

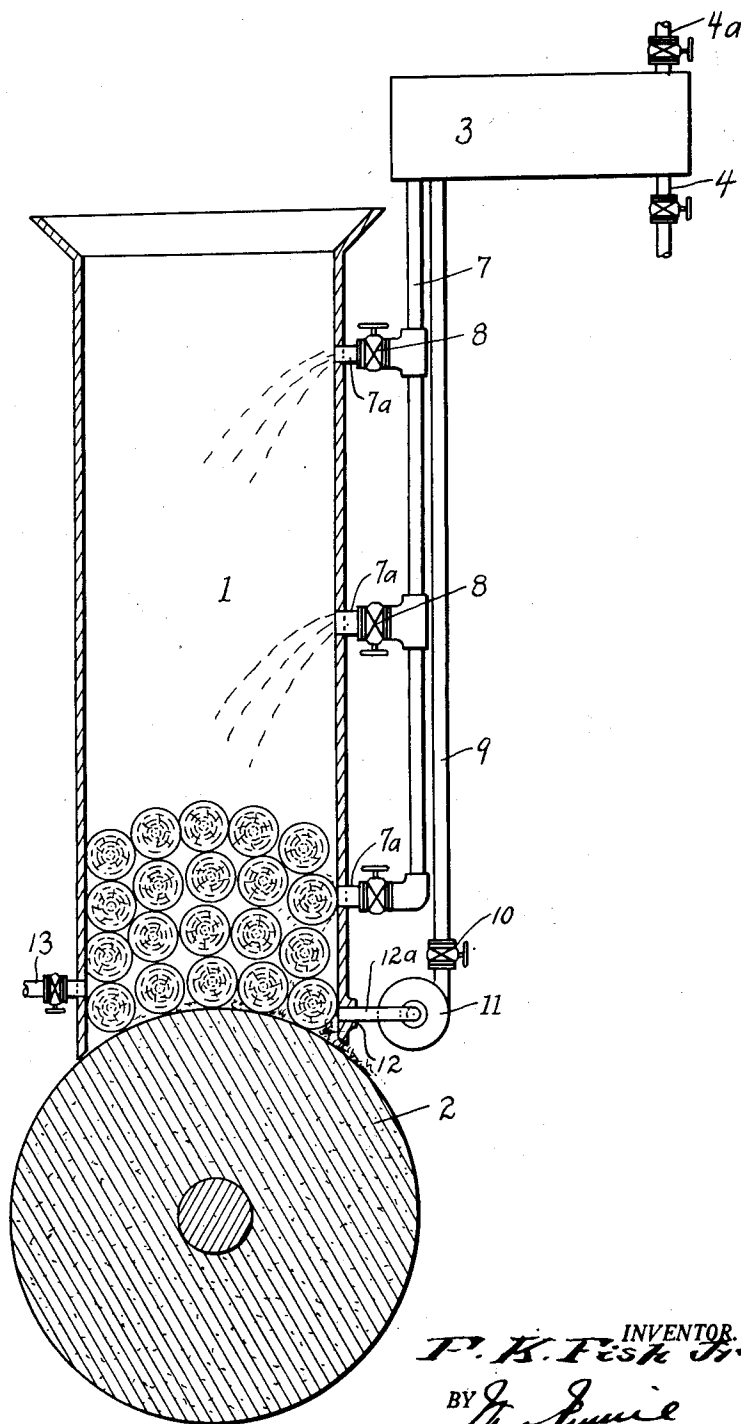
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PROCESS AND APPARATUS FOR MANUFACTURING GROUND WOOD PULP

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PROCESS AND APPARATUS FOR MANUFACTURING GROUND-WOOD PULP.

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This invention relates to a process and apparatus for manufacturing ground wood pulp.

In the manufacture of paper pulp, I have found that unusual results can be obtained by the employment of liquor previously used in digesting and cooking the pulp, the resinous and solvent constituents with which this liquor is charged, apparently serving to attack and otherwise act on like constituents and on the fiber material to greatly disintegrate the fibers and improve their condition for pulp purpose. Without attempting a full explanation as to how or why re-use of the digesting liquor brings about such favorable results, I may say without contradiction that the fact remains that there is an action brought about, whether chemical or physical, I cannot say, which has enabled me to greatly reduce the cost of the manufacture of pulp from materials which it has been thought to be wholly unfitted for pulp purposes.

These results have led me to utilize this broad principle in the manufacture of ground wood pulp, and it is therefore the object of the present invention to provide an apparatus and a process for treating the wood before and at the time of grinding to facilitate separation of the individual fibers and saturate the fibers with solvents or extractives, which materially enhances the value of the product and greatly expedites its manufacture.

In grinding pulp wood, it is the usual practice to moisten the stone and the log at or about the grinding surfaces, and great care must be exercised in preventing too much of the water mixing with the pulp stock. According to my invention, I introduce liquor to the logs in the form of a spray, care being taken to regulate the spray to a sufficient degree so that the logs will absorb only the necessary and desired supply of moisture, and then provide means to take up any excess liquor, and subsequently circulate it in spray form to the logs.

Another object of this invention is to provide a process for treating the logs while and previous to grinding, with a liquor charged with dissolved solvent extractives from wood to soften, saturate, and penetrate the fibers to insure of longer and stronger fibers in the final product, hence a better and stronger product.

Another object of the invention is the pro-

vision of means for introducing liquor charged with dissolved solvent extractives from wood into the individual fibers at the point of separation from the log, so that the particles of woody material are in intimate contact and association with the globules of charged liquor, which insures saturation and penetration of the liquor into the material, to materially break up and separate the constituents in the material which are objectionable and difficult to overcome in making pulp stock.

The invention also comprehends improvements in the construction and arrangement of parts, and steps in the process, which will be hereinafter described and particularly pointed out in the claims.

In the accompanying drawing, I have shown diagrammatically an apparatus for carrying out the invention.

1 indicates a magazine, suitably located and supported above a rotating stone 2, the latter of course being the grinding medium. 3 represents a tank located conveniently above the stone and magazine, and it is provided with a valved steam inlet 4, and a valved liquor inlet 4^a. 7 is a pipe communicating with the bottom of the tank 3, and extending therefrom are branch pipes 7^a, having valves 8, and discharging into the magazine at various levels. A pipe 9 communicates with the bottom of tank 3, and it is provided with a valve 10 and communicates with the exhaust side of a pump 11, the opposite side of which is connected with a pipe 12^a which leads to the bottom of the magazine in close proximity to the periphery of the grinding stone 2, as shown at 12. This point of communication 12 of pipe 12^a with the magazine is so located that excess liquor from the sprays and what may be squeezed from the pulp in the rotation of the stone and the logs is withdrawn from the magazine before it passes out of the magazine and becomes mixed with the pump and discharged therewith into the grinder pit. While I have shown but one such connection, it is obvious that I may withdraw this excess liquor at several points to accomplish this end.

A valved steam inlet pipe 13 is provided at one or more points at the lower portion of the magazine above the pulp forming zone, to admit sufficient steam and increase the temperature of the liquid.

In the pulp industry, it is well recognized

that dry or partially dried wood does not grind as readily or produce as good a grade of pulp as wood well saturated. Yet in grinding the wood, it is necessary to limit the amount of water or liquor supplied to the grinder, and ultimately mixed with the ground wood from which the pulp stock is ultimately formed, otherwise the pulp is of low grade and frequently, when too wet, is useless.

In the process of grinding heretofore known to me, it has not been possible to obtain the required saturation of the wood in the grinder, and at the same time maintain the required supply of water in the subsequently-formed pulp. According to my invention, I am not only able to regulate the liquor supply to saturate the logs for convenient grinding, but in addition, I am able to regulate the moisture content of the pulp stock, and thus meet the objection heretofore pointed out.

In the operation of my invention, wood, in the form of logs, is fed into the magazine and supported on the stone which forms a bottom. One or more of the valves 8 are opened, depending on the height of logs in the magazine, and water previously heated by steam passed through pipe 4, and preferably primarily charged with solvent extractives and stored in tank 3, under pressure, is sprayed through pipes 7 to the wood.

The spray or sprays injected into the magazine has considerable force, with the result that the liquor thoroughly penetrates and saturates the wood, and the solvent extractives contained in the liquor attack the constituents of the wood and partially dissolve and extract same. These partially melted and dissolved constituents, in the transit of the logs through the magazine, are largely released by the ever increasingly-enriched liquor which is continuously circulated over and between the logs in the magazine.

The temperature of the spray of liquor on the logs while in the magazine may be regulated by passing steam through pipe 13, which with the heat in the liquor and the continued movement of the logs causes vapor and gases formed by the dissolved constituents in the logs to rise in the magazine and around the logs. These vapors condense and the liquor of condensation accumulates in the bottom of the magazine, but as stated, care must be taken to avoid too much of the liquor in the grinding zone. The vapors, consequently the liquor, become surcharged with the extractives and constituents liberated from the logs. Hence, the constituents in the logs are attacked and acted upon by like constituents which better prepares the wood for the grinding action, and leads to a definite and defined separation of the fibers, features most important and essential in the making of ground pulp. The heat from

the liquor is largely conserved in the magazine, which assists largely in assisting the sprayed liquor penetrating the logs.

The liquor accumulates at the bottom of the magazine and is drawn through pipe 12^a, by pump 11, to the tank 3 and is there reheated. This liquor may be continuously or periodically pumped, but in any event, it is continuously surcharged with the extractives and constituents liberated in the magazine, so that in the continued operation of the pump, the spray, heat, and the contained wood constituents in the liquor, softens, dissolves, and removes, portions of the encrusting material of the wood fiber and thus prepares the wood for efficient economical grinding.

Steam may be admitted to the magazine from time to time, through the valved pipe 13, which will discharge into the magazine at a point or points best adapted to secure the required temperature in the charge, but care must be taken not to raise the temperature excessively by admitting too much steam.

In the usual processes of grinding wood, the vapors which ordinarily pass upwardly in the magazine, owing to the heat generated at the stone, have a tendency to cause discoloration of the resulting pulp, but this is overcome in my process owing to the quantity of liquor used, which liquor absorbs the steam and vapors and adapts them for advantageous use in the process.

In order to prevent the accumulation of too great a quantity of liquor in the product produced, the valve 10 is opened and the operation of the pump 11 is regulated through the medium of the valve 10 to withdraw liquor from the magazine and return it to the tank 3 where it may be reheated to the required point by the admission of steam to the tank through the valved pipe 4. By withdrawing the excess liquor in this manner and returning it directly for reuse, its heat and contained extractive properties are conserved.

Moreover, it will be noted that the remaining liquor containing solvent extractives in the magazine at the grinding zone acts on the fibers as they are separated at the stone and so affects the encrusting materials of the wood, as to produce from the treated product a whiter and more desirable pulp.

In practical grinding, it has been found that "bundles" of fiber frequently appear in the product and these have a bad effect when the pulp is run into paper. I have been able to overcome this objectionable feature because of the prior softening effect of the liquor when charged with the extractives, with the result that the fibers readily separate one from the other under the grinding action.

An important characteristic of the im-

proved process is that the wood is subjected to the action of the charged liquor in advance of the grinding zone, so that the function of the solvents in the liquor is of gradually increasing effect toward the grinding zone, with its maximum effect at the point where the fibers are separated—that is at the grinding zone. Thus the liquor, incident to its being charged with the extractives of the wood being treated is of gradually-increasing strength toward the grinding zone, and hence its maximum effect is had at that point where the wood is most susceptible to the treatment, that is where the fibers are separated one from the other. Thus the product is given the maximum treatment in gradually-increasing steps from the initial spraying to the grinding point, thus insuring the most effective separation and treatment of the fibers.

It will be apparent that I may use in my process any desired character of liquor which will have the required effect on the wood in the magazine.

What I claim is:

1. In combination with a grinder, a liquor supply tank, means for distributing liquor in the upper portion of the magazine, and means for withdrawing liquor from the lower portion of the grinder and discharging it into said tank.

2. In combination with a pulp grinder, means for removing excess liquor from the grinder before said liquor reaches the point at which the pulp is discharged from said grinder.

3. Apparatus as defined in claim 2 having means for returning the said withdrawn liquor to the grinder for reuse.

4. Apparatus as defined in claim 2 having means for returning said withdrawn liquor to the grinder for reuse, and means for heating said liquor during circulation.

5. A process of making ground wood pulp in a magazine grinder, the step which consists in subjecting the wood in said grinder to the action of water and steam to heat and soften the wood and withdrawing excess water before it becomes mixed with the pulp in the grinder pit.

6. In a process of making ground wood pulp in a grinder, the step which consists in withdrawing from the lower portion of the grinder excess water, applied to the wood for the purpose of softening it before said water becomes mixed with the pulp in the grinder pit.

7. A process of making ground wood pulp, consisting in spraying the wood before and during the grinding period with preheated water charged with extractives from wood to soften and impregnate the wood with moisture and extractives to thereby prepare the wood for grinding and at the same time release contained ex-

tractives, the released extractives being intermixed with the water to enrich the same, withdrawing a substantial proportion of the excess water charged with extractives above the actual grinding point, and recharging the grinder with the withdrawn water charged with extractives.

8. The herein-described process of making ground wood pulp, consisting in subjecting the wood in the grinder to a spray of heated water more or less charged with the wood extractives, to thereby soften the wood and directly affect and release the contained extractives, and finally withdraw undesirable excess of water charged with the wood extractives substantially at the grinding zone to prevent excess water in the ground pulp, the withdrawn charged water being redelivered to the wood above the grinding zone.

9. The herein-described process of making ground wood pulp, consisting in spraying water charged with extractives of the wood onto the wood above the grinding zone to thereby prepare the wood for grinding through softening the same and liberating undesirable constituents, collecting the excess water with liberated constituents at the grinding zone, withdrawing such excess charged water from the grinding zone to prevent super-saturation of the ground pulp, and utilizing such withdrawn water for recharging the wood above the grinding zone.

10. The herein-described process of making ground wood pulp, consisting in subjecting the wood in the grinder to the action of heated water charged with extractives of wood to thereby soften and liberate extractives from the wood before the same reaches the grinding zone, maintaining a desired saturation of the wood at the grinding zone by withdrawing excess water with its charged extractives at the grinding zone, and utilizing such excess charged water for initial wood treatment in the grinder.

11. The herein-described method of making ground wood pulp, consisting in initially subjecting the wood remote from the grinding zone to sprays of heated liquor charged with wood extractives with the effect to soften the wood and increasingly charge the liquor with the wood extractives, subjecting the wood as in fiber form at the grinding zone to the liquor with a maximum charge of extractives, and finally withdrawing all charged liquor at the grinding zone other than that necessary to the proper pulp consistency.

12. The herein-described method of making ground wood pulp consisting in initially subjecting the wood in the grinder to sprays of liquor charged with the extractives of the wood, the spraying action being remote from the grinding zone to

thereby soften the wood and increasingly enrich the treating liquor with the removed extractives, and finally subjecting the wood at the grinding zone to the liquor at its maximum charge of extractives to thereby directly affect the fibers of the wood as they are liberated by grinding.

13. In a process of mechanically making wood pulp, that step which consists in dissolving those encrusting materials of the wood which are not soluble in water by subjecting the wood prior to and while being mechanically acted on to water intermingled with extractives of wood to thereby dissolve the said encrusting materials.

14. In a process of mechanically making wood pulp, that step which consists in dissolving those encrusting materials of the wood which are not soluble in water by sub-

jecting the wood prior to and while being mechanically acted on to heated water intermingled with extractives of wood to thereby dissolve the said encrusting materials.

15. A process of making wood pulp in a grinder which consists in spraying superheated water charged with solvent wood extractives onto the wood in the grinder prior to the grinding action, subjecting this charged water to the further heat of the friction incident to the grinding action on the wood, withdrawing a substantial portion of such charged and heated water from the lower portion of the grinder, and circulating such withdrawn charged water to the initial spray.

In testimony whereof I affix my signature.

FREDERICK K. FISH, Jr.