United States Patent Office

CHARLES HEATON, OF NEW YORK, N. Y.

Letters Patent No. 66,338, *dated July* 2, 1867.

IMPROVED MODE OF TREATING BAMBOO, CANE, AND OTHER FIBROUS PLANTS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, CHARLES HEATON, of the city, county, and State of New York, have discovered a new and improved Method of Treating Crude Vegetable Fibrous Productions; and I do hereby declare that the following is a full, clear, and exact description of the same.

In the reduction of such vegetable fibrous materials as bamboo, cane, straw, corn stalks, sorghum, basswood, and pine, where the material is to be reduced from its natural or undisintegrated state, I have found that the application of a caustic alkaline solution, (KO. HO or Na O. HO,) either hot or cold, produces among others the following results: The alkaline solution, which is more or less transparent when first applied to any of the above-mentioned materials, becomes after a time more or less opaque and dark-colored, depending on the nature of the crude fibre to which it is applied, and also on the amount of heat which may be used. If the material under treatment is first subjected to heat, and then to a caustic alkaline solution cold, or of a less temperature than the heat first applied, as described in my patent of August 1, 1865, No. 49,106, the alkaline solution becomes dark-colored and opaque within two or three hours after application. But if the material to be disintegrated is not subjected to heat, but simply placed in a cold solution of caustic alkali, I find it takes more time for the material to be permeated by the solution and to become soft enough for mechanical disintegration, and also that the alkaline solution does not become so dark or opaque, but if the material to be disintegrated be subjected to great heat or pressure and caustic alkali combined I find it is disintegrated to a pulp, and that the alkaline solution becomes very dark and opaque, in fact of a pitchy or sticky nature. I have discovered that this darkness or opacity of the alkaline solution is caused by the resinous portions of the gum being dissolved or taken up and suspended in the solution, and the greater the quantity or quality of heat applied the greater the quantity of resinous matter taken up, the softer the fibre, and the less the yield from a given quantity of crude material. Partially disintegrated fibrous matter, such as manilla rope, new or old, gives the same result when treated with caustic alkaline solutions. It is usual, and I believe has always been considered necessary, to remove this dark-colored solution from the fibrous matter by washing, and in the manufacture of paper it is always washed out, such washing necessitating a waste of more or less fibre, besides taking time and labor. My invention is designed to save such washing and at the same time to utilize the aforesaid resinous portions of the material instead of removing and wasting them.

To enable those skilled in the art to make use of my invention or discovery, I will describe my method of proceeding with bamboo, first remarking that the same is applicable to all crude or partially disintegrated fibrous materials, subject only to such modifications as are well understood by those skilled in the art.

In the manufacture of paper from bamboo, I first soften and prepare the crude material for mechanical disintegration by subjecting it to the action of a caustic alkaline solution, as described in my patents of previous dates. After the material has become soft and ready for reduction to pulp, and before removing it from the vessel in which it has been treated, I apply a concentrated solution of alum, the proportion which I prefer to use being about two hundred pounds of alum ($Al_2 O_3 3SO_3 + KO\ SO_3 + 24HO$, or $Al_2 O_3 3SO_3 \times Na\ O\ SO_3 \times 24\ HO$,) usually called "potash" or "soda alum." Chlorohydric (HCl.) or sulphuric (SO_3) acid will do, but I prefer to use alum, as before stated. The alum so used will be found to precipitate that portion of the gum which gives or causes the opacity in the solution, and to leave the solution perfectly clear and transparent as it was first applied when this precipitation has taken place. I drain off the solution from the fibrous matter and transfer the fibrous matter to the "rag engine," well known in paper-mills, and used for washing and beating or reducing fibrous matter to pulp. I reduce the softened material in this engine in the usual manner, except that I do not wash it or size it. In the manufacture of paper from bamboo, which I am now carrying on at Rhinebeck, New York, I proceed as follows: First, I place the bamboo in its crude state, only split up, into a tank with two hundred and fifty pounds of caustic soda or potash to a ton, and enough water to cover it. This done, I apply heat through the medium of steam to accelerate the softening of the material. When it is soft, which is in about twenty-four hours after applying the steam, I drain off the dark opaque solution and precipitate the gums by a solution of alum, as before described. I transfer the soft material to the "rag or beating engine," and, with enough water to float it, beat it to pulp. I do not wash it, simply beat it in the same water. After beating it for an hour the fibrous matter is moderately uniform pulp, and the water in which it has been beaten is of a

dark color, and quite opaque. At this stage I add from six to ten pounds of alum, or enough to precipitate the gum in solution into the pulp, and in from ten minutes to a quarter of an hour I find the water in the engine has become clear and transparent, the gums that were in solution or suspension being precipitated into the pulp, where they remain to substitute the use of resin or other matter for sizing. And after beating the material to pulp, and running it over the paper machine into paper, I find that the gum so precipitated is not only so much gain to the weight of paper from a given quantity of crude material, but also that the paper is more uniformly and better sized than it would have been by any other method. In the manufacture of white paper I proceed in the same way, except that after I have applied the alum and rendered the solution clear by precipitation, I wash the material to free it from the trace of chemicals in the water, and then bleach the fibre and precipitated gum in the ordinary manner.

The advantage of my discovery is that I save the cost and trouble of applying an artificial sizing, as well as that I increase the yield of paper from a given quantity of raw material, while it takes no more alum or acid to precipitate the gum and thus form a sizing than it would do were I to wash out and waste these gums and then apply an artificial sizing and alum or acid to "set" or precipitate that sizing.

I do not claim the use of alum or acid broadly as a precipitator, for I know that it is used for that purpose, but heretofore acids have only been used in paper-making to precipitate foreign or extraneous matters, such as size or color, which have been added to the pulp after it has been washed and prepared for it, whereas I use alum or acid for precipitating that portion of the gum which discolors the chemical solution, thereby rendering the customary washing unnecessary, saving the waste of fibre attendant on such washing, and utilizing that which has heretofore been wasted.

I do not limit myself to any kind of acid, or to any particular time or way of applying it, but I claim as new, and as my invention, which I desire to secure by Letters Patent of the United States—

1. Saving and utilizing the resinous and other soluble portions of vegetable fibrous matter, which are usually washed out and wasted, in the manner set forth.

2. The employment of alum or acid in paper-making, whenever the same is so applied as to precipitate that portion of the gum which is now washed out and wasted.

3. In the disintegration of vegetable fibrous matter, when an alkaline solution has been used and become discolored or opaque, or partially so, I claim the employment of alum for precipitating the suspended matter or clarifying the solution, as herein set forth.

CHAS. HEATON.

Witnesses:

A. LE CLERC,

J. URQUHART.