

# UNITED STATES PATENT OFFICE.

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## PROCESS OF MAKING PULP AND PAPER.

1,166,848.

Specification of Letters Patent.

Patented Jan. 4, 1916.

No Drawing.

Application filed January 6, 1915. Serial No. 839.

*To all whom it may concern:*

Be it known that I, ROBERT ATHELSTAN MARR, a citizen of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented certain new and useful Improvements in Processes of Making Pulp and Paper, of which the following is a specification.

The present invention constitutes an improvement upon the process described and claimed in my U. S. Patent 1,046,475, in which process the vegetable materials are boiled with a solution containing zinc chlorid.

In the process constituting the subject matter of the present application, the vegetable material, which may be wood of any suitable variety, such as the oaks, white oak, spruce, pines, loblolly pine, old field pine, hemlock, gums, bowl gum, black gum, cypress, juniper, maples, red maple, laurel, or any other suitable variety of wood or other materials as specified in the prior patent, may be cooked (preferably under pressure) with a solution of zinc sulfate, or zinc sulfate and zinc chlorid, to which a small amount of glycerin or tannic acid, or both, may be added. In operating upon wood, it is ordinarily advantageous to employ pressure during the cooking operation, but this is not so essential with the other organic materials.

A special feature of the invention resides in the fact that the total time may be very short, say three hours or less, from the raw wood to the finished pulp, thereby effecting a great saving in the cost of the plant, since eight or more cooks may be made during each twenty-four hours, instead of one cook, as in the sulfite process and soda process which are now largely employed in this country.

In operating the process, I preferably cut up the wood, by running the same through a chipper or hogger, or otherwise cut the wood into pieces of a convenient size for handling in the digester. It is not necessary to cut the wood into chips as small as are ordinarily used in the soda or sulfite process, but if desired the wood may be cut into blocks two or three inches long, and from one quarter to one half inch in thickness and one to three inches in width, or larger pieces or smaller pieces may be em-

ployed. The wood is then introduced into a digester, which may be of the ordinary type, and to this is added a solution of zinc sulfate of two to four ounces per gallon. The preferred strength of the solution will depend to a certain extent upon the variety of wood treated, on some wood a solution of less than two ounces per gallon has found to be suitable, and on some varieties of wood a solution as strong as four ounces per gallon has found to be too strong and is liable to weaken the fiber. To this solution may be added a small amount of glycerin (the function of which is to maintain the binder soft, so as to make the resulting paper flexible), or a small amount of tannic acid (one ounce per 200 gallons being sufficient). The inclusion of the tannic acid is more or less optional, but it seems to hasten the cooking process. While the amount of solution may vary more or less, I find that about two thirds of a gallon of solution per pound of chips or wood, is a suitable proportion. The wood and solution are then heated, by the introduction of steam or otherwise, until a cooking pressure of 50 to 150 pounds per square inch is obtained. This pressure may be maintained for 1½ to 2½ hours, depending on the strength of solution, variety of wood, etc. With green gum wood, and a 2% solution, and 90 pounds pressure, 1½ hours is a suitable time. At the end of the cooking operation the wood and liquor are blown from the digester, and the liquor drained off, for use with a subsequent batch of chips. To the solution may be added a small amount of zinc sulfate, and water, in order to make up for the loss in handling and the like, and the solution may then be used with another batch of chips. It is not necessary to add more tannic acid to the second and subsequent cookings, since the liquor takes up from the wood, a material which I believe to be pyrogallie acid, which answers the same purpose as the tannic acid.

The chips after separating from the liquor are passed to a pulper or attrition device of any of the usual types, for reducing the same to a pulp. From this the pulp enters the beater and is beaten up in any suitable manner. The pulping of the wood in the pulper, before entering the beater may be omitted if desired, but this saves time in



the beater, and is especially to be recommended in the case of coniferous wood. The pulp so produced may be bleached by any of the usual methods, and various coloring, sizing, or other conditioning agents may be employed. In the beater the pulp may be washed with water, in order to remove a certain amount of a material which appears to be zinc resinate from the pulp, also if desired a suitable amount of rosin size may be added to the pulp. After this it is preferable to add a small amount of aluminum sulfate, alum, or other soluble aluminum salt, in order to precipitate the size upon the separate fibers. In this way I produce a pulp containing a natural size, which may be present to an amount equal to 7½%, although the preferred amount of size will, of course, depend upon the particular use to which the paper is to be put.

The yield is very much higher than with the soda or sulfite processes, since in my process I do not attempt to dissolve the lignone, and similar materials. In using zinc sulfate solution as the digestive agent, I have repeatedly produced on a commercial scale, an amount of dried pulp equal to 88 to 90% of the dry weight of the wood employed.

In a modified form of the process, which is especially suitable for use with the more resistant woods, such as hemlock, spruce and certain others, I may use a solution consisting of 1 to 2 ounces each of zinc sulfate and zinc chlorid, per gallon of water, and to this solution may also be added the glycerin and tannic acid above referred to.

The product of my process is characterized by possessing extremely long fibers, which are very strong. Thus I can produce, from very cheap materials, a very strong, long fibered paper.

What I claim is:—

1. A process of making pulp or paper, which comprises digesting organic materials

containing cellulose, with a solution containing zinc sulfate. 45

2. A process of making pulp or paper, which comprises digesting organic materials containing cellulose, with a solution containing zinc sulfate and zinc chlorid. 50

3. A process of making pulp or paper, which comprises digesting organic materials containing cellulose, with a solution containing zinc sulfate, zinc chlorid, and a small proportion of tannic acid. 55

4. A process of making pulp or paper, which comprises digesting organic materials containing cellulose, with a solution containing zinc sulfate, zinc chlorid, and small amounts of tannic acid and glycerin. 60

5. A process of making pulp or paper, which comprises digesting organic materials containing cellulose, with a solution containing about 2% to 4% of zinc sulfate.

6. A process of making pulp or paper, which comprises digesting organic materials containing cellulose, with a solution containing a mixture of salts of the metal zinc. 65

7. A process of making pulp or paper, which comprises digesting organic materials containing cellulose, with a solution containing zinc sulfate, thereafter pulping the product, and adding a solution of an aluminum compound. 70

8. A process of making pulp or paper, which comprises digesting organic materials containing cellulose, with a solution containing zinc sulfate, under superatmospheric pressure. 75

9. A process which comprises digesting wood with a solution containing zinc sulfate. 80

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT ATHELSTAN MARR.

Witnesses:

A. B. FOSTER,

BENNETT S. JONES.