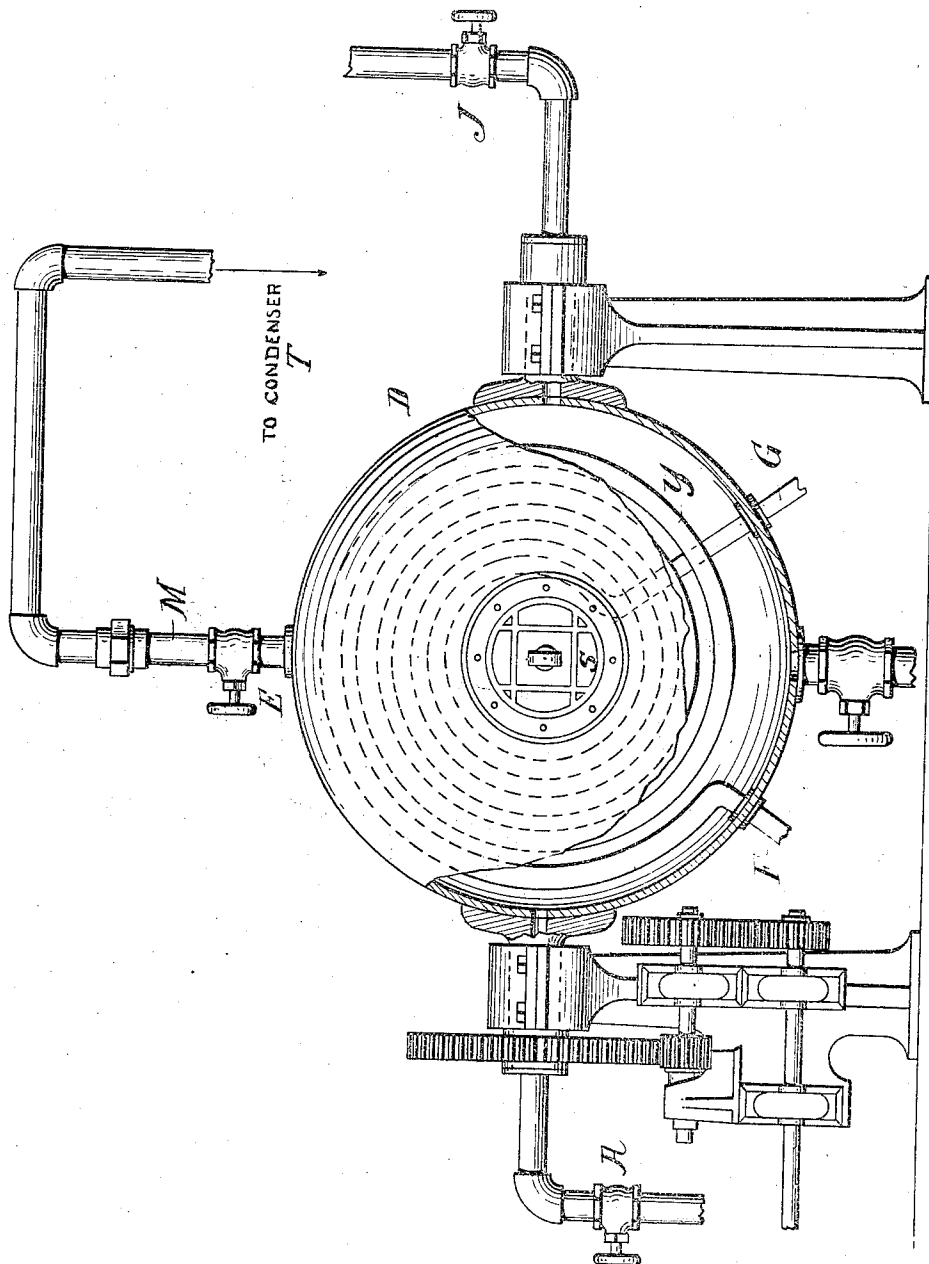


PROCESS OF TREATING WOOD TO PRODUCE TERPENES AND WOOD PULP.

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PROCESS OF TREATING WOOD TO PRODUCE TERPENES AND WOOD-PULP.

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To all whom it may concern:

Be it known that I, WILLIAM J. HOUGH, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Processes of Treating Wood to Produce Terpenes and Wood-Pulp, of which the following is a specification.

My invention relates to a process for the production of terpenes and paper pulp from resinous wood, in one continuous operation.

The process involves the successive steps of the removal of the terpenes, the drying of the exhausted wood, and the reduction to pulp of the same, each progressive act being accomplished within a digester without the handling or removal of the wood, the same remaining continuously within the digester throughout the process.

My invention will now be fully set forth and particularly pointed out in the claims, reference being had to the accompanying drawing forming part hereof, and illustrating a suitable apparatus for carrying out the process.

The resinous wood, such as stumps, roots, slabs, mill waste, and fallen and standing timber, is first reduced to small pieces by chipping, shaving, or any of the usual methods of preparing wood for the pulping process. Not only is it necessary to have the wood in this condition to pulp it, but to extract the terpenes as will now be explained.

The terpenes exist in the resinous wood together with resinous acids as an oleo-resin, from which the terpenes are volatilized at temperatures ranging from 155 degrees C. to 185 degrees C. However they have the property of distilling with steam, as has also a heavier oil, native to the wood, boiling between 185 and 250 degrees C., and known to commerce as "pine oil". While the terpenes distil with steam a temperature of about 100 degrees C., the pine oil requires a somewhat greater degree of heat. It is impossible for steam to completely penetrate the pores of the wood when the same is in large pieces. The wood must be reduced to chips, in which condition each chip may receive a thorough steaming and the terpenes and pine oil distilled from the same.

After reducing the resinous wood to chips, for reasons aforesaid, they are placed in digester "D" through door "S". The di-

gester may be of any kind, such as used in the soda pulp industry. However, a rotary digester, either spherical or cylindrical, is preferred, as I have found that this type of digester insures a complete penetration of the resinous wood by the chemical reagents used in pulping the same. Valve "E" is provided at the top of the digester, said valve being connected with pipe "M", which leads to condenser "T". In case the digester is rotary, a suitable connection must be provided between valve "E" and pipe "M", and preliminary to the extraction of the terpenes the digester must be revolved to such a position that valve "E" is vertical and connection can be made with pipe "M". Steam, preferably dry or trapped steam, is now admitted to the digester by opening the valve "A". The terpenes will now distil with the steam, as pointed out above, and escaping through pipe "M" are condensed, together with the steam, in condenser "T", and then collected.

It is preferable that the steam be of a boiler pressure of 50 pounds (50 pounds above atmospheric pressure), as steam of this pressure is of sufficient temperature (about 155 degrees C.) to extract all the pine oil. A boiler pressure much greater than this should be avoided, as the steam will have a temperature that will cause the terpenes to change into inferior bodies and to be contaminated with malodorous, objectionable products. Steam of a temperature of about 200 degrees C. will cause the wood to char, whereby the terpenes will be polluted with phenoloid and other bad-smelling hydrocarbons, rendering the wood unfit for pulping by reason of the charring of the cellulose. The terpenes are all isomerides of the formula $C_{10}H_{16}$ and change from one class into another with slight provocation. Oil of turpentine is composed mostly of pinene, boiling at 155 degrees C., and when this terpene is subjected to a much greater degree of heat, it changes into dipentene, also a terpene, but having a boiling point of 178 degrees C. Consequently it is of importance to avoid steam of high pressure and high temperature. A digester pressure of about 40 pounds is carried, in order to secure rapid penetration of the chips by the steam.

The steaming of the chips continues until the terpenes cease to be volatilized, which requires about three to four hours' time. The

chips are now very moist, and this moisture must be driven off before the chips can be reduced to pulp, as the pulping liquors such as used in the soda or sulfate process of pulping resinous wood will not penetrate the chips while in this condition, a fact well known in the art. The pulping solutions must replace the moisture in the chips, and this cannot be accomplished until the chips are dry or nearly so. To drive off this moisture steam is passed through coil "Y", by means of the unions "F" and "G", beginning this drying operation while volatilization of the terpenes is still in progress. If in the volatilizing process dry steam is used, that is, steam from which the small particles of water held in suspension have been removed by trapping or other means, the moistening of the chips during the volatilizing operation is minimized, so that less time is required for drying. And, as is evident, there is a further saving of time by introducing steam into drying coil "Y" well before the volatilization of the terpenes is completed. A boiler pressure of not over 50 pounds should be carried in coil "Y", as steam of much greater pressure will have a temperature that will impair the cellulose of the wood, and also result in the production of poor terpenes, as explained above.

It is to be noted that after the terpenes are distilled from the wood, the chips are dried without removal of the same from the digester. During the steaming process described above, many of the terpenes are condensed. This is due to several causes, but mainly to the fact that the terpenes extracted from the bottom of the digester are cooled while passing through the mass of chips above. Consequently, if the chips are now removed from the digester for the purpose of drying them, they will be found to be not only moist but sticky owing to the condensed terpenes on their surfaces; and upon their removal, the chips being warm, the terpenes will be absorbed by the air, and considerable loss will result. This objection is entirely overcome by the drying of the chips in the same digester within which the terpenes have been extracted and the chips are to be pulped. By my method a stronger pulp also results, as will be apparent from the explanation below. While drying the chips a large amount of the resinous acids oozes out upon the surface of the chips—also other gelatinous gums. The chips while in this condition and warm, are extremely receptive to the alkali solution, and the cook takes place in less time than otherwise. Now, if the chips were removed from the digester at this step of the process, taken to another place and dried, and thereafter replaced in the same or another digester, the chips would have an opportunity to cool during the last transfer, and re-ab-

sorption would take place. That is, the cellulose would absorb the gelatinous gums or inter-cellulose adhesive matter. A stronger solution would be necessary in consequence, to pulp it, more time would be required, and the fiber would be more or less injured, being shorter and necessarily, therefore, of impaired strength. As pulp resulting from resinous wood is peculiarly adapted to wrapping paper, the strength of the pulp is of the utmost importance. The drying of the chips without removal saves a large amount of labor and time, also, as is self-evident; by the old methods it is necessary to empty the digester by hand or conveyer means, as it would be impossible to "blow" the chips. And furthermore, the digester could not be unloaded until the pressure in the digester had fallen to that of the atmosphere, which would be a matter of some time.

After the moisture has been driven off, liquors of the usual strength used in the manufacture of wood pulp by the soda or the so called "sulfate" process are admitted to the digester by opening valve "J". After a sufficient quantity of the pulping reagent has entered the digester, valve "J" is closed. If a rotary digester is used, valve "E" is disconnected from pipe "M", and the digester allowed to revolve. Steam is again admitted to the digester. The steam pressure is rapidly increased to the pressure usual in making soda or sulfate pulp (90 to 110 pounds), which pressure is maintained for a period of eight to ten hours. The incrusting material is now completely dissolved, and the wood reduced to pulp. The pressure is allowed to run down before the end of the operation, and the pulp "blown".

What I claim is:

1. The method described, which consists in introducing resinous wood into a receptacle, volatilizing and carrying off the terpenes from the wood within the receptacle by introducing steam into the receptacle, then, without removing the wood from the receptacle, driving off the moisture from the wood within the receptacle, and then, without the removal of the wood from the receptacle, making the wood into pulp within the receptacle.

2. The method described, which consists in introducing resinous wood into a receptacle, volatilizing and carrying off the terpenes from the wood within the receptacle by introducing dry steam into the receptacle, then, without removing the wood from the receptacle, driving off the moisture from the wood within the receptacle, and then, without the removal of the wood from the receptacle, making the wood into pulp within the receptacle.

3. The method described, which consists in introducing resinous wood into a recep-

tacle; volatilizing and carrying off the ter-
penes from the wood within the receptacle
by introducing steam into the receptacle,
then, without removing the wood from the
5 receptacle, driving off the moisture from
the wood within the receptacle, beginning
such drying operation while the volatilizing
steam is being introduced into the receptacle,
and then, without the removal of the wood

from the receptacle, making the wood into 10
pulp within the receptacle.

In testimony whereof I affix my signa-
ture, in presence of two witnesses.

WILLIAM J. HOUGH.

Witnesses:

R. PEALE HERRICK,
FRANK J. KENT.