UNITED STATES PATENT OFFICE.

CHARLES B. CARTER, OF LAWRENCE, MASSACHUSETTS.

IMPROVEMENT IN PROCESSES FOR MAKING WOOD PULP.

Specification forming part of Letters Patent No. **219,566,** dated September 16, 1879; application filed August 11, 1879.

To all whom it may concern:

Be it known that I, CHARLES B. CARTER, of Lawrence, county of Essex, and State of Massachusetts, have invented new and useful Improvements in Processes for Making Wood Pulp, of which the following is a specification.

My invention relates to processes for reducing wood to pulp without grinding it, and is in the nature of an improvement upon my patent of May 27, 1879, No. 215,880, to which reference may be had; and it consists in subjecting the wood to certain preparatory processes previous to disintegration by boiling in caustic lye, which serve to render the wood more sensitive to the action of said caustic liquor than it otherwise would be, and to such a degree that the fibers of the wood are easily separable by simply boiling the wood in an open vessel, instead of under steam-pressure in rotaries, as is usually practiced.

I have discovered that wood in its natural state, charged with gums and acids, possesses repellent elements which oppose the disintegrating action of caustic liquor upon its fibers, such wood requiring to be boiled under a high steam-pressure for from fourteen to thirty-six hours, and in caustic liquor of about 16° strength, in order to separate its fibers, and even under the aforesaid severe treatment the result is fraught with uncertainty, for the charges of a rotary have oftentimes to be reboiled before they become reduced to a pulp.

As a result of the aforesaid treatment of the wood, the fiber thereof is found to be more or less injured, its strength being impaired and a shorter fiber being produced.

It is obvious that the production of wood pulp under the above-named conditions demands a heavy outlay for apparatus, and is fraught with more or less danger, as about one hundred pounds pressure of steam per square inch is carried in the rotaries while boiling the wood.

My improved process, as hereinafter set forth, obviates the expense, (to a considerable extent,) inconvenience, damage to the fiber, &c., attendant upon the old one, besides effecting quite a saving in expenditure for caustic liquor; and, in addition to the above, I save the natural acids and gums of the wood in the form of pyroligneous acid, and this latter product is nearly of the value of the wood and the cost of labor in extracting.

In practicing my said process, I first place the wood in suitable retorts, and subject it to a distilling process, by which the natural acids and gums of the wood are driven off. These I condense in the usual manner, saving the same in the form of pyroligneous acid for commercial purposes.

In practicing this branch of my process, it is easy for a person skilled in the art of distilling woods to so regulate the heat which is applied to the retorts containing the wood, governed by the appearance of the condensed product of distillation coming therefrom, as to prevent any danger of injury to the wood by overheating the retorts. Furthermore, the wood fiber does not undergo any perceptible alteration at temperatures lower than 500° Fahrenheit, while turpentine-oil separates from the wood acids at about 430° Fahrenheit, and the acids themselves can be distilled at a temperature under 500° Fahrenheit.

I next cut the wood into convenient small pieces and boil it in a weak caustic lye in an open or loosely-covered vessel, employing a lye of about 8° or 9° strength, and boiling it about eight hours.

Under the last-named treatment the wood becomes reduced to a pulp, which is bleached in the ordinary way, and is then fit for use.

By removing the acids and gums from the wood, as above set forth, before boiling it, the strong coloring properties of said acids, &c., are not permitted to act upon the pulped wood to render bleaching more difficult.

In accounting for the above-named advantages resulting from the employment of my improved process, it should be observed that the wood of the spruce-tree, (*Abies nigra*,)—a kind commonly used for making pulp—consists in its natural state (abstracting the water from it) of cellulose, (fiber,) ninety-two per cent.; pitch, six per cent.; albumen and salts, two per cent.

The pitch consists, in variable proportions, of turpentine-oil, sylvic acid, pinic acid, (pimaric acid.)

As turpentine-oil itself is with difficulty dissolved in caustic lye, and still more so if in combination with the above-named acids, it is

evident that wood impregnated with those substances will resist for a long time the action of said lye upon it.

By abstracting from the wood the above-named acids, gums, &c., as above set forth, nothing remains in it of a nature to neutralize the effect of the caustic lye upon it to disintegrate its fibers.

In the nature of the resinous acids and the turpentine-oil above named, and of the caustic lye, when all are brought into combination in a steam-rotary filled with wood in its natural state, is found an evident solution for the necessity above named for reboiling the charges—viz., the said combination forms a kind of soap, and may, to the extent of 6° or 7°, weaken the strength of the lye; but by discharging the first liquor, impregnated more or less with said extracts from the wood, and by submitting the wood to the action of fresh lye a second time, its disintegration is finally accomplished.

Some other woods than spruce—poplar, for instance—contain more pitch or tar than the former, and hence more elements of resistance to the action of caustic lye.

What I claim as my invention is—

1. The hereinbefore-described improvement in the art of making wood pulp, which consists in extracting from the wood, by distillation, its natural gums and acids, and in subsequently boiling it in a solution of caustic lye in an open or covered vessel, substantially as set forth.

2. The hereinbefore-described improvement in the art of making wood pulp, which consists in extracting from the wood its natural gums and acids previous to treating it with caustic lye to disintegrate its fibers, substantially as set forth.

CHARLES B. CARTER.

In presence of—

WM. H. CHAPIN,

H. A. CHAPIN.