

UNITED STATES PATENT OFFICE.

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PROCESS FOR THE PRODUCTION OF MECHANICAL WOOD-PULP.

997,064.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, GUY C. HOWARD, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Processes for the Production of Mechanical Wood-Pulp, of which the following is a specification.

This invention relates to processes for the manufacture of wood-pulp for paper-making, and especially to wood-pulp produced by mechanical or largely mechanical means.

The object of the invention is the improvement in methods of manufacture of wood-pulp whereby increased production and greater uniformity in quality of the product is effected.

The invention consists in the improved and advantageous manner of disintegrating the fiber-bundles and in their continued separation and subdivision into their ultimate fibers, as will be hereinafter described and set forth in the appended claims.

In the process hereinafter described I utilize, preferably, the well-known "tube-mill," consisting of a revolving horizontal or slightly inclined cylinder in which is placed a number of flint or steel balls. The pounding and rubbing action of the mass of balls rapidly reduces the size of the material being treated.

I first grade the chipped-wood, saw-dust, or other fiber-yielding material, according to size of the constituent fiber-bundles, as by screening. The material of larger mesh is then introduced in a tube-mill containing balls of relatively heavy weight and large dimensions and is therein subjected to disintegration and reduction in size of its fiber-bundles. Upon the subdivision of said fiber-bundles to a proper, though relatively incomplete, degree of fineness, the material under treatment is withdrawn from contact with the said larger balls and further treated by similar contact with balls of lesser size in a separate compartment of the machine or in an adjacent machine. The material thus separated in comparatively small fiber-bundles, may, in turn, be further reduced in size by progressively reducing the weight and size of the balls to which it is subjected, the said balls being proportioned somewhat in ratio to the mean longitudinal dimensions of the fiber-bundles included therein. It is found that by maintaining a relatively

small ratio between the sizes of the grinding balls and the material being treated that an advantageous rending and shearing action is instituted between the individual fibers and that their mutual cohesion is destroyed without undue reduction of their fiber-length.

The occurrences affecting the fibers within the mill during the successive stages of treatment just described are about as follows, although it is to be understood that the phases hereinafter detailed are not distinct and complete and that all the phenomena set forth is of constant and continued occurrence throughout the grinding operations to a varying degree: In the first stage, wherein large wood-chips or fiber-bundles are acted upon by relatively heavy balls, I find a compressive action against the ends of the fibers, due to the relatively large area of their cross-section, causing a battering effect and loss of cohesion between the fibers and accompanied with a shearing or tearing of the fiber-bundle into smaller units. In the second stage the balls may advantageously be proportioned to have their diameters equal to or nearly so with the lengths of the fiber-bundles and in consequence will exert more or less bending strains upon the fiber-bundles resulting in further loss of cohesion and in disintegration. A third stage wherein the balls approximate the size of medium coarse sand finally subdivides the fiber-bundles into their ultimate fibers, chiefly through their penetration between the latter and the tearing apart of the connective tissue. The number of such stages in the disintegration and comminution of the fibers will vary according to the material utilized and the extent to which such reduction is desired. Usually two or three said operations will be sufficient to effect separation of the individual fibers, although the process may obviously be applied and adapted to the changing conditions encountered with various materials and the purposes for which the product is to be utilized. I further propose to employ in the preparation of said wood-pulp and in combination with the afore-described mechanical processes, certain chemical solvents, such as caustic soda, or sulfurous acid, to destroy or weaken the cohesion of the individual fibers and to facilitate their separation by the said mechani-

cal means. The application of said chemicals may not be necessary or desirable, though when utilized may be introduced at the beginning of said mechanical operations or intermediate the various stages thereof. Sufficient moisture may likewise be supplied during the process to facilitate the operation or to convey the products to their proper station.

10 What I claim as my invention, is—

1. A process for the production of wood-pulp, consisting of subjecting a mass of fiber-bundles to a disintegrating and comminuting action in a tube-mill containing 15 balls of relatively large size and weight, and progressively reducing the size and weight of the said balls in further operation on said fiber-bundles as the size of the latter are reduced.

20 2. A process for the production of wood-pulp, consisting of subjecting a mass of fiber-bundles to a disintegrating and comminuting action in a tube-mill containing balls of relatively large size and weight, 25 progressively reducing the size and weight of the said balls in further operation on said fiber-bundles as the size of the latter are reduced, and treating said fiber-bundles to a chemical solvent at a selected stage of said 30 process to partially destroy the cohesion of said fibers.

3. A process for the production of wood-pulp, consisting of first subjecting a quantity of fiber-bundles to the disintegrating action in a tube-mill containing balls with 35 a mass heavier than the contained individual fiber-bundles, second, subjecting the resulting reduced fiber-bundles to similar treatment by balls of reduced weight, and third, continuing in further like operation 40 to reduce the weights of said balls to correspond with the progressively reducing sizes of the fiber-bundles with which employed.

4. A process for the production of wood- 45 pulp, consisting of subjecting a quantity of fiber bundles to disintegrating action in a tube-mill containing balls of diameters larger than the lengths of the said fiber-bund- 50 dles, then subjecting the resulting reduced fiber-bundles to similar treatment by balls substantially equal in diameter to the lengths of said fiber-bundles, and finally 55 subjecting the resultant mass of comminuted fiber-bundles to like treatment by balls with diameters less than the lengths of said fiber-bundles.

GUY C. HOWARD.

Witnesses:

H. BARNES,
E. PETERSON.