

# UNITED STATES PATENT OFFICE.

JOHN PULLMAN, OF LONDON, AND EDWARD ENGLAND PULLMAN, OF  
SURBITON, ENGLAND.

## PROCESS OF BLEACHING.

SPECIFICATION forming part of Letters Patent No. 658,674, dated September 25, 1900.

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*To all whom it may concern:*

Be it known that we, JOHN PULLMAN, manufacturer, of The Trowlock, Teddington, London, in the county of Middlesex, and EDWARD ENGLAND PULLMAN, manufacturer, of 13 Claremont Gardens, Surbiton, in the county of Surrey, England, subjects of the Queen of Great Britain, have invented a certain new and useful improvement in the process of treating, for the purpose of scouring and bleaching, vegetable fibers and yarn and woven fabrics made from such fibers, of which the following is a specification.

In the preparation of vegetable fibers and of yarn and fabrics made from such fibers, such as cotton and linen, for subsequent treatment of different kinds in paper-making, bleaching, and dyeing a process of boiling with lime, usually in the form of milk of lime, is valuable and in some cases indispensable. The chemical actions of the lime in such boiling processes are, however, much impeded by its comparative insolubility in water, in consequence of which it penetrates the fibers or fibrous fabrics with extreme slowness.

The objects of our present invention are, first, to thoroughly lime vegetable fibers or fibrous materials, such as cotton or linen; second, to reduce largely the time occupied in the process of liming; third, by operating with known weights of vegetable fibers or fibrous material, definite temperature, strength of the solutions used, and time occupied to produce an exactly-determined liming result; fourth, to avoid waste, as the quantity of lime used in the ordinary methods of liming vegetable fibers and fibrous materials is considerably in excess of that required, and, fifth, a reduction in cost, since there is little or no waste and the salts can be recovered.

Our invention consists, essentially, in chemically producing calcium hydrate in the substance of the vegetable fibers themselves instead of treating the fibers with calcium hydrate externally applied.

To carry our invention into effect, we first treat the vegetable fibers or fibrous materials with a solution of a soluble calcium salt, calcium chlorid, ( $\text{CaCl}_2$ ), and we then effect the subsequent metathesis of this in the sub-

stance of the fibers by a weak alkaline solution—caustic soda ( $\text{NaHO}$ ) or caustic potash ( $\text{KHO}$ )—so that calcium hydrate ( $\text{Ca.2HO}$ ) is produced and is retained and fixed in and in combination with and in uniform and intimate distribution through and in the mass of the fibers or fibrous material.

The process may obviously be reversed—that is to say, the caustic or alkaline solution being used first and the solution of a calcium salt afterward.

The quantity of lime deposited in the vegetable fibers or fibrous materials by the method described may be accurately determined and regulated by variations in the strength of the solutions employed.

The following description is in illustration of the method which we have found effective in putting our invention in operation; but it must be understood that we do not confine ourselves exactly to the proportions of the several ingredients, to the exact time occupied in the different processes, nor to the precise methods of carrying out the operations. Supposing that linen cloth is the material to be treated, we pass it through a solution in water at a temperature of about  $95^\circ$  Fahrenheit of two per cent. of calcium chlorid ( $\text{CaCl}_2$ ) weighed dry. The cloth is simply passed through this solution. We then remove it and squeeze it by passing it between rollers or by other means until it retains a weight of the solution equal to its own weight, but not more than twice its own weight. We then pass the cloth through a solution of water containing about one per cent. of caustic soda, ( $\text{NaHO}$ ), in which it remains for only a short time—say about half an hour—and is then removed. Cloth of vegetable fiber so prepared may then be boiled in the usual way and under the usual conditions either in what is known as an ordinary “lime boil” or in a “caustic-soda boil,” after which it may be further treated and finished in the usual well-known ways.

The treatment of the linen cloth in the way described is superior to the ordinary method of treatment in the uniformity and general character of the result.

Linen yarns may be advantageously treated by this improved process of liming, whereas



the ordinary process of boiling with milk of lime is in most cases unsuitable. By the present invention the yarns are dipped in the hot solution of calcium chlorid, (two per cent.  $\text{CaCl}_2$ ), and when thoroughly impregnated the excess of the solution is removed by draining, followed by the action of squeezing-rolls or a centrifugal machine. The yarns are then laid in a boiling pot or keir and boiled under the ordinary conditions with a lye of caustic soda. The quantity of caustic soda ( $\text{NaHO}$ ) employed is from ten to twenty per cent. in excess of the amount required to decompose the calcium chlorid retained by the yarn, as described above.

Instead of a soluble salt of calcium in some cases one of magnesium or other metal of the alkaline earths, such as barium, may be used.

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

1. The process of treating vegetable fibers and fibrous materials, which consists in subjecting them to the action of a solution containing calcium chlorid and afterward while

wet subjecting them to the action of a solution containing caustic soda, whereby an insoluble precipitate of calcium hydrate is deposited in the substance of the material treated, substantially as described.

2. The process of treating vegetable fibers and fibrous materials which consists in subjecting them to the action of a solution containing about two per cent. of calcium chlorid, subjecting such material or fiber to pressure until there is left therein only about its own weight of such solution and then treating such material with a solution containing about one per cent. of caustic soda, whereby an insoluble precipitate of calcium hydrate is deposited in the substance of the material under treatment, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two witnesses.

JOHN PULLMAN.

EDWARD ENGLAND PULLMAN.

Witnesses:

ARTHUR ERNEST EDWARDS,  
EDMUND EDWARDS.