UNITED STATES PATENT OFFICE.

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MANUFACTURE OF WOOD-PULP FOR PAPER.

SPECIFICATION forming part of Letters Patent No. 227,464, dated May 11, 1880.

Application filed April 7, 1880. (No model.)

To all whom it may concern:

Be it known that we, GEO. F. WILSON, of East Providence, Rhode Island, and PHILIP O'REILLY, of Providence, same State, have invented a new and useful Improvement in Manufacture of Wood-Pulp for Paper, which improvement is fully set forth in the following specification.

The object of the invention is to provide an efficient and inexpensive method of treating the wood of a tree which grows in the southwestern part of California, (and perhaps elsewhere,) about one hundred miles southwesterly of Los Angeles, and botanically known as the "*Yucca draconis*," or *in vulgaris*, "sage-wood tree," so as to convert it into white paper-pulp for the manufacture of white paper, for which we have found it to be especially suitable. A great many attempts have been made to accomplish this result, but they have not satisfactorily succeeded for one reason or another.

We have found that the wood of the body of the tree holds, in addition to albumen, a considerable quantity of salts of lime, magnesia, and soda, and that before it can be cheaply, practically, and profitably subjected to the usual cleansing and bleaching processes these lime, magnesian, and other salts and the albumen must be removed.

The following is a description of the method or process which we preferably adopt, and it will enable those skilled in the art to make and use our invention.

It is preferred to use the wood in an unseasoned condition, for reasons apparent to any person accustomed to chemical processes. The wood is preferably cut into thin pieces at an angle of forty-five degrees (more or less) with the longitudinal center of the bole or trunk of the tree by any machine adapted to the purpose, and then these chips are broken into finer pieces by means of a suitable picker. The picker employed is what is well known under that name, the one especially adapted being that for tearing flax-tow, as it is armed with strong teeth which are able to tear the fibers apart. These operations prepare the wood for the subsequent chemical treatment.

The prepared wood is steeped for several days, say seven, in any suitable vat, in water sufficient to saturate the wood—for one thousand pounds of dry and picked wood about one thousand gallons of water, more or less, at a temperature not exceeding 175° Fahrenheit—and until acetic or other organic acids are formed. These acids will decompose the earthy salts above referred to and liberate carbonic-acid and sulphurous-acid gases, and the albuminoid compounds will at the same time be broken down. We have sometimes hastened these results by the introduction of fermentive yeasts.

After this result has been attained, the wood is washed in water at ordinary temperatures in a suitable apparatus from thirty minutes to an hour, more or less, as may be required, and then boiled for five hours under atmospheric pressure in a solution of seventy pounds of commercial caustic alkali in one thousand gallons of water, in order to remove the silicates which are not taken away by the fermentive process described above.

The wood fiber is again washed thoroughly to remove the silicate of soda formed by last operation. The pulpy mass, which condition the wood has now assumed, is subjected for three hours, or thereabout, to the action of a weak muriatic-acid bath composed of commercial muriatic (hydrochloric) acid and water in the proper proportion of forty pounds of the former to six hundred gallons of the latter, or thereabout. From this bath the fiber goes into a weak solution formed of sixty-five pounds (more or less) chloride of lime in one hundred and thirty gallons of water; and then, after the desired white color has been obtained, say in three hours, it is subjected to the action of a dechlorinating agent—say fifteen pounds of antichlorine or sulphite of lime in six hundred gallons of water—for two hours, to remove the chlorine and prevent its injurious effect upon the fiber. This is now subjected to the action of a hydro-extractor to remove the greater portion of the water contained in the pulp, dried, and made ready for packing and shipment.

The proportions and strength of materials and the time of action may be varied without departing from the spirit of this invention.

The fiber of the *Yucca* tree has marked pe-

culiarities, which enable one skilled in the art to distinguish readily the pulp made from it from that made of other fiber. The pulp heretofore made from the *Yucca* has been brown or of dark color, and unsuited to the manufacture of white paper, to which the fiber itself is otherwise eminently adapted.

By this invention the pulp is made pure white, and the bleached pulp constitutes a new article of manufacture.

We do not desire, however, to be understood as asserting that the fiber of the *Yucca draconis* has not been or cannot be made white by processes known and used before our invention; but in such operation the strength of the fiber is destroyed, rendering it unsuited for paper-pulp, and the effects of the treatment on the fiber would be apparent to an expert.

In the product obtained as hereinbefore set forth the strength and integrity or paper-making qualities of the fiber are preserved at the same time that the interstitial matter and color are removed.

We would also observe that in preparing hemp or flax it has been proposed, as a substitute for the ordinary retting, to subject the stalks to the action of water mixed with a small quantity of vinegar or acid at 90° Fahrenheit for forty or fifty hours, in order to induce fermentation; but while this process has a similarity to the fermenting operation in this invention, yet the true conditions required to practically effect the desired fermentation in the fiber of the *Yucca draconis*, owing to the difference in character between it and the flax or hemp, are different from what is above indicated, and were obtained only as the result of persistent experiment.

Having thus fully described our said invention, and the manner in which the same is or may be carried into effect, what we claim, and desire to secure by Letters Patent, is—

1. The method of preparing the *Yucca* or other wood containing albumen and earthy salts in considerable quantities for making paper-pulp, consisting in first removing the albumen and earthy salts and then bleaching the fiber, substantially as described.

2. In the preparation of pulp from the *Yucca*, the method of effecting the removal of the contained albumen and earthy salts by inducing fermentation in the pores of the wood, so as to decompose the earthy salts and break down the albumen compounds, substantially as set forth.

3. The process of making pulp from the *Yucca* or other wood by inducing fermentation in the pores of the wood, washing, treating with alkali, washing, and bleaching, substantially as described.

4. Bleached paper-pulp from the fiber of *Yucca* or sage-wood tree from which the albumen and alkaline and earthy salts have been removed before the bleaching is effected, the said pulp being distinguished from the pulp heretofore made from said fiber by the whiteness, purity, or absence of interstitial matter, strength, and integrity of the fiber, substantially as described.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

GEO. F. WILSON.
PHILIP O'REILLY.

Witnesses:
CHARLES GREENE,
AUGUSTUS S. MILLER.