

UNITED STATES PATENT OFFICE

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PULPING FARM WASTES

No Drawing.

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The present invention relates to a process of pulping farm wastes in order to produce a cellulosic pulp suitable for paper-making and the like.

One of the objects of the invention is to improve on the process of alkaline pulping of farm wastes so as to enable the more economical production of paper pulp, while at the same time producing a special type of long-fibered pulp, differing in its physical characteristics from the hitherto known types of paper pulp derived from farm wastes such as bagasse, cornstalks, rice-straw, etc.

A further object of the invention is to treat farm wastes such for example as cornstalks, in roughly comminuted form, with alkaline reagents of insufficient strength completely to pulp the material; thereafter to separate the sufficiently pulped material from that insufficiently pulped, and thereupon to treat the insufficiently pulped material with reagents of sufficient strength to convert the same into marketable cellulosic pulps.

Further objects of the invention will appear in connection with the description and claims hereinbelow.

The present invention is an improvement on the process of pulping farm wastes, specifically cornstalks, in accordance with my earlier United States patent application Serial No. 325,897, filed December 13, 1928. In the said prior application I have described in great detail the precise steps employed in converting comminuted cornstalks into paper pulp by a series of steps comprising washing, comminution and digestion of the comminuted material in large digesters in which the material is subjected to the action of a solution of sodium hydroxide and sodium sulfite of a strength of not over 1% of sodium hydroxide, the entire mass of material being constantly pumped about through the digesters while undergoing treatment. In the said prior application I have also described the method of separating the pulped fibers from the digestion-liquor by means of large rotary filters of the standard "Oliver" type.

It has been found, depending upon the age and dryness of the farm-waste that is undergoing treatment, that the process described

in my said co-pending application above mentioned often fails to give entirely satisfactory results; this being true especially when some of the material is very hard and dry. In that case, the relatively mild digestion treatment previously disclosed by me will not completely liberate the cellulosic fiber from the harder and drier portions of the cornstalks, but leaves these portions more or less intact. If the milder processes were continued for a sufficient length of time, or were carried out at a higher temperature or pressure, sufficient to treat these more recalcitrant portions, the softer portions, and especially the pith portions of the pulp would be very deleteriously altered and hydrated.

In accordance with the present improvement in the said process, I treat the comminuted cornstalk or other farm-waste material with a dilute alkali, say with a 1% solution of sodium hydroxide containing $\frac{1}{10}$ % of sodium sulfite, for about 2 hours at 20 lbs. pressure in a closed digester so arranged that the material including the digestion-liquor is constantly pumped from the bottom of the digester and reintroduced into the top thereof. At the end of the said period, I discharge the digester, preferably under its own pressure, and then run the contents thereof over a screen of such dimensions that the finer completely pulped material may pass through the screen, while the coarser insufficiently treated portions are retained by the screen. The screen preferably has meshes about $\frac{1}{2}$ " square, and retains larger particles and portions of cornstalks or bagasse and the like that is undergoing treatment. The screen is preferably of the rotating type. The finer portions, which pass through the screen are then run to the Oliver filters as described in my said co-pending application, where they are freed from the digestion liquor and subsequently further treated by bleaching and similar operations.

The coarser particles that are retained by the $\frac{1}{2}$ " mesh screen are then subjected to treatment with a stronger digestion liquor, say one containing 2% of sodium hydroxide, at 50 lbs. pressure, in a digester exactly like that described. About 2 hours treatment

under the above conditions of pressure, and the corresponding temperature, will convert the coarser portions into a relatively long-fibered cellulosic pulp that is markedly free from pith particles or short fibers. It is exceptionally strong and very suitable for the production of wrapping paper, heavy cardboard and the like. It is also excellent in admixture with softer paper pulps in such cases where extra tearing-strength is required. The long-fibered pulp is handled just like the short-fibered pulp, that is to say, after the digestion it is run over the Oliver filters and thereupon washed and bleached.

The essential feature of the present invention lies in the separation of the partially pulped from the completely pulped material, and represents a specific improvement in my process already covered by my co-pending application Serial No. 325,897, filed December 13, 1928.

The amount of long-fibered pulp obtained by the present process represents about 5% by weight of the total cellulose recovered from, say, cornstalks; and slightly more than that when bagasse fibers serve as the raw material.

It is obvious that in order to economize time, that the long-fibered incompletely digested raw material screened out from a batch of shorter fibered pulp may be stored until sufficient thereof has accumulated to make up a complete batch of long-fibered material. The digestion liquor from the digestion of the recalcitrant material may serve as the initial treating solution for a complete batch of mixed material, as the caustic soda content thereof will have fallen to about 1% after boiling a batch of the long-fibered material; and thus economies in the use of chemical may be effected.

It is also optional to subject the separated incompletely digested material to the pulping actions of sulfite solutions or other known pulping reagents instead of to the alkali as described.

What I desire to protect by Letters Patent, as an improvement in the production of cellulose from farm wastes is:

1. In the process of manufacturing cellulosic pulp from comminuted farm wastes by alkaline digestion, the step which comprises separating the partially digested products from the completely digested products, and thereafter subjecting the thus separated partially digested products separately to an alkaline pulping operation.

2. In the process of manufacturing cellulosic pulp from comminuted farm wastes by alkaline digestion, the step which comprises screening the resultant pulped products through a screen whereby completely pulped products will pass through the screen and incompletely pulped products will be retained by said screen, thereupon subjecting

the material retained by the screen to the action of a boiling 2% solution of sodium hydroxide to pulp the same.

3. The process of manufacturing cellulosic pulp from farm wastes which comprises comminuting the same, washing to remove dirt and soluble matter, subjecting the washed material to digestion with a solution containing 1% of sodium hydroxide and $\frac{1}{10}$ % of sodium sulfite, thereafter screening the resultant products to separate the same into portions that pass a screen having $\frac{1}{2}$ " meshes and a portion that is retained by said screen, and then subjecting the retained portion to the action of a 2% solution of sodium hydroxide to pulp the same with the production of long-fibered cellulosic pulp.

4. The process as defined in claim 3 wherein the farm waste material comprises cornstalks.

In witness whereof, I have hereunto subscribed my name.

ELTON RICHMOND DARLING.