS FOR DYEING FABRICS

Application filed November 13, 1926. Serial No. 148,123.

This invention relates to improvements in the art of dyeing textile fabrics, and has particular reference to a method and apparatus for the dyeing of what is known as ombre fabrics. Such fabrics have the characteristic that the color or colors thereof are shaded and the shading is blended without distinctive outlines, or, in other words, various shades of the same color or of different colors merge one into the other so that a gradual change from dark to light hues, or vice versa, is produced.

Several methods of dyeing fabrics of the above nature have heretofore been employed. One, known as the printing process, involves the use of rollers over which is passed the fabric to be dyed and each of which is heavily milled or engraved adjacent one end with the milling or engraving gradually decreasing in density toward the other end so that the quantity of dye applied to the fabric will be decreased from the first named toward the second named end, thus producing the ombre effect. This process is open to the objection that considerable difficulty has been experienced in obtaining a graduai and uniform change in the shading of the fabric.

Another known method consists in supporting the fabric from a frame suspended in a horizontal position above a tank containing the liquid dye and repeatedly lowering and raising the frame so as to dip the fabric in said dye. For the first dipping operations the frame is lowered until the entire fabric is immersed and then as the dipping proceeds the frame is lowered less and less so that a gradually decreasing area of the fabric is permitted to enter the bath with the result that the shade of the fabric will be lightest adjacent the frame and will gradually increase in density toward the bottom of the fabric. As the dipping operations proceed the attendant intermittently adds more of the dye to the tank so as to deepen the shade of the fabric. Such a method requires great care in its accomplishment and necessitates the employment of the services of expert dyers. Furthermore, the operation is a long and tedious one, sometimes taking from three to four hours to dye a piece of fabric.

Still another method frequently used is one in which the dyes are blown on to the fabrics through a series of steam or compressed air nozzles.

In its broad aspects, the invention contemplates the provision of means for partially mixing a plurality of dyes of different shades which are thereupon fed upon the surface of a fabric where said dyes will flow on the fabric in such a way that, due to their mixed condition and the subsequent further mixing thereof while on the fabric, they will produce a graduated or blended effect, without distinctive outlines, in the fabric.

In accordance with the present invention it is proposed to effect the application of a dye, or dyes, of different shades to the fabric in a manner which will greatly facilitate the dyeing operation and produce a uniform ombre finish. To this end the fabric to be dyed is passed beneath a single roller or between a pair of pressure rollers to which single roller or one of the pair of pressure rollers is fed a plurality of dyes of various shades, which dyes may be of the same or different colors, and which are permitted to flow on to the fabric just previous to its passage beneath said single roller or its entrance between the pressure rollers. In so doing it has been found advantageous, in order to secure a better blending of the different shades of dyes so that all possibility of any distinctive outlines being formed in the fabric will be avoided, to permit the mixing together of relatively small volumes of different shades at points of mutual contact before being fed to the roller and at the same time prevent the complete mixing of the main bodies of the different dye liquids. In other words, said main bodies are only partially mixed and it is to be understood that wherever the term "partially mixed" is used in the following specification and claims, it is to be construed as meaning that operation in which a relatively small quantity of the main body of one dyeing liquid is mixed with a similar quantity of a different main body, and it is not to be understood as meaning such partial mixing as might inevitably occur during many dyeing operations when some batches of dyes are improperly mixed. In some cases it has been

found that the pressure exerted upon the fabric, when using a pair of rollers, causes permanent creases or marks to be printed in the fabric and a too sharp line of separation between different shades to be formed, and in such instances better results may be obtained by the use of only a single roller which permits of a more even distribution of the colors and avoids the formation of creases or marks in the fabric.

When dyeing a fabric with various shades of the same color it is also preferable that the roller or rollers beneath or between which the fabric passes be inclined transversely with respect to the direction of travel of the fabric so that the fabric will be inclined in a like manner. In this instance the deepest shade of the color is fed to the lower end of one of the pressure rollers and consequently to the fabric at the lower edge of the latter with the shades of less density progressively fed to the fabric towards the opposite edge. With this arrangement, before the dyes have passed through the fabric and fallen into the tank, a certain amount of flow of the dyes toward the lower edge of the fabric will be permitted with the result that the dyes will be further mixed and a more uniform blending of the shades in the fabric obtained.

On the other hand, when dyeing a fabric with different colors and various shades of these colors, it is preferable that no transverse flow of the dyes relative to the fabric be produced and consequently the roller or rollers are arranged in a horizontal plane.

The inventive idea involved is capable of receiving a variety of mechanical expressions, some of which, for purposes of illustration, are shown in the accompanying drawings.

In the drawings—

Figure 1 is a longitudinal section through the tank of the apparatus with the operating parts in side elevation, the view being taken substantially on the line 1—1 of Figure 2;

Figure 2 is a fragmentary top plan view;

Figure 3 is an enlarged longitudinal sectional view through the pressure rollers and the feeding means therefor;

Figure 4 is a transverse sectional view substantially on the line 4—4 of Figure 2; and

Figure 5 is an enlarged fragmentary longitudinal section through the dye feeding means with the pressure rollers indicated in horizontal position.

The apparatus of the present invention is shown as consisting of an elongated tank 10 with its supporting framework 11 at one end of which is rotatably mounted a delivery roller 12 upon which the length of fabric 13 to be dyed is wound. The fabric is led over a guide roller 14 supported above the framework 11 and from thence passes downwardly with considerable inclination to a point where it enters between the upper and lower felt-covered pressure rollers 15 and 16 rotatably supported in the framework 11. By giving the fabric a decided inclination at the point just previous to its passing between the rollers 15 and 16, said fabric forms a space in the nature of a trough or trap into which the dyes from the feeding means (later to be described) will flow from the surface of the roller 15, the inclination of the fabric preventing excessive spreading of the dyes over the surface thereof. This feature is graphically illustrated in Figure 3. As the fabric is passed between the rollers 15 and 16, considerable pressure is applied thereto by the rollers which will squeeze the liquid from the fabric and thus permit it to pass rearwardly from the rollers in a partially dried condition. If it is found that the pressure of the roller 16 against the fabric results in the absorption by the fabric of an insufficient amount of the dyes, the lower roller 16 may be dispensed with entirely, thus relieving the fabric of a pressure which would otherwise tend to force or squeeze the dyes therefrom, and also avoiding the difficulties previously referred to.

The fabric is laid over a feed roller 17 supported in suitable bearings on the framework 11 and from thence said fabric is wound upon the take-up roller 18. Any conventional means may be employed to drive the feed roller 17, such as the motor 19, which drives the endless belt or chain 20 engaged with a pulley or gear carried by the shaft of the roller 17. The latter roller may be driven at any suitable speed and due to the friction of the partially wet fabric with the surface thereof, it will be apparent that as the roller 17 is rotated it will draw the fabric from the roller 12 and between the pressure rollers 15 and 16. The take-up roller 18 is driven from the roller 17 by means of the endless belt 21.

As previously mentioned, when a fabric is being dyed with a single color of various shades, the rollers 15 and 16, together with the feeding means therefor, are inclined transversely, as clearly shown in Figure 4, with the result that as the fabric passes between the rollers, said fabric will also be inclined, thus permitting the dyes which fall upon the fabric adjacent its upper edge to flow downwardly toward the opposite edge to a certain extent before passing through the fabric. The bearings for the rollers 15 and 16 are disposed in the brackets or standards 22 and the upper roller 15 is supported for vertical movement in order that the pressure upon the fabric may be regulated. To this end the bearings 23 of the roller 15 are slidably mounted in the standards 22 and are each connected to a pivoted weighted arm 24 engaged by a cam 25 mounted upon a shaft 26, the latter carrying a hand wheel 27 by means of which the shaft may be rotated to

turn the cam 25 and thus raise or lower the arm 24.

The means for feeding the various dyes to the surface of the upper pressure roller 15 preferably comprises a feed tube 28 or its equivalent which is supported directly above said roller in close proximity thereto. This tube is divided throughout its length into a plurality of compartments, by means of partitions 29 and each of these compartments is connected by one or more valved pipes 30 to one of a number of receptacles 31, each of which contains a liquid dye of a color or shade different from that in the other receptacles. In this manner various shades of the same color or of different colors may be separately fed into the compartments in the feed tube 28 from whence said dyes will flow on to the surface of the roller 15 through a longitudinal slot 32 extending the length of the tube 28. In order that the dyes flowing from the tube 28 through the slot 32 may be prevented from falling on to the fabric after the latter has passed between the rollers, said slot is disposed forwardly and in offset relation to a vertical line passing through the axes of rotation of the rollers 15 and 16, as clearly shown in Figure 3. It is desirable to permit of a partial or slight mixing of the dyes in adjacent compartments of the tube 28 before they flow through the slot 32 and for this purpose the partitions 28 are cut away, as indicated at 33, adjacent their lower edges thus affording communication between the adjacent compartments. It will be seen from this that as the dyes are fed into the compartments a slight mixing of the dyes will occur before the same flow through the opening on to the forward portion of the roller 15. If desired, the partitions 29 may be dispensed with and the dyes simply fed into the tube 28 where they would be partially mixed to a greater extent than when employing the partitions. From the surface of the roller 15 the dyes will fall upon the fabric and into the trough formed thereby with the surface of the roller, as indicated at 34. Upon falling on to the roller and then on the fabric the dyes from the adjacent compartments will be additionally mixed and this additional mixing, together with the transverse flow of the dyes before passing through the fabric to the bottom of the tank, will result in a gradual blending of the shades to produce a uniform ombre effect in the dyed fabric. It will, of course, be understood that when the rollers 15 and 16 and tube 28 are inclined the deepest shade of color will be fed into the compartment at the lower end of said tube, the next deepest shade in the next adjacent compartment and so on. In this manner the lower edge of the fabric passing between the pressure rollers will be dyed the deepest hue and the color will become gradually lighter toward the higher edge of the fabric. By varying the angle of the fabric it is possible, to some extent, to regulate the portion of dyes flowing on top of and passing through the fabric, thereby aiding in securing the proper shades in the finished product.

As previously stated, when it is desired to dye a piece of fabric in different colors to obtain the ombre effect, rollers 15 and 16 and tube 28 are arranged in a horizontal plane so that practically no transverse flow of the dyes on the fabric will result. In this case the deepest shades of two different colors are fed into the two end compartments of the tube 28 and the progressively lighter shades fed into the next adjacent intermediate compartments with the center compartment receiving a liquid which may be pure water. In fact, any compartment may receive pure or acidified water, soap liquor, or other chemical affecting the dyeing process. In this manner the portions of the fabric on each side of its center may be dyed in different colors and in various shades of these colors. It will, of course, be understood that the invention is in no way restricted to the number of compartments in the tube 28 and consequently to the number of shades of the same or different colors which may be employed to dye the fabric. It will also be appreciated that in order to avoid the possibility of having to run the length of fabric through the machine more than once to obtain the proper coloring effect, the tank 10 may be sufficiently long to position therein two or more of the units including the pressure rollers and the feed tube. When this is done the fabric is successively run through the various units so that the complete dyeing operation may be effected by one run of the fabric.

What is claimed is:

1. The method of dyeing fabrics which consists in mixing together relatively small volumes of dyes of different shades at a point of mutual contact, at the same time preventing the complete mixing of the main bodies of the dyes, feeding said partially mixed dyes on to the surface of one of a pair of pressure rollers, and passing a fabric between said rollers so that the dyes from the first named roller will flow on to said fabric.

2. The method of dyeing fabrics which consists in mixing together relatively small volumes of dyes of different shades at a point of mutual contact, at the same time preventing the complete mixing of the main bodies of the dyes, feeding said partially mixed dyes on to the surface of one of a pair of pressure rollers, and feeding a fabric in a downwardly inclined direction toward said rollers and then between the same so that the dyes from the first named roller will flow onto said fabric.

3. The method of dyeing fabrics which consists in feeding on to the surface of one of a pair of pressure rollers a plurality of dyes

of different shades with the shades gradually changing in density lengthwise of the roller, passing a fabric between said rollers, and causing said dyes to flow transversely to the direction of travel of the fabric.

4. In an apparatus for dyeing textile fabrics, rollers between which a fabric is passed, means for feeding a plurality of dyes of different shades on to the surface of one of said rollers, and means for mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing a complete mixing of the main bodies of said dyes, said partial mixing being effected before the dyes are fed on to said roller.

5. In an apparatus for dyeing textile fabrics, pressure rollers between which a fabric is passed, said rollers being inclined transversely relative to the direction of travel of said fabric, and means for feeding a plurality of dyes of different shades on to the surface of one of said rollers.

6. In an apparatus for dyeing textile fabrics, pressure rollers between which a fabric is passed, said rollers being inclined transversely relative to the direction of travel of said fabric, means for feeding a plurality of dyes of different shades on to the surface of one of said rollers, and means for mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing a complete mixing of the main bodies of said dyes, said partial mixing being effected before the dyes are fed on to said roller.

7. In an apparatus for dyeing textile fabrics, a roller beneath which a fabric is passed, a feed tube adjacent said roller and having a plurality of communicating compartments therein and an outlet for said communicating compartments, and means for feeding a dye of different shade into each of said compartments and through said outlet on to the surface of said roller, the dye in each compartment partially mixing with that in an adjacent compartment through the communication between said compartments.

8. In an apparatus for dyeing textile fabrics, pressure rollers between which a fabric is passed, means to feed the fabric between said rollers and thereby rotate the same, means for feeding a plurality of dyes of different shades on to the surface of one of said rollers, and means for mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing a complete mixing of the main bodies of said dyes, said partial mixing being effected before the dyes are fed on to said roller.

9. In an apparatus for dyeing textile fabrics, a roller beneath which a fabric is passed, means to feed the fabric beneath said roller and thereby rotate the same, a feed tube adjacent one of said rollers and having a plurality of communicating compartments therein and an outlet for said compartments, and means for feeding a dye of different shade into each of said compartments and through said outlet on to the surface of said roller, the dye in each compartment being partially mixed with that in an adjacent compartment through the communication between said compartments.

10. In an apparatus for dyeing textile fabrics, pressure rollers between which a fabric is passed, a feed tube adjacent one of said rollers and having an outlet extending the length thereof, a plurality of partitions in said tube dividing the same into compartments, each of said partitions having an opening affording communication between adjacent compartments, and means for feeding a dye of different shade into each of said compartments and through said outlet on to the surface of said roller.

11. In an apparatus for dyeing textile fabrics, pressure rollers between which a fabric is passed, means for supporting said rollers in an inclined position transverse to the direction of travel of said fabric, a feed tube adjacent one of said rollers and having a plurality of interconnected compartments therein and a common outlet for said compartments, and means for feeding a dye of different shade into each of said compartments and through said outlet onto the surface of said roller.

12. In an apparatus for dyeing textile fabrics, upper and lower pressure rollers between which a fabric is passed, and means supporting said rollers in an inclined position transverse to the direction of travel of the fabric, a feed tube also supported in an inclined position above said upper roller and having an outlet extending the length thereof, a plurality of partitions in said tube dividing the same into compartments, each of said partitions having an opening therein adjacent said outlet to afford communication between adjacent compartments, and means for feeding a dye of different shade into each of said compartments and through said outlet on to the surface of said roller, the openings in said partitions permitting dyes in adjacent compartments to partially mix before passing through said outlet.

13. In an apparatus for dyeing textile fabrics, a roller beneath which a fabric is passed, a guide roller elevated in a plane above the first named roller and over which the fabric is fed in a downwardly inclined direction toward the latter roller, means for feeding a plurality of dyes of different shades on to the surface of said first named roller and from thence on to said fabric, means for mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing a complete

mixing of the main bodies of said dyes, said partial mixing being effected before the dyes are fed on to said first named roller, a feed roller for drawing the fabric beneath said first named roller, and a take-up roller upon which the fabric is wound after being dyed.

14. In an apparatus for dyeing textile fabrics, pressure rollers between which a fabric is passed, means supporting said rollers in an inclined position transverse to the direction of travel of the fabric, a guide roller elevated in a plane above said pressure rollers and over which the fabric is fed in a downwardly inclined direction toward said pressure rollers, means for feeding a plurality of dyes of different shades on to the surface of one of said rollers and from thence on to said fabric, means effecting a partial mixture of the dyes before being fed on to said roller, a feed roller for drawing the fabric between said pressure rollers, and a take-up roller upon which the fabric is wound after being dyed.

15. The method of dyeing fabrics which consists in mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing the complete mixing of the main bodies of the dyes, feeding said partially mixed dyes on to the surface of a roller and passing a fabric beneath said roller so that the dyes therefrom will flow on to said fabric.

16. The method of dyeing fabrics which consists in mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing the complete mixing of the main bodies of the dyes, and feeding said dyes in partially mixed condition on to a surface of a continuously moving fabric.

17. The method of dyeing fabrics which consists in mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing the complete mixing of the main bodies of the dyes, feeding said dyes in partially mixed condition on to a surface of a continuously moving fabric, and causing said dyes to flow transversely to the direction of travel of the fabric.

18. The method of dyeing fabrics which consists in mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing the complete mixing of the main bodies of the dyes, feeding said partially mixed dyes on to the surface of a roller and passing a fabric in a downwardly inclined direction toward said roller and then beneath the same in contact therewith so that the dyes from said roller will flow on to said fabric.

19. The method of dyeing fabrics which consists in mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing the complete mixing of the main bodies of the dyes, feeding said partially mixed dyes on to the surface of a roller, passing a fabric in a downwardly inclined direction toward said roller and then beneath the same in contact therewith so that the dyes from said roller will flow on to said fabric, and arranging said roller in an inclined position transverse to the direction of movement of the fabric to cause said fabric to assume a similar position as it passes beneath the roller.

20. In an apparatus for dyeing textile fabrics, means for mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing the complete mixing of the main bodies of the dyes, means to feed said partially mixed dyes on to the surface of a fabric, and means to pass said fabric beneath said feeding means.

21. In an apparatus for dyeing textile fabrics, a roller beneath which a fabric is passed, means for mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing the complete mixing of the main bodies of the dyes and means for feeding the partially mixed dyes on to the surface of said roller.

22. In an apparatus for dyeing textile fabrics, a roller beneath which a fabric is passed, said roller being inclined transversely relative to the direction of travel of said fabric, and means for feeding a plurality of dyes of different shades on to the surface of said roller.

23. In an apparatus for dyeing textile fabrics, a roller beneath which a fabric is passed, said roller being inclined transversely relative to the direction of travel of said fabric, means for feeding a plurality of dyes of different shades on to the surface of said roller, and means for mixing together relatively small volumes of dyes of different shades at a point of mutual contact and at the same time preventing a complete mixing of the main bodies of said dyes, said partial mixing being effected before the dyes are fed on to said roller.

24. In an apparatus for dyeing textile fabrics, a roller beneath which a fabric is passed in contact therewith, means to feed the fabric past said roller and rotate the same through the contact of the fabric with the roller, means for mixing together relatively small volumes of dyes of different shades at a point of mutual contact, at the same time preventing the complete mixing of the main bodies of the dyes, and means for feeding said partially mixed dyes on to the surface of said roller.

25. A fabric dyeing machine comprising, in combination, means for supporting a length of fabric to be dyed, means for receiving the dyed fabric, means for conducting the

fabric from said first means to said receiving means, and means between said supporting and receiving means for dyeing said fabric with a plurality of parallel bands of different colors during its travel toward the receiving means.

26. A fabric dyeing machine comprising, in combination, means for supporting a length of fabric to be dyed, means for receiving the dyed fabric, means for conducting the fabric from said first means to said receiving means, means between said supporting and receiving means for dyeing said fabric with a plurality of parallel bands of different colors during its travel toward the receiving means, and means for causing the colors of adjacent bands to blend along their contiguous edges.

27. A fabric dyeing machine comprising, in combination, means at one end of the machine for supporting a spool of fabric to be dyed, means at the opposite end of the machine for supporting a spool for receiving the dyed fabric, means for winding the fabric from the supporting spool on to the receiving spool, means between said spools for dyeing said fabric during its travel toward the receiving spool with a plurality of parallel bands of different colors, and means for causing the colors of adjacent bands to blend along their contiguous edges.

28. A fabric dyeing machine comprising, in combination, means for supporting a length of fabric to be dyed, means for receiving the dyed fabric, a dyeing roller supported for rotation between said supporting and receiving means, means for conducting the fabric in contact with said roller from said supporting means to said receiving means, and means for delivering a plurality of dyes of different colors to said roller at different portions of its length thereby to impart to the fabric a plurality of parallel bands of different colors.

29. A fabric dyeing machine comprising, in combination, means at one end of the machine for supporting a spool of fabric to be dyed, means at the opposite end of the machine for supporting a spool for receiving the dyed fabric, a dyeing roller supported for rotation between said spools, means for winding the fabric in contact with said roller from the supporting spool on to the receiving spool, means for delivering a plurality of dyes of different colors to said roller at different portions of its length thereby to impart to the fabric a plurality of parallel bands of different colors, and means for inclining said roller relative to the horizontal.

30. A fabric dyeing machine comprising, in combination, means at one end of the machine for supporting a spool of fabric to be dyed, means at the opposite end of the machine for supporting a spool for receiving the dyed fabric, a dyeing roller supported for rotation between said spools, means for winding the fabric in contact with said roller from the supporting spool on to the receiving spool, means for delivering a plurality of dyes of different colors to said roller at different portions of its length thereby to impart to the fabric a plurality of parallel bands of different colors, means for inclining said roller relative to the horizontal, and means for maintaining the fabric in taut condition while the roller is in inclined position.

31. In a dyeing machine, the combination with a dyeing roller, of a tube adapted to deliver dye to said roller along its entire length, and a plurality of individual manifolds in communication with said tube.

32. In a dyeing machine, the combination with a rotatable dyeing roller, of means for raising one end of the roller relative to the other, and means for delivering dyes of different colors to said roller at different portions of its length.

33. In a dyeing machine, the combination with a rotatable dyeing roller, of adjustable means for supporting said roller in an inclined position, a tube disposed above said roller and adapted to deliver dye thereto, and means for maintaining the tube in parallel relation to the roller.

34. The process of dyeing fabrics which consists in passing the fabric in contact with a plurality of dyes of different colors while maintaining said fabric in inclined position relative to the horizontal.

In testimony whereof I have affixed my signature.

ERNEST CADGENE.