

UNITED STATES PATENT OFFICE.

LUDWIG K. BÖHM, OF NEW YORK, N. Y., ASSIGNOR TO WILLIAM S. MACCLYMONT, OF SAME PLACE.

PROCESS OF MANUFACTURING PAPER FROM STRAW.

SPECIFICATION forming part of Letters Patent No. 659,784, dated October 16, 1900.

Application filed March 2, 1900. Serial No. 7,066. (No specimens.)

To all whom it may concern:

Be it known that I, LUDWIG K. BÖHM, a citizen of the United States of America, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Processes of Manufacturing Paper from Straw, of which the following is a specification.

My invention relates to improvements in the process of manufacturing paper, and particularly to improvements in the manufacture of paper-pulp from straw; and it is the object of this invention to prepare paper-pulp from straw of such quality that the same may be worked up into various grades of printing and particularly writing paper, while heretofore generally packing and wrapping paper—that is, very cheap paper of an inferior grade—has been made from straw.

As is well known, straw contains fiber-bundles of special length, and the incrustations thereon are of such chemical nature as to be removable by chemical agents, exposing thereby the real fiber, and after such chemical treatment a fiber is obtained which is and remains soft and flexible and may be easily bleached. Straw-pulp therefore is well applicable in paper-making, and, in fact, has been used for manufacturing packing and wrapping paper and partly for admixing with other pulps in the manufacture of finer grades of paper. The reason why straw as a substitute material for linen rags in paper-making has not been more extensively used is that straw was not obtainable in such quantities as, for instance, wood for wood-pulp, especially in Europe, while at present great quantities of straw are obtainable in the United States which are wasted, burned up on the fields, and practically of no value. Straw therefore represents a very cheap and easily-obtainable raw material for preparing pulp for paper-making; and it is the object of this invention to provide a process by means of which straw is more utilized for making all kinds of paper. In attaining this purpose I substantially proceed as follows: The straw first is freed from weeds, if such are present. Then it is put into any suitable tank. It may be cut into short pieces of from one to two inch lengths; but this is not necessary.

The stalks may be worked up in their full length. First the straw is treated in a diluted solution of acetic acid of from three to five per cent. strength. The tank in which the straw is first treated is provided with an arrangement for introducing steam, which issues either directly into the solution or passes through a worm. Care should be taken that the temperature in the tank can be raised to from 100° to 130° centigrade. After the straw has been boiled in this solution from four to six hours then same is drawn off, representing then a dark-brown dirty liquid. The straw now is washed out in the same tank. The purpose of this treatment in a dilute solution of acetic acid is a double one—first, the straw is washed thereby, so that a clean material is obtained, and at the same time all water-soluble substances are extracted, and, second, the acetic acid tends to soften the straw and at the same time binds those organic substances which are bases or of a basic character, thus removing them therefrom. After the straw has thus been prepared it is treated in the same tank with a solution of caustic soda. The strength of this solution varies with the kind and grade of paper to be made out of the pulp and increases with the better quality of the paper to be made. For common paper ten per cent. of caustic soda is sufficient, provided the straw has been first treated as above described, and for the finer grades the quantity of caustic soda increases up to twenty-five per cent. This chemical treatment is continued for about seven or eight hours, while the temperature is raised by steam to from 100° to 130° centigrade, when all the silicic acid and the gummy and fatty substances contained in the straw will be taken out. Now the steam is turned off, and the dirty caustic lye is drawn off, and the remaining softened straw, representing pure fiber, is washed out in the same tank, first with hot water, then with cold water, and finally with a very weak solution—say of one or two per cent.—of acetic acid. So far the straw has retained the full length of its stalks, which simplifies the processes of washing out and prevents practically any loss of material. Now the straw is removed into the hollander, where it is washed and torn up for several

hours, until the softened straw has been reduced to a pulpy mass and so-called "half-stuff" is produced. Now this pulp is treated with bleaching-powder solution in the usual manner; but after the bleaching solution has been acting on the pulp for about two hours then some acetic acid is added for the purpose of facilitating the elimination of the hypochlorous acid in the bleaching solution. The acetic acid is added gradually in very small quantities and in a very dilute condition. After the process of bleaching has been finished, the pulp is washed out in the usual manner or treated with an antichlor and then washed out, when it is ready for the beating or breaking machine, the fiber as treated so far having not yet been sufficiently disintegrated for fine qualities of paper. In the breaking-machine the pulp is treated for from four to six hours until the proper disintegration of the fiber is effected. For fine qualities of paper the knots or joints of the straw are separated from the pulp in suitable machinery. After the pulp leaves the breaking-machine it is again bleached, if same should be necessary or if very fine paper shall be made therefrom, and now the pulp is ready for loading, sizing, coloring, and working up into paper by hand and machine according to any of the well-known methods.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The process of making paper-pulp from straw, consisting in first treating the straw in a boiling solution of diluted acetic acid, then washing out the straw, then treating it in a boiling solution of caustic soda, removing the caustic lye, by washing with water, then washing it with a very dilute solution of acetic acid, then disintegrating the straw for the purpose of obtaining the pulp and then bleaching same as specified.

2. The process of making paper-pulp from straw, consisting in treating the straw in a boiling solution of dilute acetic acid, then washing it out, then treating it in a boiling solution of caustic soda, removing the caustic lye, then reducing the straw in order to obtain so-called half-stuff, bleaching it, beating it for the purpose of producing fine pulp, then bleaching it again, and then working the pulp up into paper, as specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LUDWIG K. BÖHM.

Witnesses:

EVELYN GREEN,
LOUISE WIEDMANN.