

# UNITED STATES PATENT OFFICE.

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## PROCESS OF LIBERATING, SEPARATING, AND BLEACHING FIBERS.

No. 803,392.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, HENRY SPENCER BLACKMORE, a citizen of the United States, residing at Mount Vernon, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Processes of Liberating, Separating, and Bleaching Fibers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is to liberate and separate fibers from their naturally uniting or binding constituents with which they are bound in nature—such as cutose, vasculose, &c.—in such a manner that the fibers are not injured and that their gummy or binding constituents are removed by simple and economical means and whereby the fibers thus isolated may be obtained in a whitened or bleached condition and comparatively free from vegetable coloring-matter by direct treatment.

My invention relates particularly to the separation and bleaching of ramie fiber, but is not limited thereto, as many other fibers may be liberated and separated by my process, such as jute, New Zealand flax, &c.

It is well known that the substances which bind fibers of ramie and similar vegetation consist largely of complex acid substitution products combined more or less with calcium, forming ordinarily insoluble compounds, such as the calcium salts of oleocutic, stereocutic, pectic, and similar organic acids.

My invention therefore consists in transforming the insoluble binding constituents of the fibers into soluble compounds without affecting or injuring the fiber and separating the individual fibers from each other by the increase in bulk of chemicals introduced between the fibers induced by decomposition or combination and in bleaching the fibers so obtained by the action of an ingredient of the fiber-rending composition.

In carrying out my process I prefer to proceed as follows: I take the stalk, such as ramie, from which it is desired to separate and bleach the fiber and place it in a receptacle containing a ten-per-cent. solution of alkali aluminate, such as sodium aluminate, preferably in a heated state, (about 200° Fahrenheit.) The receptacle is then closed

and the stalks allowed to digest for about an hour, when the pressure is preferably reduced by exhaustion, which withdraws from the stalks any occluded air within the pores.

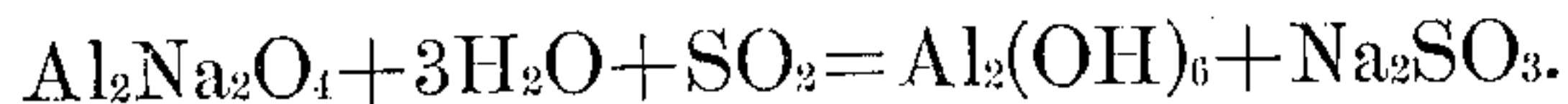
I prefer to treat the fibrous material in drums holding about two hundred and fifty gallons of ten-per-cent. solution of sodium aluminate and add thereto from time to time fresh portions of alkali aluminate to compensate for that taken up by the decomposition of the binding constituents of the fiber, so that the solution may be maintained at about a uniform density. I then subject the material to an increased pressure of steam to about sixty pounds, which further heats the solution and drives it into the material, thus thoroughly saturating it with alkali aluminate. During the digestion under pressure with the alkali aluminate the binding calcium salts are decomposed, producing alkali oleocutate, stereocutate, pectate, &c., and calcium aluminate. The alkali salts are finally dissolved out by thoroughly washing with water. The stalks containing alkali aluminate are then removed from the chemical bath and exposed to the action of sulfur dioxide under pressure of about one hundred pounds, which decomposes the alkali aluminate within the pores between the fibers, liberating aluminium hydroxid or hydrated oxid, which, together with the alkali sulfite simultaneously produced, increase in bulk and segregate the fibers from each other, while the sulfurous constituent of the material bleaches the fibers thus separated. The pressure is then reduced and the stalks thoroughly washed with water, the alkali salts being thereby removed, leaving the fibers practically free from each other, but retaining a portion of the aluminium hydroxid, which is finally removed by treatment with a dilute alkali solution, such as a five-per-cent. solution of caustic soda, which combines with the aluminium hydroxid, regenerating alkali aluminate, which is employed for further operation, leaving the fibers clean and bleached, and which, after drying, are in condition for mechanical treatment and manufacture into textile articles.

It can be seen by the foregoing description that my process consists in chemically transforming the binding substances of the fibers into soluble compounds without injuring the fiber and parting the individual fibers by increase in bulk of chemicals within the pores



between the fibers, such as the decomposition of sodium aluminate by the action of sulfur dioxide, producing alkali sulfite by the absorption of the sulfur dioxide and the liberation of aluminium oxide, which immediately absorbs moisture, producing aluminium hydroxide, both compounds of which are considerably increased in bulk by the reaction, and it can also be seen that simultaneously with this process of disintegration of the binding constituents of fibers and the separation of the same from each other that they become bleached by the action of one of the fiber-rending ingredients—viz., the sulfurous content—by which means the fibers are liberated, separated, and bleached in practically one operation.

The reaction which takes place may be illustrated by the following chemical formula or equation:



In cases where an excess of sulfur dioxide is employed it is obvious that a part, if not all, of the aluminium hydroxide,  $\text{Al}_2(\text{OH})_6$ , will be converted into aluminium sulfite,  $\text{Al}_2(\text{SO}_3)_3$ , which, together with the sodium sulfite,  $\text{Na}_2\text{SO}_3$ , in the presence of air and moisture will be converted into aluminium-sodium sulfate or soda alum, which absorbs a large portion of water of crystallization in its formation and is designated by the following chemical formula:  $\text{Al}_2\text{Na}_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$ , a solid crystalline substance of much larger bulk than the original aluminate exposed to the action of sulfur dioxide, water, and oxygen of the air, the utility of which when formed by chemical action within the pores between the fibers for the purpose of lifting, parting, and separating the fibers from each other is clearly obvious.

It is obvious that other salts or compounds capable of increasing in bulk by chemical combination or transformation by the action of bleaching agents, and which chemical compounds have the property of transforming the binding substances of fibers into soluble substances without injuring the fiber *per se* may be employed without departing from the spirit of my invention, which consists substantially in liberation and separation of fibers from their binding constituents by the action of chemical compounds, the increase in bulk whereof when introduced into the pores between the fibers lift and part the same without injury to the fiber by the action of a bleaching and combining agent.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process of liberating, separating and bleaching fibers which consists in saturating the combined fibers with a chemical compound capable of transforming the binding constitu-

ents into soluble substances, and separating the fibers from each other by increasing the bulk of chemicals in the pores between the fibers by the action of a chemical agent capable of simultaneously bleaching the fiber.

2. The process of liberating, separating and bleaching fibers which consists in saturating the material containing the combined fibers with a compound capable of decomposing the binding substances of the fibers and increasing in bulk when exposed to action of sulfur dioxide and exposing the material so saturated to the action of sulfur dioxide producing a product of increased bulk whereby the fibers are separated from each other and bleached by the formation and expansion of chemical salts within the pores between the fibers by action of the sulfur dioxide.

3. The process of liberating, separating and bleaching fibers which consists in saturating the material containing the combined fibers with a solution of chemicals capable of decomposing the binding substances by digesting therein, removing the saturated material from the chemical bath and exposing it to the action of sulfur dioxide capable of uniting with the chemical contained therein, producing a product of increased bulk and bleaching the fiber and finally washing and removing the compounds thus formed therefrom, substantially as described.

4. The process of liberating, separating and bleaching fibers which consists in saturating the combined fibers with an alkali aluminate and exposing it to the action of water and sulfur dioxide.

5. The process of liberating, separating and bleaching fibers which consists in saturating the combined fibers with sodium aluminate and exposing it to the action of sulfur dioxide and water.

6. In the process of liberating, separating and bleaching fiber, the step of separating them from each other which consists in increasing the bulk of chemicals within the pores between the fibers by the absorption, combination or reaction with a substance capable of simultaneously bleaching the fiber supplied thereto after saturation therewith, substantially as described.

7. The process of liberating, separating and bleaching fibers which consists in decomposing the binding constituents of the fibers by chemical action and separating the fibers from each other by producing solid compounds of increased bulk within the pores between the fibers by transformation of the chemical content by action of sulfur dioxide.

8. The process of liberating, separating and bleaching fibers which consists in saturating the combined fibers with an aluminate and exposing it to the action of water and sulfur dioxide.

9. The process of liberating, separating and  
bleaching fibers which consists in saturating  
the combined fibers with a substance capable  
of absorbing or combining with sulfur dioxid  
5 with increase in bulk and exposing such satu-  
rated fibrous material to the action of sulfur  
dioxid.

In testimony whereof I affix my signature in  
presence of two witnesses.

HENRY SPENCER BLACKMORE.

Witnesses:

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