

UNITED STATES PATENT OFFICE.

GEORGE B. WALKER, OF LONDON, ENGLAND.

TREATMENT OF YUCCA OR SOTAL FIBER FOR THE PRODUCTION OF PAPER PULP OR STOCK, AND OBTAINING BY-PRODUCTS THEREFROM.

SPECIFICATION forming part of Letters Patent No. 310,753, dated January 13, 1885.

Application filed May 23, 1884. (No specimens.)

To all whom it may concern:

Be it known that I, GEORGE BOULDING WALKER, a citizen of the United States, residing at the city of London, England, have invented certain new and useful Improvements in the Treatment of the Yucca or Sotal Fiber for the Production of Paper Pulp or Stock, and in Obtaining By-Products therefrom, of which the following is a specification.

My invention consists of certain improvements in the treatment of the fiber of the *Yucca draconis*, or *Yucca puberula*, or *Yucca breifolia*, or Sotal tree, so as to produce a pulp or paper-stock of a finer quality than heretofore, and, the agents employed being native products drawn from the immediate locality (California) where the fiber is grown, with increased economy. The yucca wood or plant, having been unbarked, shredded, or torn up, so as to be in the condition resembling tow, by suitable and known machinery, in any suitable manner, is brought into tanks provided with perforated double bottoms; water containing common salt or waste solutions, resulting from a subsequent part of the process, is run onto the mass, so as to cover the mass, which is then weighted down and allowed to remain in contact with the same for several days; but if the temperature is raised to about 100° Fahrenheit by means of steam this part of the process will be accelerated.

To facilitate the next operation, I prefer to pass the longer portions of fiber through a straw-chopper before the material is treated in the aforesaid tanks, so that the main portion of the fiber under treatment should not exceed one inch in length. The material is now removed from the tanks and brought under a system of trituration or further opening up of the fiber by means of a grinding or trituration contrivance. This may consist of a fiber-opener (*defibreur*) or a pan-mill, consisting of broad grooved or ribbed granite runners working upon a grooved or ribbed bed-plate of granite or horizontal stones working under a flow of water, with a discharge trough or spout provided with a sieve for preventing fibers of a coarser nature from passing through than desired; or I allow the mass as it passes from under the stones to run onto a "sorting-machine," such as is used in wood-pulp mills, or

a "knotter," which will separate the coarse from the fine fiber. The coarse part is of course put back into the mill or apparatus to be reworked. This perfected method of opening up and disintegrating the fiber renders the subsequent chemical treatment more simple and effectual. The fiber brought into this state is now subjected to a species of digestion with a strong solution of borax prepared from the native borax mineral or earth occurring in the locality where the yucca is indigenous. This may be done simply in vats or tanks provided with stirrers or agitators and steam-coils with condensing contrivance, as is well known. The mass of fiber is steamed in contact with the solution of borax, which should be about 12° Baumé, for two or three hours. The borax-liquor is then drained off from the fiber, and sulphurous-acid gas or vapor introduced by means of perforated inlet pipes or coils, the tanks or vessels being covered during this part of the process, and remaining covered for an hour, (more or less,) while the sulphurous gas is being thus introduced. The fumes from five parts (more or less) of sulphur to one hundred parts of dry fiber, by weight, will be sufficient. Water is now run in sufficient to float the fiber, and the stirrers are set in motion, so as to wash out the combinations formed and left secreted in the fiber. This may be done in about half an hour. The waste liquor thus obtained is, by preference, used as a steep-liquor for the first part of the process—viz., the digestion in the tanks. The borax-liquor run off is then treated for borax, the liquor being first filtered through a bed of animal charcoal to remove the coloring-matter, and afterward boiled down and crystallized in the ordinary way. By this means a cheap and valuable agent in the treatment of the fiber is secured, as I am refining the crude borax of the country at the same time that I am treating fiber.

In the production of sulphurous acid I employ the crude sulphur of the country, either in the form of native sulphur or of pyrites, in the ordinary manner, with the precaution of passing the gas or fumes through a washer containing water to which sulphite of soda has been added, or milk of lime, so as to neutralize or eliminate any sulphuric acid which

may form. The sulphurous acid may also be made by fusing together the crude sulphur hereinbefore mentioned and sulphate of iron in a retort, when sulphide of iron will be formed and sulphurous acid given off. The sulphide of iron is used over again for the fresh formation of sulphate of iron, and so on continuously. I also form sulphurous acid by passing the fumes of burning sulphur or pyrites through a tower filled with vegetable charcoal, sawdust, pith from the yucca, or such like material arranged on the principle of the scrubber of gas-works. The sulphurous acid thus absorbed in the before-mentioned material may be easily driven off for use from a retort, and may be employed without washing, if required.

I wish it to be understood that I do not confine myself solely to the use of gaseous sulphurous acid, but also use it where found necessary or convenient, in a condensed or liquid form, in connection with other solutions.

For commoner descriptions of paper the borax solution may be dispensed with, and I use simply a digestion with sulphurous acid, by allowing the moist fiber to absorb a larger quantity of the acid gas than previously stated, or about equal to the gas to be evolved from ten parts (more or less) of sulphur to one hundred parts, dry weight, of fiber under treatment, and steamed in the same for about four hours in a closed or covered vessel. The liquor formed is run off and used as a steeping solution. The fiber is then washed in a warm weak solution of carbonate of soda, to prepare it for bleaching and for softening the fiber. This liquor may also be used in the steeping operation. In either case the material is now ready for bleaching, which may be effected in the ordinary manner, or by any

known or convenient means; but I prefer for high-class paper to bleach with hypochlorite of magnesia, instead of hypochlorite of lime, the former being less injurious to the fiber, and imparting a brighter color.

I claim—

1. The method of preparing paper pulp or stock from yucca fiber, consisting in treating the fiber, after it has been rendered into a condition resembling tow, by steeping it in waste acid sulphite liquors, then opening the fiber, and then digesting it in a closed vessel by means of sulphurous acid while being agitated, substantially as set forth.

2. The method of preparing paper pulp or stock from yucca fiber, consisting in treating the fiber, after it has been rendered into a condition of tow, in the manner described, by steeping it in waste acid sulphite liquors, then opening the fiber, and then digesting it in a closed vessel by means of borax-liquor and sulphurous acid while being agitated, and then washing in a weak carbonate-of-soda solution, substantially as set forth.

3. In the method of preparing paper pulp or stock from yucca fiber, the method of treating the fiber by means of a solution of crude or native borax, in combination with sulphurous acid, substantially as set forth.

4. In the method of preparing paper pulp or stock from yucca fiber, the method of treating the fiber by means of waste acid sulphite liquors from a previous operation, substantially as set forth.

London, April 29, 1884.

GEO. B. WALKER.

Witnesses:

W. J. NORWOOD,

J. WAIT,

Both of 17 Gracechurch St., London, E. C.