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METHOD OF MAKING WOOD PULP.

No Drawing.

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My invention relates to improvements in the method of making wood pulp, particularly for pulping waste materials such as shavings, edgings, saw dust and similar wood waste materials.

Most of the mechanical methods for making wood pulp employ grinding mechanism in which natural or artificial stone is used as an element, such as grind stone, burr stones or emery stone. In all of these methods the grit of the grinding element has a tendency to cut or break the fiber in its length as this grit consists of a number of fine points which when magnified are like saw teeth, and as they operate across the grain of the wood or fiber, the fiber is cut up into small lengths which is not as good for paper making as the longer fibers.

In my improved process I have found it possible to make wood pulp from waste materials in a more efficient and less expensive manner and with the production of pulp with longer fibers than by present methods. I accomplish this largely by using as one of the steps in the method the separation of the fibers by a crushing and rolling operation between rapidly rotating disks or plates of metal while wet or in the presence of water, these disks or plates of metal being preferably hardened or chilled and arranged to rotate in opposite directions at an extremely high speed.

Briefly stated the method consists in, first comminuting or shredding the material by the use of hogs or shredders which reduces the material to a comminuted state in the form of chips, shreds or shavings; second, in soaking this material in water until it becomes thoroughly saturated; and, third, in crushing and rolling the materials under pressure in the presence of water between these high speed rotating disks whose peripheral edges are separated from each other by a distance equal only to a few thousandths of an inch or less.

The reduction of the wood or waste material may be performed by any of the well known devices now in use. For the saturating process the chips or comminuted material may be thrown into tanks of water and left to soak until they sink when they are usually quite well saturated. The process of saturation if cold water is used may be hastened by the use of pressure on the tanks to force the water into the pores or fibers of the wood.

This process may also be hastened by heating the water or boiling the materials by steam or otherwise and if heat is used the fibers can be separated by the pressing and rolling operation of the disks while still hot in which the separating operation is generally more expeditious and economical and less power is required to separate the fibers when hot and when thoroughly saturated.

Any desired means may be employed for rotating the disks providing a proper speed can be obtained. I have very successfully used these rotating disks where they have been properly mounted in a frame with an electric motor directly connected to each of the disks by which a very high speed can be obtained.

The disks or plates themselves are preferably formed slightly concave on their working faces so that when the disks are placed together with their outer edges touching there is a gradually decreasing space between the disks from their centers outward towards their peripheries.

The operating faces of the disks are free from anything like the grit of grind stone or emery stone. They are preferably slightly serrated in a radial direction on their working faces, the serrations being reduced in size towards their outer periphery and preferably arranged in series so that a comparatively fine series of ridges and spaces are formed with the ridges in one series located opposite the grooves in the other series so that there is no continuous groove from the center of the plates outwardly. These plates are set together under a strong spring pressure so that as the material is fed into the center and works its way outwardly between the disks it is subjected to a very high pressure and as the disks are rotating in opposite directions a rolling movement is imparted to the shreds or pieces of material which tends to crush and roll the fibers apart. This tends to cause the chips or shreds to arrange themselves longitudinally and in a radial direction from the center to the outside of the disks and the centrifugal force caused by the high speed disks and the water which is fed in with the material tends to keep them in this direction and cause them to move in a substantially longitudinal direction from the center to the outside of the disks so that the rolling and crushing action on the materials is for the most part lengthwise of the

grain of the wood very much the same as the stick of a match would be crushed by placing it under a foot and rolling it on the floor with the sole of a shoe, except of course that with the disks rotating in the opposite direction it will be subjected to this rolling movement on each side which will prevent to a certain extent the material being carried around by the respective disks.

The material first enters the disks in this larger space near the center so that the materials will be rubbed against each other, some of them having a tendency to move in one direction with the rotation of one disk and others in the opposite direction with the rotation of the other disk and as they gradually approach the outer peripheries they will be subjected to a very high pressure and passing out at the peripheries where the disks are rotating in opposite directions but almost touching each other, the fibers will be thoroughly separated and reduced to pulp since the pressing and rolling action will assist materially in the hydrating of the fibers and one operation will be sufficient to produce a pulp which could be used for certain products. It may be advantageous, however, where finer materials are required to subject these fibers to a succession of operations through the disks.

In practice I have employed this method with disks rotating at a peripheral speed of approximately 12,000 feet a minute which would represent the passing of one disk over the other at a speed double this or something over four miles a minute. This very high speed will also develop a certain amount of heat which will assist in the separation of the fibers and reducing the whole to a pulpy gelatinous mass.

I have found that by this method I can use most any kind of waste wood including bark, shavings, chips, etc. and produce pulp therefrom in a much shorter time and with the use of very much less power than any other method with which I am familiar. The resulting material is also of a better texture and of a longer fiber than is possible to obtain with any sort of grinding action where natural or artificial stones are used and where the grit of the material tends to cut the fibers across their lengths.

Under certain conditions the process or

method may be carried on with a saving in power and time required to separate the fibers by saturating the chips with a chemical composition instead of plain water, such as sodium hydroxide or sodium sulphite or other chemicals.

Having thus described my invention, I claim:

1. The method of producing pulp from fibrous material which consists in first impregnating the material with water by saturation, second, in subjecting the material in the presence of water to the rolling and crushing action of two oppositely and concentrically revolving disks under pressure to separate the fibres.

2. The method of producing pulp from chips or small pieces of fibrous material by first impregnating them with water; second, in the presence of water subjecting them to the rolling and crushing action of two oppositely and concentrically rotating high-speed metal plates under pressure to secure hydration and a separation of the fibres.

3. The method of producing pulp from wood by first reducing the material to a comminuted state; second, impregnating the material with water; third, subjecting the material to the rolling and crushing action of two oppositely rotating metal plates under pressure with heat to produce hydration and a separation of the fibres.

4. The method of producing pulp from fibrous wood by first reducing the material to a comminuted state; second, impregnating the material with hot water; third, subjecting the material to the rolling and crushing action of high-speed oppositely and concentrically rotating disks while hot to secure hydration and a separation of the fibres.

5. The method of reducing coarse material to pulp by impregnating the material with water and while wet subjecting the material to the rolling and crushing action at points one opposite the other of two oppositely and concentrically rotating metal plates having a high peripheral speed whereby the material will be hydrated, rolled, squeezed and separated into filaments or fibres.

In testimony whereof, I have hereunto set my hand this 30th day of October, 1924.

HOWARD F. WEISS.