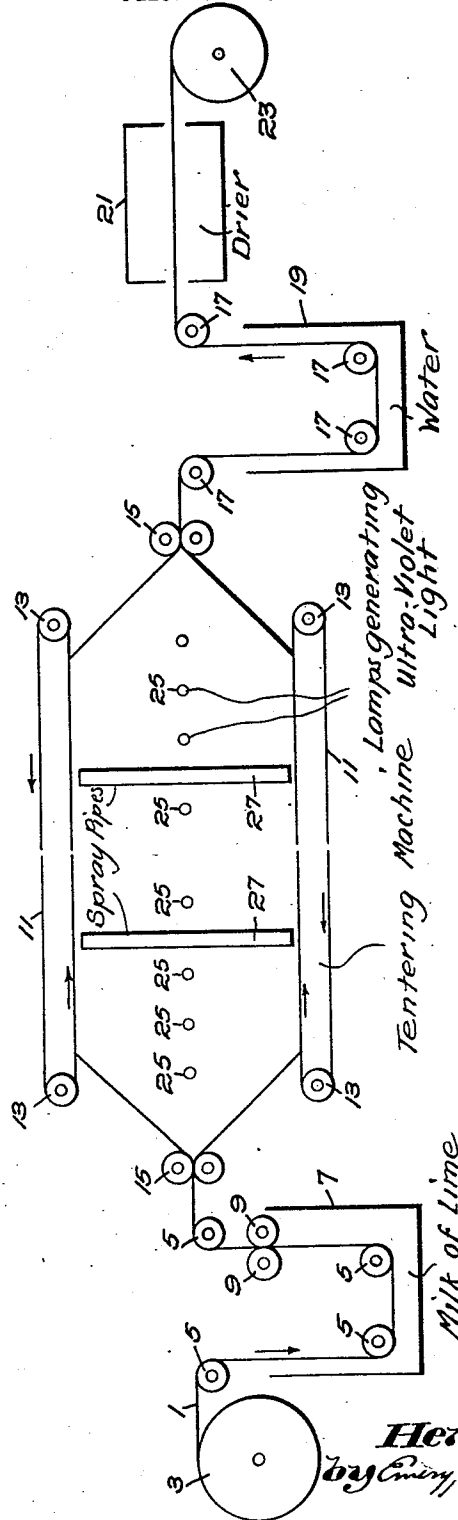


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BLEACHING TEXTILE FIBERS

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UNITED STATES PATENT OFFICE

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BLEACHING TEXTILE FIBERS

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My invention relates to methods of and apparatus for bleaching textile fabrics, such as cotton yarn and cloth, by use of actinic rays.

5 The invention will be best understood from the following description of an example of the practice of the improved method and of an example of apparatus for use in such practice, especially when read in the light of the
10 accompanying drawings, while the scope of the invention will be more particularly pointed out in the appended claims.

The drawings schematically illustrate an example of apparatus embodying the invention.
15 tion.

Hitherto it has been common practice to bleach cotton fabrics woven in natural color by an expensive time-consuming process involving successive treatments of the fabric
20 with alkalis and acids with intermediate washing in water. This method can be practised commercially only where pure water in large quantity is available, as the practice necessitates the use of about 1,000,000 gal-
25 lons for each 25,000 pounds of fabric treated, and as a commercial plant commonly treats from 20,000 to 100,000 pounds of fabric daily it will be readily appreciated that the amount of water consumed and the expense incident
30 thereto in many instances and locations is so great as to be commercially prohibitive. Further, the acids and alkalis (commonly sulphuric or hydrochloric acid and soda-ash) with which the fabric is treated results in a
35 weakened texture which for many uses of the fabric prohibits it being bleached. Commonly the present method takes about four days to bleach the usual grades of cotton cloth.

According to the improved method, which
40 involves the bleaching of the fabric or yarn with so-called actinic rays, as, for example, ultra-violet light, with elimination of all or most of the treatment with strong acids and alkalis, the amount of water necessary as
45 compared with prior methods may be reduced about 50% and the time for carrying out the method reduced from about 25% to 50%, while a resultant stronger bleached fabric may be produced. Consequently the im-
50 proved method not only results in an im-

proved bleached product but effects a great and desirable economic saving in water and time with decreased maintenance and installation costs. The saving in water, it will be appreciated, permits the improved method to be practised in localities where it is impos-
55 sible to practise the prior method.

As an example of the improved method, but without limitation thereto, assuming that cotton cloth woven in the natural color, "in the
60 grey" as it is termed, is to be bleached and said cloth has the warp thereof impregnated with starch, as commonly would be the case, it may be first subjected to a "stripping process", that is, treated to remove the starch.
65 For carrying out this step of the method the cloth may be run from a roll through a vat containing a warm, weak solution of diastase at such speed as will cause the cloth leaving the vat to be saturated. The cloth leaving
70 the vat may be run through squeeze rolls to remove the excess solution and then may be "plated down" and allowed to stand for about two hours, after which the cloth may be
75 washed in a washing machine to remove the treated starch, and then the cloth may be dried. The cloth may then be treated with milk of lime; for example, it may be run from a roll through a vat containing a 10%
80 Twaddell milk of lime solution at such speed as will saturate the cloth. The cloth leaving the vat may be passed through squeeze rolls to remove the excess solution. I have found that the treatment of the cloth with the milk
85 of lime solution breaks down the natural waxes and oils of the fiber and improves the effect of the subsequent treatment of the fabric by actinic rays.

After being treated with milk of lime as above described, and while the fabric is still
90 moist, it may be subjected to the action of the actinic rays, preferably ultra-violet light, for about six hours. I have found that to prevent injury to the cloth during its treatment with ultra-violet rays best results are secured by
95 keeping the cloth wet. After a treatment of the cloth by use of ultra-violet rays it may then be washed in water to remove the milk of lime and dried.

As an example of apparatus for carrying 100

out the improved method the strip of cloth 1 may be fed from a roll 3 over guide pulleys 5 through a vat 7 containing the milk of lime above referred to. Leaving the vat the cloth 5 may pass between the squeeze rolls 9 to remove the excess liquid and then may pass to a so-called "tentering machine" comprising the chains 11 moving over pulleys 13 and the feed mechanisms diagrammatically indicated at 15. The tentering machine, the details of which form no part of my present invention, as will be understood, is effective to turn the cloth from the horizontal position in which it leaves the vat 7 to a vertical position and hold it taut. Leaving the tentering machine the cloth is turned to a horizontal position and passed about the guide pulleys 17 through a vat 19 containing water for washing the cloth, after which the cloth may 20 be passed through a drier 21 from which it is delivered to a roll 23.

At the tentering machine, and preferably at opposite sides of the vertical sheet of cloth passing therethrough, are arranged lamps 25 which generate ultra-violet light, said light materially concentrated as compared with natural ultra-violet light, while at convenient intervals throughout the length of the machine may be arranged spray pipes 27 for spraying the cloth with water to keep it moist. I have found that satisfactory results can be obtained when the speed of the cloth passing through the tentering machine with respect to the number of lamps is such as to subject 35 the cloth to the ultra-violet rays for about six hours, under which conditions the concentration of the ultra-violet light may be that produced by 900 watt ultra-violet lamps spaced about 18 inches from the cloth.

When necessary and desirable, if the cloth contains "motes" or other foreign matter, it may be treated for removal of the same by an acid and boiling process after it leaves the vat 19.

I have found that other alkalis such as lime water, and water solutions of soda-ash and caustic soda, may be substituted for milk of lime in the above process, but that the bleaching is less rapidly effected with these substitutes. I have also found that where treatment with alkali is omitted, the bleaching may be effected if the fabric material is kept moistened with water while subjected to the ultra-violet light, but that the bleaching action in this case is much slower.

Although I have described for purposes of illustration a particular example of the practice of the improved method and an example of apparatus for use therewith, it will be understood that within the scope of the invention wide deviations may be made therefrom without departing from its spirit, and that my invention is not limited to use for bleaching cloth or cotton textiles, but that 65 yarn as well as cloth and other textile fabrics

as well as cotton fabrics may be similarly treated.

Claims:

1. The method of bleaching textile fibers which comprises exposing them to the action of artificial ultra-violet light while moistened with an alkaline substance. 70

2. The method of bleaching textile fibers which comprises exposing them to the action of artificial ultra-violet light while moistened with milk of lime. 75

3. The method of bleaching cotton fabrics woven with a starched warp which comprises treating the cloth to remove the starch and afterwards subjecting the fabric to the action of ultra-violet light while moistened with an alkaline substance. 80

4. The method of bleaching cotton fibers which comprises removing therefrom the waxes and fats, and afterwards exposing said fibers to ultra-violet light while moistened with milk of lime. 85

5. The method of bleaching cotton fibers which comprises removing therefrom the waxes and fats, and afterwards exposing said fibers to ultra-violet light while moistened with an alkaline substance. 90

6. The method of bleaching cotton fabrics woven with a starched warp which comprises treating the cloth to remove the starch and afterwards subjecting the fabric to the action of ultra-violet light while moistened with milk of lime. 95

7. The method of bleaching cotton fabrics woven with a starched warp which comprises treating them with a diastofor solution for digesting the starch, washing the fabric to remove the digested starch, treating the fabric with milk of lime for removing waxes and fats, and exposing the fabric to ultra-violet light while moistened with the milk of lime. 100

8. The method of bleaching cotton fabrics woven with a starched warp which comprises treating them with a diastofor solution for digesting the starch, washing the fabric to remove the digested starch, treating the fabric with alkali for removing waxes and fats, and exposing the fabric to ultra-violet light while moistened with an alkaline substance. 105

In testimony whereof, I have signed my name to this specification. 115

HENRY P. BENSON.

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