

# UNITED STATES PATENT OFFICE.

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## PROCESS OF BLEACHING VEGETABLE TISSUES.

SPECIFICATION forming part of Letters Patent No. 303,065, dated August 5, 1884.

Application filed December 11, 1883. (No specimens.)

*To all whom it may concern:*

Be it known that I, JOHN A. SOUTHMAYD, a citizen of the United States, residing in Elizabeth, Union county, New Jersey, have invented certain new and useful Improvements in Processes of Bleaching Vegetable Tissues, fully described and represented in the following specification.

This invention consists, first, in the combination, with permanganate of potash for decomposing the coloring-matter, of oxalic acid and sulphite of sodium for removing the previous agent and the coloring-matter from the tissues; and, also, in the combination of chlorine with the acid and sulphite of sodium in treating certain fibers.

Heretofore the processes of bleaching with permanganates have been deficient in two important respects—namely, that the agents used to discharge them from the tissues required to be used in a concentrated and injurious form, or the tissues required repeated treatment with the various agents to effect such bleaching as was desired. In either case the expense of such processes deprived them of their practical value, and in all cases the tissues regained a considerable part of the discharged color upon exposure to the air, and especially if affected by heat, as in calendering processes. Such processes could therefore be used only in the production of light-brown fibers, while my invention is intended to produce permanently white tissues by the substitution of the oxalic acid mixed with sulphite of sodium for the discharging agents heretofore used.

This invention is intended as a substitute for the bleaching processes usually practiced in pulp-grinding engines, wherein from five to ten hundred pounds of pulp are acted on at once, and a period of eight to twelve hours is consumed in working the pulp through the bleaching-liquor. In mills of large capacity from ten to twenty such engines, using from seventy-five to one hundred and fifty horse-power, are employed all the time in bleaching and washing the pulp, it being absolutely necessary to remove every trace of the chlorine to prevent yellowness in the product. In my invention any required amount of the stock can be bleached at one time in a single vessel, the chemicals acting in a much more rapid manner than does chlorine, and a charge of

five tons may therefore be bleached and washed in about five hours. The same amount operated upon in the ordinary pulping-engines would require the continuous use of thirty such engines for over twenty-four hours and the consumption of one hundred and fifty horse-power during the whole of such time. My invention, therefore, saves the space occupied by all this machinery, the power required to operate it, and four-fifths of all the time now consumed by its use.

The material to be bleached may first be treated with caustic potash to soften and prepare the tissues for the action of the permanganate of potash, and such treatment is best effected in a close boiler, where the heat and pressure of steam may be used to facilitate the mechanical and chemical action of opening the fibers. The permanganate attacks and decomposes the coloring-matter, but does not remove it, such matter being subsequently removed by the use of the oxalic acid and sulphite of sodium.

I will first describe the application of the process to the bleaching of hard spruce, and then state the modifications employed with other fibers. The first stage of the process consists in boiling the fibrous matter or tissue with a solution of permanganate of potash, in the proportion of ten to fifteen pounds of the agent to one ton of the fiber, until the same appears to be thoroughly oxidized, the operation requiring from one to two hours if performed in a closed vessel under steam-pressure, but a rather longer time if boiled in an open vessel. The application of heat in this stage of the process is essential to produce the required effect; but the subsequent treatment may be performed in a closed or open vessel without heat, as may be most convenient. When the fiber is properly affected by the permanganate, I treat it with a solution of oxalic acid and sulphite of sodium, which effects the bleaching in about two hours by the decomposition of the permanganate and coloring-matter. With certain kinds of tissues this treatment suffices to discharge all the color; but in cases where the fiber, owing to its place of growth and the presence of certain salt in its texture, is not wholly bleached by such treatment, I prepare this acid and sulphite with the addition of a small amount of chlo-



rine, thus securing a totally different action with the chlorine from that produced by either the acid or chlorine alone. For a ton of such fiber, the acid solution is prepared by dissolving from forty to sixty pounds of the acid and fifteen to twenty-five pounds of sulphite of sodium in two hundred gallons of water, and the fiber is preferably boiled in such solution to produce the desired effect, although the same results can be obtained by using the acid without heat, if a longer time be allowed for its action. As the spruce fiber is very difficult to bleach, other tissues can be whitened in a shorter time and with a smaller proportion of the agents employed.

The advantage of my invention consists in its cheapness, owing to the small quantity of the agents required, and in the perfect results secured in the treatment of crude fibers, which by my process may in a single operation be bleached ready for use in preparing perfectly-white paper. As stated above, the effect of the permanganate can be best secured by the agency of heat; but the subsequent treatment may be performed either hot or cold, as the operator may have less or more time for the operation. In any case the saving of time is very great by the use of the process I have devised, for the reason that the ordinary chlorine bleaches usually require a great deal of time, both in the application and action of the agent itself and in the tedious washings required to prevent the fibers from turning yellow, as is the case if the chlorine is not effectually removed from the tissues. The economy of my process therefore consists largely in the reduction of time effected and the great increase of capacity thereby added to the vessels or tanks already employed with other agents.

I am fully aware that the chlorine has been used in various combinations, but find that its effect, when combined directly with the acid and sulphite-of-sodium solution, is totally different from that otherwise obtained, as the three agents effect, with one-sixth the amount of chlorine otherwise used, a perfect removal of the coloring-matter already combined with the permanganate of potash. Thus, a chlorine bath of over 1° Baumé would be required, if used alone to effect the bleaching, and a tedious process of soaking and washing to remove the chlorine in the end, while my process usually effects the same results in a greatly diminished time without the use of chlorine, or with one-sixth the amount of chlorine in the case of certain tissues, as spruce fibers. The chlorine thus used is entirely removed from the tissues when washed to remove the oxalic acid and sulphite of sodium, the three agents being removed together in a very short time, and the chlorine appearing to lose its distinctive injurious properties when thus combined.

In treating manufactured fibers, as rags, I find that, owing to the twisting of the threads and the variety of thicknesses, textures, and

colors which I subject to treatment at one time, I am compelled to use nearly the same amount of chemicals as for hard crude fibers; but with soft grasses and soft woods like poplar I use only from seven to twelve pounds of permanganate, twenty-five to thirty-five pounds of acid, and seven to twelve pounds of the sulphite of sodium for each ton of the tissues. I also find in practice that it requires about sixteen hundred gallons of water to soak a ton of spruce fiber, and the preparatory boiling with potash, which prepares the fibers so peculiarly for the action of the permanganate, therefore requires that amount of water. When the alkali is drawn off before the bleaching operation, the bleaching agents are then applied with the water in which they are dissolved, and enough water is added to boil the charge thoroughly.

I am also aware that the permanganate of potash has been used heretofore in bleaching processes, but not in combination with the discharging agents I employ, nor with the closed boiler, which prevents the dissipation of the active agents, as when boiled in the open air, the most volatile elements being the most valuable in the bleaching process.

I claim—

1. The process of bleaching vegetable tissues, which consists, first, in treating the same with permanganate of potash to destroy the coloring-matter, and, second, in neutralizing and removing the same by the application of oxalic acid and sulphite of sodium, substantially in the manner herein shown and described.

2. The process of bleaching vegetable tissues, which consists, first, in treating the same with permanganate of potash to destroy the coloring-matter; secondly, in neutralizing and removing the same by the application of oxalic acid, sulphite of sodium, and chlorine, substantially as described; and, thirdly, in washing out the chlorine and discharging agents, substantially as herein set forth.

3. The process of bleaching vegetable tissues, which consists, first, in boiling the same with potash under pressure in a closed boiler; second, in removing the alkaline liquor and boiling under pressure in the same vessel with permanganate of potash; third, in boiling the same with oxalic acid and sulphite of sodium, substantially in the manner set forth.

4. The process of bleaching vegetable tissues, consisting, first, in treating the same with permanganate of potash; and, second, in applying a mixture of oxalic acid, sulphite of sodium, and chlorine, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN A. SOUTHMAYD.

Witnesses:

C. C. HERRICK,  
THOS. S. CRANE.