

UNITED STATES PATENT OFFICE.

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METHOD OF PULPING WOOD.

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This invention relates to a method of pulping wood whereby the resultant pulp has characteristics peculiarly desirable for the production of high grade paper.

5 Particularly is the present invention directed to the control of bulkiness and the ability to be hydrated.

In this process, the wood is subjected to a mild chemical treatment applied in two stages. The first stage effects the removal of organic acids, such as acetic acid from the wood, as well as about thirty per cent of the lignin originally present in the wood. The second stage, which is made after the withdrawal from the wood of unabsorbed chemical solution, is for the purpose of modifying the extent to which the cooked wood may be hydrated in any mechanical beating or grinding engine in use in the paper industry. A completely filled digester avoids corrosion.

In the present process, the wood used is in a condition broken up into chips of the size customarily used in pulp mills and tannin extract plants or obtained in saw mills in the production of hogged saw mill refuse. The chips may be subjected to a preliminary extraction such as the extraction of tannic acid from chestnut wood, before being used for pulp making. The chips of wood are charged into a usual digesting vessel and are subjected to the action of live steam at atmospheric pressure or somewhat greater, though not more than twenty pounds per square inch gauge pressure. The object of the steaming is to remove air from the wood substance. In the case where chips have been treated or extracted with water, the steaming treatment may be omitted, although it is preferable to use it. The period of steaming takes about thirty minutes, and thereafter the chemical treating solution or cooking liquid is admitted to the digester until it is filled. The cooking liquid employed is an aqueous solution containing a normal sulphite and a salt of a weakly ionized polybasic acid. For example, in the pulping of extracted chestnut wood, a residue obtained from tannic extract plants, a chemical treating solution containing 40 grams per litre of sodium sulphite and 15 grams per litre of sodium bicarbonate or sodium carbonate will enable good pulps to be produced.

55 After the digester is filled, it is closed and

live steam is admitted for the purpose of heating its contents. A temperature range of at least 100° C. and not more than 125° C. is used at this stage. Other methods of heating may be used, but not as conveniently as this. During the heating, it may be necessary to discharge a small amount of cooking liquid from the digester in order to allow space for the condensation of the heating steam. When the temperature attains a value between 110° C. and 120° C., a rapid decomposition of the wood substance takes place, with the formation of organic acids, and the solution of about fifteen to twenty per cent of the weight of the wood. In the case of aspen, this decomposition takes place at a temperature between 115° C. and 118° C. The temperature of the digester is raised to around 125° C. and maintained at that point until the contents of the digester are uniformly heated. This usually requires about one hour. The time depends upon the size of the digester, since when large digesters are used, more time is required to obtain the same temperature throughout their contents.

At the end of this period of heating, which constitutes the first stage of chemical treatment, the cooking liquor is removed from the digester, as far as practicable, leaving the partially decomposed wood chips in the digester. These chips contain some absorbed chemical solution, and they are heated to higher temperatures, namely of at least 125° C. and not more than 170° C., preferably by the admission of steam. This second heating constitutes the second stage of the chemical treatment. At this period, by the proper choice of temperature, which has been arrived at by repeated trials, the resulting pulps are caused to have certain desired papermaking properties imparted to them, particularly as regards bulkiness and ability to be hydrated. For instance, if the second stage of heating is performed at 135° C. or thereabouts, a pulp may be produced which can be made into a bulky soft sheet of paper and which shows little tendency to be hydrated in a beater. If the temperature is raised to 155° C. in this heating, a pulp may be obtained which can be hydrated readily to form a hard, dense sheet of paper. It is not necessary to raise the temperature during the second heating to above 170° C. The period of heating may

be from a few minutes to four or six hours in duration. Larger chips require longer periods of heating to secure uniform treatment. At the end of the heating period, the contents of the digester are removed and the pulping of the cooked wood completed by the use of beating or grinding devices.

The cooking liquid removed from the digester at the end of the first stage of chemical treatment, is fortified by the addition of cooking chemical and is used for the treatment of further quantities of wood chips. The cooking liquor therefore contains in addition to the normal sulphite and the salt of a weakly ionized polybasic acid, certain organic compounds of unknown constitution; these substances do not affect adversely the effect of the cooking chemical on the wood, and such cooking liquors may be used any number of times, provided enough cooking chemical be added to them before use. As regards the choice of the chemical salts it is preferable to use sodium sulphite and the sodium salts of weakly ionized polybasic acids as the cooking chemical on grounds of economy.

Attention is directed to the fact that the digester is completely filled with a liquid capable of neutralizing acids during that period when acids in liquid or in vapor form are being liberated from the wood. The liquid is the aqueous solution of a mixture of sodium carbonate and sodium sulphite or sodium bicarbonate and sodium sulphite. The particular period of acid liberation is most strikingly noticeable when the temperature is from 110° C. to 125° C. In this way, corrosion of the interior of the digester is eliminated, namely by keeping the fibrous material, chips, completely submerged in the liquor, thus providing a medium for the absorption of volatile acids. With the withdrawal of the liquids the acids are eliminated.

I claim:

1. The process of pulping wood which includes the treatment in which wood chips are submerged in and heated with an aqueous solution of a normal sulphite and a salt of a weakly ionized polybasic acid and under temperature conditions of at least 100° C. and not more than 125° C., removing the chemical treating liquor, and thereafter heating the woody material to a higher temperature.

2. The process of pulping wood which includes a treatment in which particles of the wood are steamed, subjecting the resultant woody material to a chemical digesting treatment, during which treatment acids are liberated from the wood, while covered with the treating liquid capable of neutralizing the acids so formed and under temperature conditions of at least 100° C. and not more than 125° C., removing the chemical treat-

ing liquor after the acids are liberated and neutralized, and thereafter heating the woody material to a higher temperature.

3. The process of pulping wood which includes a treatment in which particles of the wood are steamed, subjecting the resultant woody material to a chemical treatment in a solution of a normal sulphite and a salt of a weakly ionized polybasic acid and under temperature conditions of at least 100° C. and not more than 125° C. while submerged in said solution, withdrawing the chemical solution, and thereafter heating the woody material to a higher temperature.

4. The process of pulping wood which includes a treatment in which particles of the wood are soaked with hot water, subjecting the resultant woody material to a chemical treatment in a solution of a normal sulphite and a salt of a weakly ionized polybasic acid and under temperature conditions of at least 100° C. and not more than 125° C., withdrawing the chemical solution, and subsequently heating the woody material to a higher temperature.

5. The process of pulping wood which includes a treatment in which particles of the wood are steamed, subjecting the resultant woody material to a chemical treatment in a solution of sodium sulphite and sodium bicarbonate and under temperature conditions of at least 100° C. and not more than 125° C., withdrawing the solution from the woody material, and thereafter heating the woody material at a higher temperature.

6. The process of pulping wood which includes a chemical treatment of woody material of the chestnut wood variety with a solution of sodium sulphite and a salt of a weakly ionized polybasic acid and under temperature conditions of at least 100° C. and not more than 125° C. while submerged in said solution, removing the liquid from the woody material, and thereafter treating the woody material with a higher temperature.

7. The process of pulping extracted chestnut wood waste which comprises treating the woody material in a solution of sodium sulphite and sodium bicarbonate and under temperature conditions of at least 100° C. and not more than 125° C., removing the chemical solution from the woody material, and thereafter heating the woody material at a higher temperature.

8. The process of pulping extracted chestnut wood waste which comprises treating the woody material with a solution of sodium sulphite and sodium bicarbonate and under temperature conditions of at least 100° C. and not more than 125° C., removing the chemical solution from the woody material, and thereafter heating the woody material at a higher temperature of at least 125° C. and not more than 170° C.

9. In a process for pulping wood, the treatment which includes filling a digester with wood chips and an aqueous solution of sodium sulphite and sodium bicarbonate, 5 cooking the material in the digester, and subjecting the material to a temperature of at least 110° C. and not more than 125° C. and during which heat treatment acid is liberated from the wood, and maintaining the digester 10 in its full condition and maintaining the wood material completely covered by said aqueous solution during the acid forming stage.

10. In a process for pulping wood, the 15 treatment which includes filling a digester

with wood chips and an aqueous solution of a chemical capable of neutralizing acids liberated from the wood, cooking the material in the digester and subjecting the material to a temperature sufficient to cause acid to be liberated from the wood, maintaining the 20 wood material completely covered by said chemical during the acid forming stage, and after the acid forming stage withdrawing liquid from the digester, and thereafter heating the wood material at a temperature 25 higher than it was heated while at the acid forming stage.

In testimony whereof I affix my signature.
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