# UNITED STATES PATENT OFFICE.

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## TREATING VEGETABLE SUBSTANCES FOR MAKING PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 322,882, dated July 21, 1885.

Application filed March 6, 1885. (No specimens.) Patented in England November 8, 1884, No. 14,735, and November 14, 1884, No. 14,988, and in Canada April 29, 1885, No. 21,563.

*To all whom it may concern:*

Be it known that we, THOMAS GRAHAM YOUNG, of Durris, and JOHN PETTIGREW, of Dinside, both in the county of Kincardine, Scotland, and subjects of the Queen of Great Britain and Ireland, have invented certain Improvements in Treating Vegetable Substances in Order to Obtain Pulp for Making Paper and other Useful Applications, (for which we have applied for patents in Great Britain, dated November 8, 1884, No. 14,735, and dated November 14, 1884, No. 14,988,) of which the following is a specification.

The invention relates to the treatment of wood, esparto grass, straw, and other vegetable substances which are capable of yielding fibers suitable for making paper and for other useful applications, and the object is to remove the resinous or other matters associated with the fibers by means of new and advantageous processes.

In carrying out the invention, nitric acid or nitrous acid is used for the purpose in view, and the materials are subsequently treated with an alkali or alkaline earth or an alkaline salt. The wood or other fibrous material is placed in a suitable vessel or boiler, and a solution of the acid is added in quantity sufficient to cover the wood or other fibrous material. The strength of the solution will require to be varied in different cases, but in treating ordinary pine wood the solution may contain about twenty per centum of acid having a specific gravity of about 1.1. The action of the acid is aided by heat, which may be applied so as to raise the temperature within the vessel or boiler to about the boiling-point of the solution. The vessel or boiler is connected by a pipe or pipes to a condenser in such a way that liquefiable vapors arising from the solution may be condensed and returned to the vessel or boiler. The time during which the boiling should continue will vary with the various vegetable substances treated, about forty minutes being a suitable time for ordinary pine wood, while a shorter time is sufficient for esparto grass.

When the boiling operation is completed, the solution is run off, and adhering acid can be removed by washing or otherwise. The partly-treated fibrous materials are next placed in a suitable vessel or boiler to be treated with an alkali or akaline earth or alkaline salt. As an example, it may be stated that for treating wood a suitable solution contains about five per centum, by weight, of caustic soda for the original weight of the wood. In this alkaline solution the fibrous materials are kept at a boiling temperature, or nearly so, for about thirty minutes under atmospheric pressure, or a higher pressure may be used, in which case less time will be required.

The fibrous materials are reduced to a pulp by the hereinbefore described processes, and may be washed and bleached, and afterward dealt with like ordinary pulp.

The spent soda solution may be treated in the ordinary way for recovering the soda.

The acid used in the first part of the process may be formed in the vessel or boiler by acting on a nitrate or a nitrite with an acid or acid salt, and the presence of small quantities of other acids or of other impurities will not prevent the desired action from taking place.

The gaseous oxides of nitrogen resulting from the oxidizing action on the matters associated with the vegetable substance may be recovered by leading them from the condensers to a tower, in which they are acted on by air and steam.

The acid solution may be used for acting on two or more successive charges of vegetable materials, and when exhausted or much contaminated with foreign matters it may be subjected to distillation, whereby a large portion of the acid may be recovered so as to be usable over again. The residue in the still will contain some oxalic acid and some nitric acid, both of which may be recovered.

What we claim as our invention is—

1. The treatment of vegetable substances capable of yielding fibers suitable for paper-making and other purposes with a solution of nitric or nitrous acid, substantially as and for the purposes hereinbefore described.

2. The combination of the process forming the subject-matter of the preceding claim with the subsequent treatment of the product thereby obtained with a solution of an alkali or alkaline earth or alkaline salt, substantially as hereinbefore described.

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

T. GRAHAM YOUNG.
JOHN PETTIGREW.

Witnesses:
EDMUND HUNT,
D. FERGUSON.