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METHOD OF PRODUCING HALF STUFFS AND CELLULOSE FROM VEGETABLE FIBERS.

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In recent times the steadily increasing demand of the world for fibers for the paper and textile industries on the one hand, and the increasing difficulties of procuring cellulose, in conjunction with the great demands on woodland areas and forests on the other hand, have led to many attempts and suggestions for utilizing a variety of fibrous plants, such as typha, hydrophytes, bamboo, etc., in order to obtain cellulose fibers for the textile or paper industries.

As to purely physical disintegrating processes, that of loosening through the action of heat or cold (frost) is well known and widely used for textile raw fibers. As to chemical process many endeavors have been made to disintegrate by means of alkalies and chlorine in basic state. The hereinafter process is based on the observation that the loosened fiber bundles opened by heat or frost are particularly adaptable to the chlorine disintegrating process, and is hence a novel combination of two known methods of operation. This combination renders possible the utilization of otherwise difficultly disintegrable plant fibers for the paper and textile industries. It has at all times appeared difficult to effect an economical disintegration of peat fibers, which, especially in the upper layers of all peat moors, contain a large quantity of cellulose. This difficulty arises from the particular chemical quality of the numerous substances which permeate the peat fibers, further and above all in the colloidal nature of a part of them, which hinders the inexpensive dissolution necessary for producing a satisfactory paper pulp.

The methods which have become known hitherto for obtaining half-stuffs from fibrous peat have all proved otherwise than economical and for the most part yield but few solid products, for which reason they could not be carried out satisfactorily. Similarly unfavourable are the conditions in all hitherto known methods, which have as their object the disintegration of a number of existing fibrous plants so as to form a half-stuff.

The new method combines with the advantage that the fibers are preserved that of great economy and makes it possible not only to effect the disintegration of the peat but of any kind of vegetable fibers, as also that of wood, in a finely disintegrated state up to white cellulose or only to a brownish half-stuff suitable for pulps according to the extent to which the process is carried out.

Like the drawing on existing fibrous plants already, the possibility of drawing on the peat moors for the production of half-stuff and cellulose, indicates particularly in view of the preservation of forests, a progress far reaching in effect as almost all civilized countries possess peat moors of great extent and richness.

As of special advantage in connection with the new method may be mentioned that it is carried out with scarcely any requirement as regards heat as the chemical process is a cold process. Further the consumption of chemicals is slight as work can be accomplished partially with waste lyes and the different necessary solutions are employed in a very diluted state. Finally the requirements as regards working staff and power are not great, whilst the machinery employed is simple.

In reference to the disintegration of peat fibers it may be further mentioned that the nature of the fibers which can be employed is very varied and the firmness and clearness of the cellulose obtained is in general subject to certain variations according to the proportion of cotton grass (Eriophorum) contained in the substance. Moss (Sphagnum) and reedy peat are not serviceable. More than 30% of moss considerably reduces the clearness and the capacity for being bleached. Rushes can be used up to 50% and beyond.

For the half-stuffs the requirements are naturally less and the extent to which the different kinds of fibrous peat are employable in their production is considerably larger.

The process according to the invention is viz, that bundles of vegetable fibers of any kind in a moist state, when exposed to sudden heating or to frost coldness, undergo loosening and thereby are rendered more easily and more quickly capable of being affected by chemicals. In different kinds of fibers, especially in peat the destruction of the colloids contained in them plays an essential part in this hot or cold treatment, in this respect that the removal of the colloids increases the capacity of the fibers for being affected by chemicals.

Peat colloid, which also plays an important part in peat drying inasmuch as it resists dehydration, is also shown to have an

injurious influence in the disintegrating process, as diffusion of the chemicals through the water with which the colloid is combined proceeds slowly and with great difficulty. The surface of attack is thereby decreased for the disintegrating chemicals.

In accordance with the invention, the general observation that by heating or freezing, the colloids are separated out in flocculent form and "destroyed", is utilized for disintegrating peat to cellulose by chemical methods.

Further interest was given this invention by the generally known fact that the dehydration of winter peat, that is, frozen, colloid-free peat, proceeded much more easily and rapidly than freshly dug peat. In practice the preliminary treatment of fibrous peat is to saturate it with water and spread it out in the open during winter, or to pass it through a heatable conveyor worm.

The vegetable fibers so treated are now exposed to the action of a changing bath of alkaline waste lyes containing about 72% of alkali and chlorating fluids and vigorously stirred. After the bath has been changed twice the half-stuff is serviceable for pulps, whilst for pure white cellulose to be used in the manufacture of paper some further treatments of the same kind must follow in connection wherewith towards the end the alkaline waste lye must be replaced by fresh lye containing about 72 to 74% of alkali.

The penetration of the soda lye can be accelerated by previous evacuation of the vessel containing the fibrous mass and the effect of the chlorine employed is increased if it comes into action in a gaseous state.

In the process the fibers previously treated by heat in the above mentioned manner are treated several times for ¾ of an hour in alkaline and chlorine baths, until according to the product desired, a half-stuff suitable for pulps or cellulose suitable for paper results.

The process according to the invention is based on the fact that in the disintegration by heat the loosening of the fibers is brought about by the bursting of the walls of the cells. Thereby and also in certain cases, as for example in connection with peat, through the destruction of the colloids, the diffusion of the chemicals is facilitated and the chemicals can act so much the better.

The chemical operations of the alkali and chlorine treatment are the known chloriting of the lignines and incrustates by means of chlorine, dissolving out of the chlorides formed, in the case of peat the humus acids by means of alkalis. Chlorine acts here further in the direction of a destruction of different organic impurities by oxidation as also with direct bleaching effect particularly in the last phases.

In addition to these chemical effects asmotic forces and colloidal chemical operations come into action to an advantageous degree in the chemical baths and further facilitate and accelerate the breaking up of the bundles of fibers into the finest single fibers that can be easily felted subsequently.

The products obtained are the half-stuff serviceable for all purposes, such as cardboards, book-binding, etc., in which pulp or paste-board is employed, and cellulose for the most varied purposes, particularly for printing paper.

The pulps or pasteboard are tough, solid and capable of being furrowed or grooved, the cellulose particularly in the case of peat, is rather short fibered but tough and strong. The quality in the case of peat disintegration is so much better according as more wool-grass peat (Eriophorum) is employed.

I claim:—

1. A method for manufacturing half-stuffs and cellulose, particularly for paper pulp and pasteboard and paper manufacture, from peat and vegetable fibers of all kinds, comprising, giving the fibers a preliminary treatment by subjecting them to a radical temperature change from the normal, whereby to at least partly free the fibers from colloidal constituents, then subjecting the fibers alternately to the action of alkaline baths and chlorine while vigorously stirring and at room temperature until this treatment has produced either the desired half-stuff or cellulose.

2. A method according to claim 1, said chlorine being employed in a gaseous form.

3. A method for manufacturing half-stuffs and cellulose, particularly for paper pulp and pasteboard and paper manufacture, from peat and vegetable fibers of all kinds, comprising, giving the fibers a preliminary treatment by subjecting them to a freezing temperature, whereby to at least partly free the fibers from colloidal constituents, then subjecting the fibers alternately to the action of alkaline baths and chlorine while vigorously stirring and at room temperature until this treatment has produced either the desired half-stuff or cellulose.

4. A method according to claim 3, said chlorine being employed in a gaseous form.

In testimony whereof I affix my signature.

ROLAND RUNKEL.