

Patented May 26, 1925.

1,539,433

UNITED STATES PATENT OFFICE.

ARLIE WILLIAM SCHORGER, OF MADISON, WISCONSIN, ASSIGNOR TO C. F. BURGESS LABORATORIES, A CORPORATION OF WISCONSIN.

METHOD OF UTILIZING RESINOUS WOODS.

No Drawing.

Application filed May 25, 1920. Serial No. 384,331.

To all whom it may concern:

Be it known that I, ARLIE W. SCHORGER, a citizen of the United States, residing at Madison, in the county of Dane, State of Wisconsin, have invented certain new and useful Improvements in Methods of Utilizing Resinous Woods; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which is appertains to make and use the same.

Ground wood pulp is manufactured by holding bolts of wood against a roughened revolving stone, the wood fibers being separated by mechanical action. Water is passed over the stone to absorb the heat produced by friction and to carry away the detached fibers. Ordinarily 60,000 lbs., or more, of water are used in grinding a ton of pulp, this water being run to waste. Heretofore the wood ground has been largely limited to deciduous species and to those conifers having a low resin content, such as spruce and balsam. Many species of conifers, such as jack pine, longleaf pine and loblolly pine contain fibers highly suitable for the manufacture of paper, but their use has been limited on account of the high resin content of the wood. This resin has the following distinct disadvantages: During the grinding process, the channels and other depressions in the grinding stone become filled with a mixture of resin and pulp, gradually reducing the efficiency of the stone and necessitating frequent cleaning of the grinder. The power consumption is high and the output of fibers low. Furthermore, the wood fibers obtained contain particles of resin adhering to them more or less loosely, and when this pulp is passed over the paper machine, the resin gradually accumulates on the Fourdrinier wire, especially in passing over the suction boxes. After the resin has accumulated to a certain extent on the wire, pieces of resin become loose from the wire and adhere to the pulp sheet, and are carried over the rolls where the heat of the rolls melts the resin and causes the paper to adhere to the rolls. This causes the sheet to tear and decreases the output of the paper machine.

It is an object of the present invention to

make available for paper making purposes resin-bearing woods not heretofore generally used in that way. It is a further object to recover the resin and make it useful in the arts.

To attain the foregoing, and other objects hereinafter set forth more at length, the liquor used for cooling the grinding stone and carrying away the detached fibers is not water, as in the common practice of grinding spruce, but is an aqueous solution of an agent having a solvent and emulsifying action on resin. This agent may be an alkali, such as caustic soda.

The average resin content of so-called "pitchy" woods, or woods so high in resin as to be generally unsuited for use in the paper making art, is about seven per cent, though certain trees or portions of a tree may contain much larger amounts. As a rule this seven per cent resin contains from ten to twenty per cent. volatile oil, the remainder consisting mainly of resin acids, the chief of which is ordinarily known as "abietic" acid.

According to one embodiment of the present invention, the procedure is as follows: 250 lbs. of caustic soda (NaOH) is added to 5000 lbs. of water to produce a solution having a solvent and emulsifying action on resin. This solution is run over the grinder stone while grinding pitchy woods, such as jack pine, longleaf pine, loblolly pine, and the like. As the pulp leaves the stone, it is passed through squeeze rolls or over suitable apparatus to remove most of the liquor, this liquor being returned to the grinding chamber by a pump, or other suitable means, instead of being run to waste, as is usual in grinder practice. The grinder liquor is thus recirculated until it becomes well charged with resinous material. The resin acids of the wood combine with the caustic soda to form water soluble salts. Excessive foaming can be prevented by the addition of a small amount of petroleum distillate, or other suitable reagent. A ton of dry wood containing six per cent of resin acids, or 120 lbs., will require 16 lbs. of caustic soda for complete neutralization. But the sodium resinate thus formed, being a soap, has detergent or emulsifying properties, and

can bring additional amounts of resin into colloidal solution, so that in order to remove the resin completely, it is not necessary to use sufficient alkali to neutralize all the resin acids.

A fresh alkaline solution as above described combined with the high temperature of about 170° F., produced by friction between the wood and the stone, exerts a highly solvent action on the resin. As the free alkali of the solution decreases and the sodium resinate increases, the solution has an increasing power of detaching and bringing the particles of free resin into colloidal solution. As a result, recirculation of the solution can properly be protracted, even beyond the point at which all free alkali has been neutralized.

The alkaline solution is reused or recirculated through the grinder until so spent that it no longer exerts a proper solvent action on the resin of the pitchy wood being ground. The solution is then drawn off and replaced by fresh solution.

The spent solution thus drawn off forms a valuable by-product of the paper making operation. Its content of alkali resinates and free resin may be used for sizing the pulp by mixing the solution with pulp in a heater and adding alum in the known manner. But preferably I recover the resin and resinates in a concentrated condition by "salting out" through the addition of common salt to the solution. Also, the resin may be recovered in the free state from the spent liquors by precipitating with suitable acids.

As this invention concerns itself with the handling of materials in a large way, thought must be given to the cost of that agent which gives to the grinding water its solvent and emulsifying action on resin. Likewise, thought must be given to the loss of this agent at certain stages of the complete operation. The pulp as it leaves the squeeze rolls contains about sixty per cent of moisture, so that a ton of pulp on the dry basis would carry away about 3000 lbs. of the grinding solution. When a fresh alkaline solution is being used in the grinder, the pulp will be carrying away a larger amount of alkali than could be permitted ordinarily. This loss of alkali can, however, be largely avoided by washing the pulp with water after it leaves the squeeze rolls and returning the wash water to the grinding chamber, as required to replace the solution carried away by the pulp. The availability of cheap alkali, and other considerations of a local character, will determine whether it is advisable to wash the pulp after it leaves the squeeze rolls, and if so, to what extent alkali and alkali resinate can be recovered profitably from that material.

The amount of alkali to be used in prepar-

ing a fresh solution having the desired solvent and emulsifying action on the resin of pitchy woods may be varied between wide limits, and the proportions above given of 250 lbs. of caustic soda to 5000 lbs. of water are but illustrative of good practice in this regard. Alkalis other than caustic soda can be used, such as sodium carbonate, caustic potash, and ammonia, or in place of these alkalis, I can use the soluble alkali salts of resins. Likewise, I can use the alkali salts of fatty acids commonly known as "soaps." But whether I use an alkali or an alkali resinate, or a soluble soap, as the agent added to the grinder water to produce an aqueous solution having solvent and emulsifying action on the resins of pitchy woods, the resin of the wood is so taken care of by the solution that it does not clog the grinding stone and does not adhere to the separated fibers and ultimately choke the Fourdrinier screen or cause tearing of the paper web or sheet. The separated fibers are clean and well suited for paper manufacture. In fact, the fibers are softened and in other respects improved from their contact with the solvent liquor. And whether the resin is taken from the wood by alkali to form an alkali resinate or enters a resinate or soap solution as a colloid or emulsion, the grinding liquor can be recirculated until substantially spent, and then can be drawn off and made to yield its resinous material in forms readily marketable.

In the claims the expression "in the bolt" as applied to wood is used to designate relatively large blocks or pieces of wood as commonly used in the art of preparing ground wood mechanical pulp. The expression does not cover small pieces of wood such as wood chips usually used in the chemical pulp art.

I claim:—

1. The method of making mechanical pulp from resinous wood which comprises grinding the wood in the bolt and subjecting the disintegrated fibers during grinding to the action of an aqueous solution of an agent having solvent and emulsifying action on resin.

2. The method of making mechanical pulp from resinous woods, which consists in grinding the wood in the bolt in the presence of an aqueous solution of an agent having solvent and emulsifying action on resin, and recirculating said solution through the grinder until the solution is well charged with resinous material, substantially as described.

3. The method of making mechanical pulp from resinous woods, which consists in grinding the wood in the bolt in the presence of an aqueous solution of an agent having solvent and emulsifying action on resin, recirculating said solution through the

grinder to increase the concentration of resin therein, and then recovering the resinous material from the solution so concentrated.

4. The method of making mechanical pulp from resinous woods, which consists in grinding the wood in the presence of an aqueous solution of an agent having solvent and emulsifying action on resin, recirculating said solution through the grinder to increase the concentration of resin therein, and then recovering the resinous material from the solution so concentrated by salting out with sodium chloride.

5. The method of making mechanical pulp from resinous wood, which comprises grinding the wood in the bolt and subjecting the disintegrated fibers during the grinding to the action of an aqueous solution of caustic soda.

6. The method of making mechanical pulp from resinous woods, which consists in grinding the wood in the presence of an aqueous solution of caustic soda and restraining foaming with a petroleum distillate.

7. The method of making mechanical pulp from resinous woods, which consists in grinding the wood in the bolt in the presence of an aqueous solution of an agent having solvent and emulsifying action on resin, squeezing and washing the pulp so produced and delivering the wash water to the grinder

for solvent action on fresh pulp, and recirculating the grinder solution through the grinder until it is well charged with resinous material, substantially as described.

8. The method of making mechanical pulp from resinous woods with recovery of resin, which consists in grinding the wood in the bolt in the presence of an aqueous solution of caustic soda, squeezing and washing the pulp so produced and delivering the wash water to the grinder for solvent action on fresh pulp, recirculating the grinder solution through the grinder to increase the concentration of resin therein and then recovering the resinous material from the solution so concentrated.

9. The method of preparing with a grinding stone pulp suitable for paper making from wood having a high resin content, which comprises grinding the wood in the bolt and treating the pulp as it is ground with a solvent and emulsifier thereby to dissolve and emulsify the resin set free by the grinder.

10. The method of preparing pulp suitable for paper making from wood bolt having a high resin content, which consists in subjecting the fibers as they are disintegrated to the action of a resin solvent and emulsifier.

In testimony whereof I affix my signature.

ARLIE WILLIAM SCHORGER.