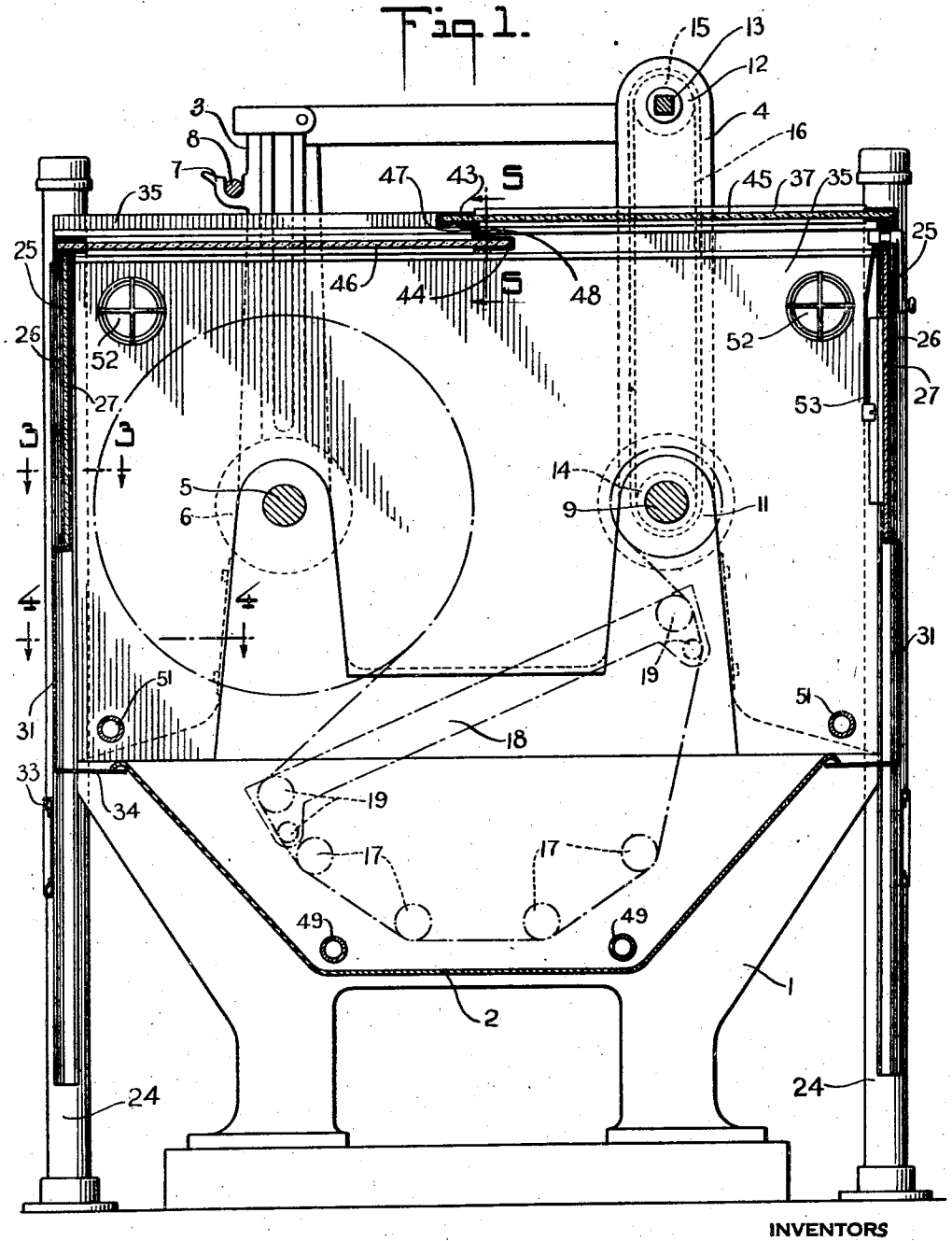
Feb. 3, 1942. H. PLATT ET AL 2,271,874

COLORATION OF TEXTILE MATERIALS

Original Filed June 14, 1938 3 Sheets-Sheet 1

Fig 1.



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Original Filed June 14, 1938 3 Sheets-Sheet 2

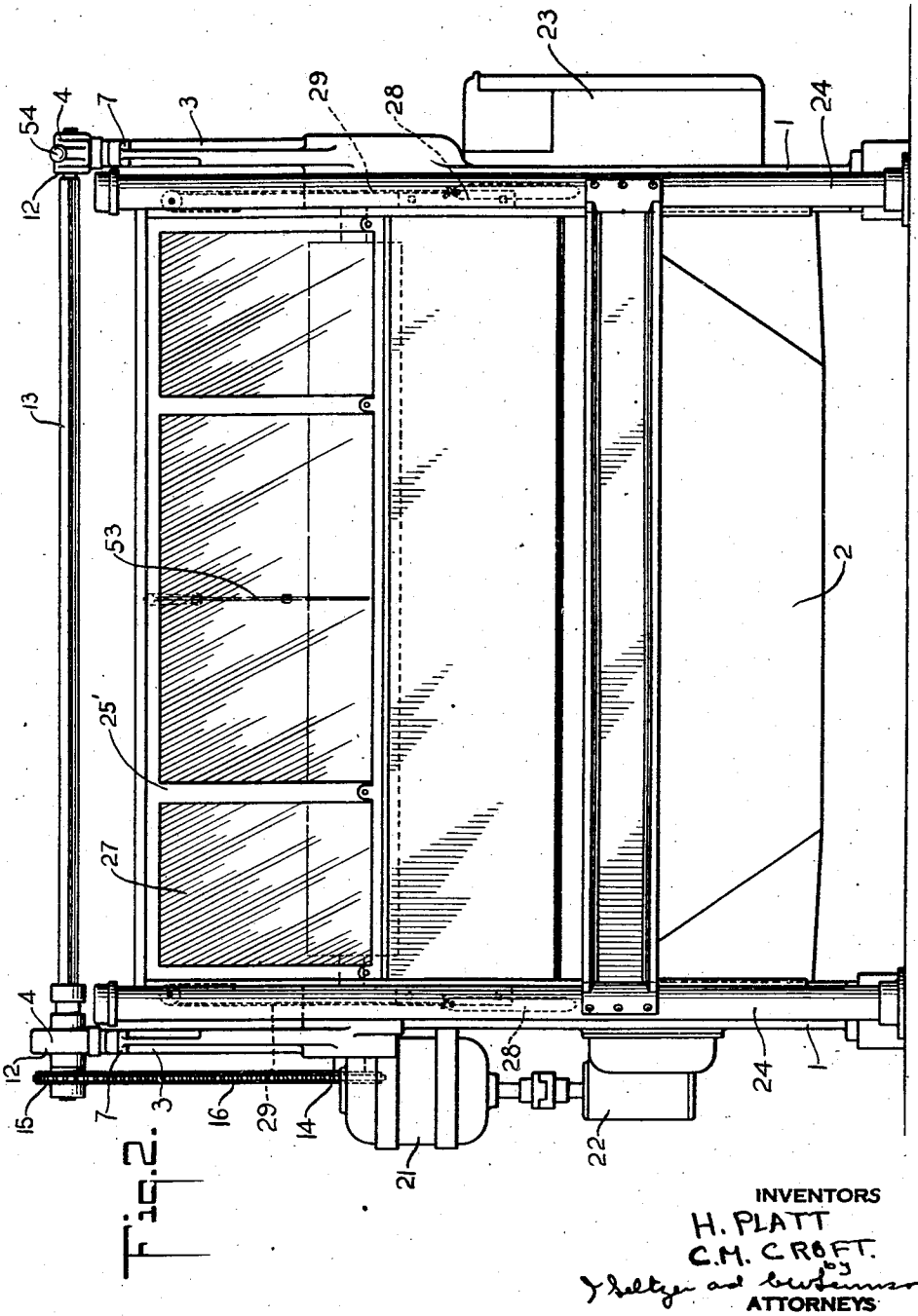


Fig. 2.

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Original Filed June 14, 1938 3 Sheets-Sheet 3

Fig. 3.

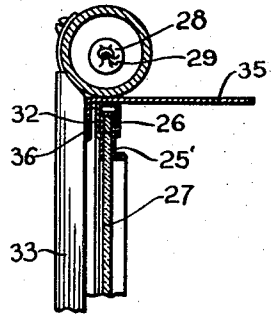


Fig. 4.

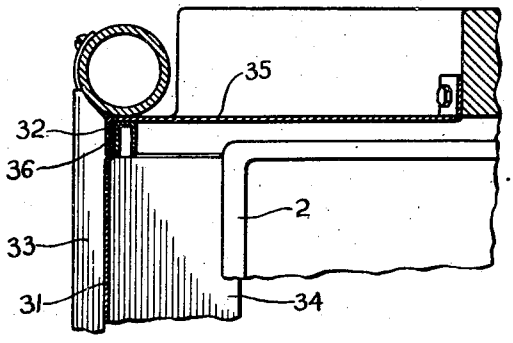


Fig. 5.

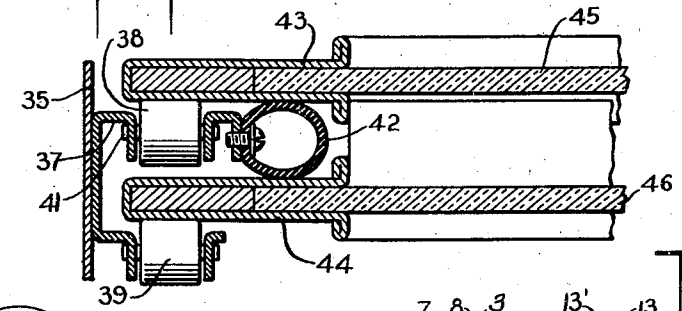


Fig. 6.

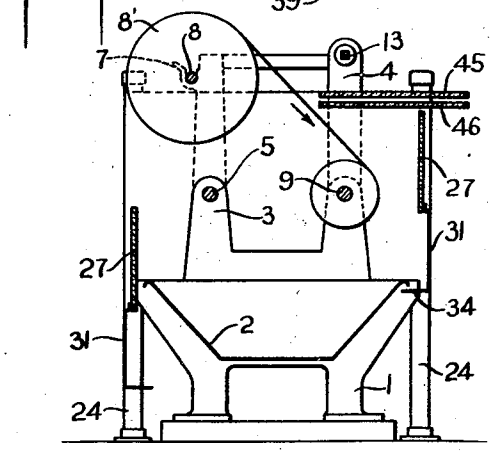
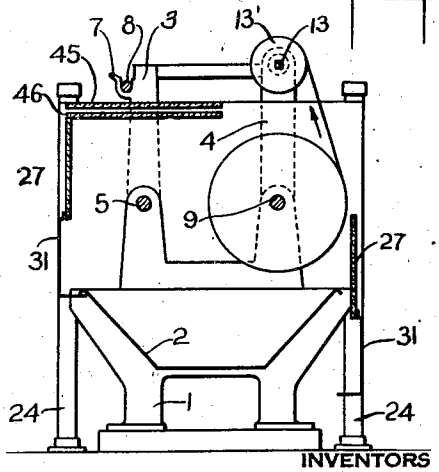


Fig. 7.



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UNITED STATES PATENT OFFICE

2,271,874

COLORATION OF TEXTILE MATERIALS

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Original application June 14, 1938, Serial No. 213,585. Divided and this application October 5, 1939, Serial No. 298,046

3 Claims. (Cl. 68—13)

This application is a division of our application S. No. 213,585 filed June 14, 1938.

This invention relates to the dyeing of textile materials, especially those containing thermoplastic yarns or filaments, with dyes which have commercially rapid dye affinity for said yarns or filaments at elevated temperatures.

An object of the invention is the application of dyes to materials containing organic derivative of cellulose yarns or filaments. Another object of the invention is the method of dyeing textile materials containing organic derivative of cellulose yarns or filaments wherein the dye is applied uniformly, the dye is substantially exhausted and the time required to bring the textile material to a good shade is reduced. Another object of the invention is the dyeing of textile materials containing organic derivative of cellulose yarns or filaments with dyes having an affinity for the organic derivative of cellulose only at elevated temperatures. A still further object of our invention is the construction of a dye jig which will dye fabrics with "high temperature" dyes. Other objects of our invention will appear from the following detailed description and drawings.

In the drawings, wherein like reference numerals refer to the same or similar elements in the respective views:

Fig. 1 is a side view, partially in section, of a dye jig constructed in accordance with this invention,

Fig. 2 is an end view of the dye jig shown in Fig. 1,

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1,

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1,

Fig. 5 is a sectional view taken on line 5—5 of Fig. 1,

Fig. 6 is a somewhat diagrammatic view showing the loading of the dye jig, and

Fig. 7 is a somewhat diagrammatic view showing the unloading of the dye jig.

The dyeing of fabrics containing thermoplastic yarns has been effected only by the use of special processes, as compared to the dyeing of other types of fabric, and by a careful selection of dyestuffs. Fabrics containing thermoplastic yarns, which are woven into twills, taffetas, etc., are normally dyed in a jig as the batch process of dyeing or dyeing on the winch causes creases to be formed in the fabric. Moreover, the yarns are somewhat softened due to the heat of the dye bath and/or reagents contained in the bath causing the creases to become permanent. In order to avoid creasing of the fabric, the fabric is dyed on devices which maintain the fabric in an open width or flattened condition, a common type of such a device being a jig. Although the use of a jig overcame the formation of creases, it limited the number of dyestuffs that could be employed. For instance, prior to this invention "high temperature" dyestuffs could not be used in a jig with commercial success. By "high temperature" dyestuffs is meant those dyestuffs that have good affinity for the fabric only at temperatures of 70° C. or above. These dyestuffs, being sensitive to the temperature of the fabric, produced streaky dyeings with shaded selvedges and ends due to the uneven cooling of the fabric on the roll and the temperature differential between the center and edges of the fabric when on the roll. We have now found that a full range of dyestuffs, including the high temperature dyestuffs, may be applied on the jig to fabrics containing thermoplastic yarns by maintaining the temperature of both rolls of fabric at a temperature above the critical temperature of that component of the dyestuff requiring the higher temperature. This not only permits the use of a wider range of dyestuffs and effects uniform dyeing, but also greatly decreases the time of dyeing, thus effecting greater production per machine and man hour.

By employing this invention a better penetration of the dyestuff into the filaments is obtained and an improved hand is obtained it being somewhat fuller than that obtained by prior methods. As stated above, the invention effects an economy in the dyeing process as there is an improved speed of dyeing. There is also effected a saving in dyestuff and steam employed, the bath being readily exhausted of dyestuff and escape of steam is confined.

In accordance with our invention, we dye fabrics containing thermoplastic yarns in an open width and flattened condition on a jig while maintaining a substantially uniform temperature throughout both rolls of fabric, which temperature is high enough to effect a dyeing with high temperature dyestuffs. To accomplish this we construct a novel jig, also forming a part of this invention, having an enclosed space above the tub in which the fabric is being treated.

This invention is applicable to the dyeing of any fabric regardless of composition or structure. However it is especially applicable to closely woven taffetas and crepes that are made of or contain thermoplastic yarns. Any type of fabric may be treated in accordance with this invention. For example, the fabrics may be woven,

knitted, netted or knotted. The fabrics may be made entirely of thermoplastic yarns or thermoplastic yarns may be interwoven or knitted with yarns of other materials, such as cotton, silk, wool, regenerated cellulose, etc. Even the yarns themselves may be made of a mixture of thermoplastic fibers or filaments and fibers or filaments of non-thermoplastic materials, and these yarns may be interwoven or knitted with yarns of thermoplastic material or yarns of non-thermoplastic material. In the practice prior to this invention it was found that the care to be given to fabric containing these thermoplastic yarns was directly proportional to the amount of thermoplastic yarns present in the fabric.

The thermoplastic material of the fabric may be any suitable thermoplastic material, such as the organic derivatives of cellulose which include the organic esters of cellulose and the cellulose ethers. Examples of the organic esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate, while examples of the ethers of cellulose are ethyl cellulose, methyl cellulose and benzyl cellulose. The thermoplastic material may be present in the fabric as substantially continuous filaments or as fibers, or may even be present as a coating or dressing.

These fabrics may be dyed with any suitable dyestuff having affinity therefor or for one constituent thereof. Mixtures of dyestuff may be employed, for instance, in dyeing a fabric containing cotton and cellulose acetate, the dye bath may contain dyestuffs having affinity for cotton and dyestuffs having an affinity for cellulose acetate. Also a mixture of dyestuffs having affinity for the same constituent may be employed to produce a desired shade. For instance, a blue and a red dyestuff, each having an affinity for cellulose acetate, may be employed. All or any of the dyestuffs employed may be high temperature dyestuffs.

The dyeing may be performed by passing the fabric any number of times through the liquid in the jig. The liquid or dye bath in the jig may be a water emulsion or dispersion of the dyestuff with suitable solubilizing agents, dispersing agents and the like, such as Turkey red oil, dextrin, sulphonated fatty alcohols and the like. The liquid of the dye bath may also contain reagents having a softening or swelling action on the thermoplastic material contained in the fabric. The dye bath may also contain reagents which act as stabilizers for either the dye or the thermoplastic material, such as morpholine compounds, benzyl ethyl aniline, etc., or finishes which are intended to remain on the fabric, such as oils, resins and stearyl chloride.

The bath may be maintained at any suitable temperature at or below its boiling point, while the enclosed space above the bath, in which space is contained the bulk of the fabric being dyed, is maintained at the same temperature as the bath or, as necessary in commercial production, a few degrees lower. Although the bath may be maintained at any temperature, this invention is primarily concerned with the use of high temperature dyestuffs, in which case the temperature of the bath is preferably maintained at or above 70° C., and for some of the fast to acid fading high temperature dyestuffs the bath is maintained at or just below its boiling point, while the rolls of fabric are maintained at or above 80° C.

In the drawings is shown a jig constructed in accordance with this invention. With particular reference to Figs. 1 and 2 the jig is constructed of a frame 1 having mounted therein a tub 2. At each side of the frame 1 is mounted pairs of uprights 3 and 4. The uprights 3, of which there is one on each side of the jig, support a shaft 5, upon which is mounted a shell 6 about which the fabric is rolled during the dyeing operation. Near the top of the uprights 3 there is provided an open top bearing 7 for supporting a shaft 8 adapted to support a roll of fabric 8' during the loading of the jig. In the uprights 4, of which there is one on each side of the jig, is a shaft 9 which has mounted thereon a shell 11 about which the fabric is adapted to be rolled during the dyeing operation. The upper ends of the uprights 4 are provided with bearings 12 adapted to support a square shaft 13. On one end of the shaft 9 at the outside of the frame member is mounted a sprocket 14, while on a similar end of shaft 13 is also mounted a sprocket 15. By means of sprocket chain 16 the shaft 9 drives shaft 13 for the purpose of rolling up and unloading the fabric 13' from the jig. Mounted in the tub are suitable guide rollers 17 for directing the fabric through the bath contained therein. Also mounted in the jig is a spreader arm 18 of any suitable type having mounted thereon spreader-controlling rollers 19 which act through the spreader arm 18 to regulate the tension on the fabric and the relative speeds of the shafts 5 and 9.

For driving the jig there is provided a suitable motor 21 which acts through a suitable transmission and speed reducing device 22 to rotate the shafts 5 and 9, the relative speeds of which and their direction of travel are controlled by suitable mechanism 23 partly responsive to the spreader arm 18.

At the outside of the jig frame is a second frame comprising four hollow corner posts 24. These corner posts are shown in cross-section in Figs. 3 and 4. These corner posts support an enclosure for the space immediately above the tub in which the fabric is rolled from shaft 5 to the shaft 9 and back as many times as it is necessary to effect the desired dyeing. This enclosure above the tub is constructed of movable ends 25 adapted to slide up and down in a guideway 26 suitably attached to the corner posts. These ends may be formed of a suitable frame, as shown at 25' in Figs. 2 and 3, which frame contains glass panes 27 such that an operator may look in the end of the device to ascertain the condition of the fabric. The movable ends 25 are held in a raised position by counterweights 28 attached thereto by means of cords 29. These counterweights 28 are adapted to hang in the hollow corner posts. Below the movable end 25 is a movable skirt 31, shown in cross-section in Fig. 4, which is adapted to be raised and lowered in the guideway 32 attached to the corner posts 24. Also across each end is a suitable brace 33 tending to maintain the corner posts in spaced and parallel relationship. The bottom of the skirts 31 may terminate in a flange 34 adapted to make contact with the tub 2 to prevent the escape of steam from between the ends of the enclosure and the tub. The sides of the enclosure are formed of a suitable sheet material 35 having cutout portions to fit around the shafts 5 and 9. The sides extend from one corner post to the other terminating in a flange 36 forming one side of the guideway 32, thus effecting a seal at the four vertical corners of the enclosure.

Along the top of both side members 35, as more fully shown in Fig. 5, is a bracket 37 adapted to support two series of rollers 38 and 39. At the inner end of the shaft 41 that supports rollers 38 is a flexible tubing 42 adapted to prevent the escape of steam along the two upper horizontal edges of the enclosure. Mounted for sliding movement on the rollers 38 and 39 are a pair of frames 43 and 44 which support glass panes 45 and 46, respectively. Each frame 43 and 44 is but slightly longer than half the length of the enclosure, the central ends of which terminate in flanges 47 and 48, respectively, such that when the panes are moved to enclose the top the flanges 47 and 48 make a seal preventing the escape of steam.

Suitable pipe lines may be connected with the tub 2 for furnishing thereto hot and cold water, etc., which being conventional have not been shown on the drawing. The tub 2 may also contain steam pipes or other means 49 for heating up or maintaining the bath in the tub 2 at an elevated temperature. Also, there may be provided above the tub 2 steam pipes or other means 51 for heating up or maintaining the atmosphere of the enclosure above the bath at a given temperature. The heating elements 51 are not always necessary as the temperature of the bath soon raises the small amount of atmosphere to substantially its own temperature. There is also provided means for lighting up the interior of the enclosure, such as marine lights 52 mounted in the side walls of the enclosure. To prevent condensate from preventing the operator from ascertaining the state of the fabric there is provided a manually operated or automatically operated wind shield wiper 53 at one or both ends of the enclosure.

The operation of the device may best be described with particular reference to Figs. 6 and 7, which, although somewhat diagrammatic, show the operation of the device. For loading the jig a roll of fabric 8' carried on a suitable shell is placed on the shaft 8 and the end of the fabric is brought around the shell contained on the shaft 9. The shaft 9 is then rotated pulling the fabric from the roll 8' and winding it on the shell and shaft 9. To accomplish this, however, the frame 25 containing the panes 27 and also the skirt 31 on that end of the machine is lowered, while the two top sections 45 and 46 are moved to the right as seen in Fig. 6. After the fabric has been placed on the shaft 9 it is then threaded about spacer arm 18, guide roll 17 onto the shell supported by the shaft 5. The end of the enclosure at the left, as seen in Fig. 6, is then raised and the top 46 is moved to the left effecting a substantially sealed enclosure about the rolls of fabric which now may be run through the dye bath contained in the tub 2. As the space enclosed is relatively small the heat contained in the dye bath or supplied thereto is usually sufficient to maintain the enclosed space within a relatively few degrees of the dye bath. For instance, when the dye bath is maintained at or near 100° C. the atmosphere contained in the enclosure is around 92° C. For the purpose of unloading the jig the fabric is wound on the shell supported by shaft 9, the right end as seen in Fig. 7 is then lowered and the top section 45 is moved to the left effecting a whole open corner. The fabric is then threaded onto a shell slipped on the shaft 13. By means of the drive chain 16 the fabric is pulled from the enclosure and wound into a roll 13' upon the shell supported by the shaft 13. After winding fabric one end of the shaft 13 may be released from its bearing, by means of the hinge bearing top 54 which permits the square shaft 13 to be raised sufficiently free of the bearing to slip the shell containing the fabric therefrom.

It is to be understood that the foregoing detailed description is merely given by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

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

1. A dye jig for use in dyeing fabrics, comprising a tub, a frame supporting said tub, an enclosure mounted over said tub, a plurality of upright members supported on said frame and extending beyond the top of said enclosure, said upright members having means thereon for supporting a roll of fabric being treated within said enclosure and separate means for supporting a roll of fabric outside of said enclosure, and said enclosure comprising means for permitting the feeding of fabric to and from the interior of said enclosure.

2. A dye jig for use in dyeing fabrics, comprising a tub, a frame supporting said tub, an enclosure mounted over said tub, a plurality of upright members supported on said frame and extending beyond the top of said enclosure, said upright members having means thereon for supporting a roll of fabric being treated within said enclosure and separate means for supporting a roll of fabric outside of said enclosure, and a divided top for said enclosure for permitting the feeding of fabric to and from the interior of said enclosure.

3. A dye jig for use in dyeing fabrics, comprising a tub, a frame supporting said tub, an enclosure mounted over said tub, a plurality of upright members supported on said frame and extending beyond the top of said enclosure, said upright members having means thereon for supporting a roll of fabric being treated within said enclosure and separate means for supporting a roll of fabric outside of said enclosure, a divided top for said enclosure for permitting the feeding of fabric to and from the interior of said enclosure and means between the separate portions of the divided top for sealing the same when the top of the enclosure is closed.

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