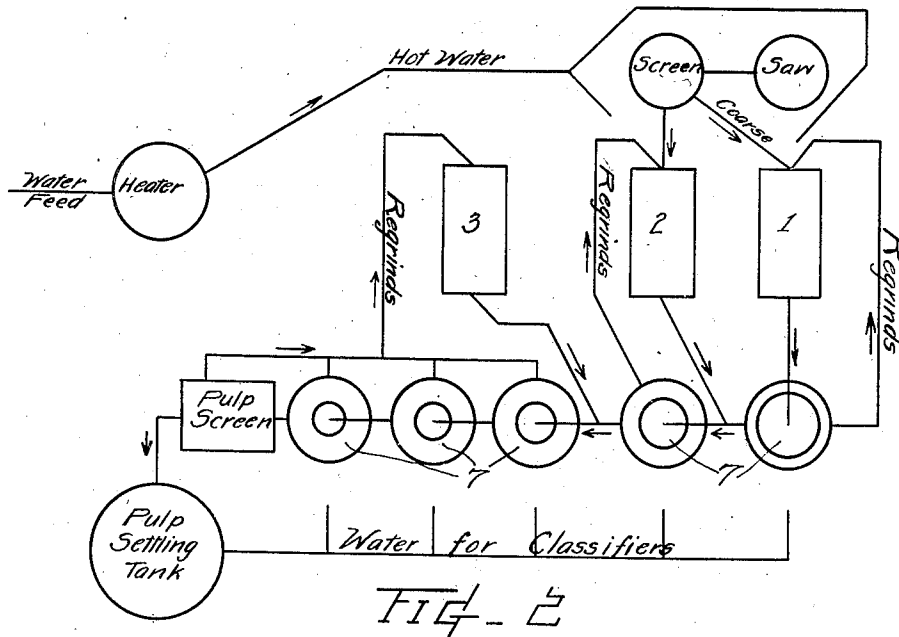
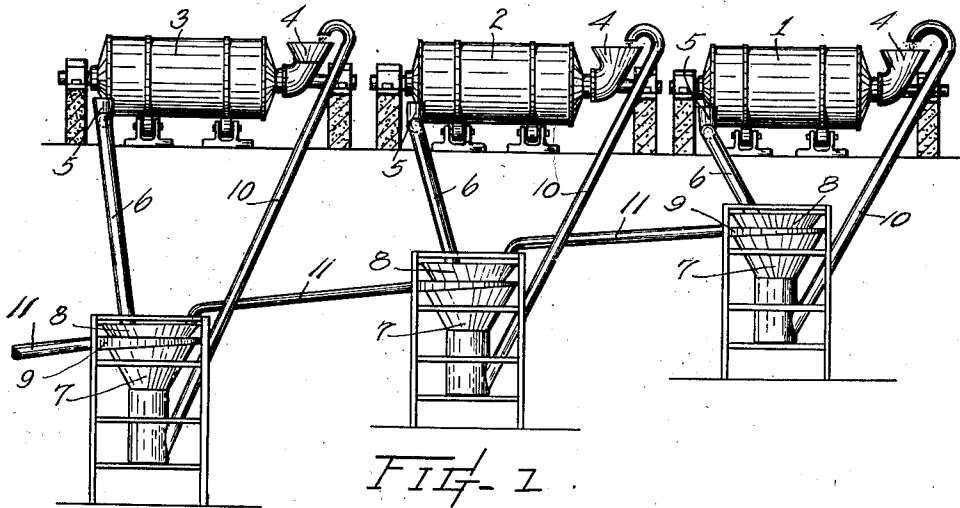


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 PROCESS FOR THE PRODUCTION OF MECHANICAL WOOD PULP.
 APPLICATION FILED AUG. 31, 1911.

1,057,151.

Patented Mar. 25, 1913.



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PROCESS FOR THE PRODUCTION OF MECHANICAL WOOD-PULP.

1,057,151.

Specification of Letters Patent.

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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 improvements in processes for the production of mechanical wood-pulp and particularly to improvements to the process disclosed in my prior Patent No. 997,064. In the said patent I describe a method of producing wood-pulp consisting of subjecting a quantity of fiber-bundles to disintegrating action, as in a tube-mill containing balls of certain dimensions relative to the sizes of said fiber-bundles and reducing the latter to a desired degree of fineness, subjecting the resulting reduced fiber-bundles to similar treatment by balls of reduced sizes, and continuing in further like operation to reduce the sizes of said balls to correspond with the progressively reducing sizes of the fiber-bundles.

It is found that in the reduction of fibrous material by the methods outlined there is a considerable advantage in maintaining as far as practicable the predetermined ratio of magnitude between the balls of the several tube-mills and the fiber-bundles being reduced therein. In the progressive operation of the mill the fibrous contents are gradually reduced to a relatively uniform size, in which the fiber-bundles of an average or mean dimensions are suitable for introduction within the next mill in the series while a certain proportion of such material is of larger size than that intended for the economical operation of the second mill and should advantageously be returned to the original mill for further reduction. In like manner a quantity of the product of the first mill may be disintegrated to a size smaller than that requisite for the second mill or perhaps may be sufficiently reduced to approximate the final desired product, in which case it would be wasteful and contrary to economical operation to subject the material to further reduction. In the one case the action of the balls of the second mill on material larger than for which they were intended would result in inefficient operation and in the latter cases material of proper final size or nearly so would be acted upon to be further reduced beyond a desired minimum to the damage of the prod-

uct by pulverization or undue shortening of the fiber-lengths and unnecessarily reducing the capacity of the apparatus by continued working upon a finished material.

It is the object of the present invention to improve the present methods of treating wood-pulp in the process of manufacture by subjecting the output of the several grinding mills to classification and separation into grades which, generally stated, respectively comprise matter sufficiently disintegrated to be more effectively treated in subsequent steps in the process and material upon which the reducing action has not been sufficiently complete and which may advantageously be returned to the grinding mill recently quitted.

A further object of the invention is to provide devices for classifying the product of the several grinding mills and automatically distributing the graded material to subsequent mills in the series for further grinding through like classifying devices which respectively retain a predetermined size of material suitable for the mill with which they are related and pass all smaller sized matter to other subsequent devices without subjecting the same to further grinding until a mill in the series is encountered treating material of an approximate size.

In the drawings accompanying this application, Figure 1 is a view in side elevation of apparatus employed in carrying out my invention. Fig. 2 is a diagram in plan of a pulp-producing plant embodying the apparatus of my invention.

I provide a plurality of fiber-separating and reducing machines designated by the reference numerals 1, 2 and 3 respectively adapted to successively treat masses of fiber-bundles in the progressive stages of their reduction to a desired state of disintegration. These reducing machines are desirably of the ball or tube-mill type and while I illustrate my process with a series of three such machines, it is obvious that the methods herein shown will be equally advantageous when employed with machines of other modes of operation and when used singly or in batteries of machines in any number. Each said machine is provided with a feed inlet 4 for the introduction of fibrous material therein and an outlet 5 at the opposite end which is connected by a conveyer 6 to a suitable classifier 7 wherein the fiber-bundles constituting the partially ground pulp material are segregated into

grades according to their relative mass, that is to say, division is made into two grades of material comprising, respectively, fiber-bundles reduced to condition best suited for treatment by later processes and those fiber-bundles still approximating in mass the predetermined size considered proper for treatment in the mill just evacuated. Said classifier may be of any suitable type having the above-described functions. Those shown herewith are particularly described and illustrated in an application, Serial No. 646,997 filed simultaneously with the present one. For the purposes of this application said devices may be described as each comprising a hopper 8 receiving said pulp material from the aforesaid conveyor 6; a discharge 9 for the separated lighter fiber-bundles and a tube 10 entering the lower portion of said classifier and containing mechanical means for conveying the heavier fiber-bundles to the adjacent mill. Each pulp mill is thus provided with a classifier whose elements are properly adjusted to separate the pulp issuing therefrom into classes respectively consisting of fiber-bundles upon which the reducing action of the mill just encountered has not been sufficiently complete and that which is more suitable for treatment in succeeding steps. The latter product is conducted from the discharge 9 of the respective classifier by the duct 11 to the charging hopper 8 of the next lower classifier in the series where it mingles with material emitted from the mill pertaining thereto and is again separated, as described. In this instance, however, the classifier is adjusted to discharge from its upper end only fiber-bundles of a size materially smaller than those released from the previously encountered classifier and subject for treatment in still further stage of the process while the opposite end retains until conveyed away material suitable for reduction in the adjacent grinding machine, as 2. This cycle of operations is again repeated in the third related group of machines and classifiers and in as many more similar groups as may be considered effective.

It will be noted that the material is not conveyed from one mill to another nor advisedly from a classifier directly to a mill, but through its adjacent classifier. Thus a by-pass is created for the progressive movement of the pulp from its delivery from the first said mill in the series exteriorly of the passages through the mills. Fibers that may be reduced to a desired degree of disintegration in the first or succeeding mills are successively passed from one classifier to the next without being caused to undergo further grinding in the mills. It is thus finally delivered at the final completed stage in the desired state of disintegration without

unnecessary pulverization or undue shortening of fiber length and without unnecessarily occupying space within the mills and clogging their efficient action. The passage of the pulp through the several said machines and classifiers is practically automatic in its action of grading and classifying.

The classifiers are adjusted to retain and return to their proximate grinding machines such fibrous matter as may be determined to be suitably adapted to be ground by such machine in the process and all matter of smaller sizes passes on to be acted upon by similar devices regulated at the will of the operator.

The process, as outlined, produces essentially a so-called mechanical pulp as distinguished from a chemical pulp and which is used in large quantities in making certain grades of paper, box-board, etc.

The advantages of the process are that it permits of an increased capacity of the grinding machines as it eliminates a large amount of unnecessary grinding and it allows the production of a better quality of pulp and a larger yield due to its removal from injurious grinding action as soon as reduced to a pulp.

What I claim as my invention, is—

1. The process of treating fibrous vegetable material consisting of partially grinding the same in a mill, passing the output of said mill through a classifier arranged to extract the material that has been insufficiently reduced and returning the latter to the mill just evacuated, conducting the remaining material through a second classifier arranged to select material of certain reduced sizes and deliver same to a mill adapted to treat material of said approximate size, passing the remainder to a successive classifier, receiving in turn the discharge of the second named mill for similar classification.

2. The process of treating fibrous vegetable material consisting of grinding same in a series of mills each adapted to treat material of progressively reduced sizes, passing the output of the first mill through a classifier arranged to extract the material that has been sufficiently reduced and returning the latter to the mill just evacuated, conducting the remaining material through successive classifiers until discharged as finished pulp or selected by a classifier for further reduction by a mill of the series.

3. The process of manufacturing wood-pulp consisting of passing partially reduced fibrous vegetable material through a series of classifiers each adapted to separate material of a predetermined size to deliver same to a grinding mill arranged to treat pulp material of the respective size and to deliver material of smaller size to following classi-

fiers in the series for relatively similar separation and delivery.

4. A process for treating material to be ground to uniform size consisting in providing a series of grinding mills each adapted to grind material of progressively diminishing sizes, passing partially ground material from each mill through a classifier adapted to extract and return material insufficiently ground to the respective mill and continuing the remainder through successive classifiers of progressively reducing selective adjustment each of which is adapted to extract material of predetermined minimum size and deliver same to a mill arranged to treat material of said approximate size.

5. The process of treating fibrous vegetable material consisting of partially grinding said material in a mill, introducing said partially ground pulp in a series of classifiers each of which is arranged to extract particles of the material of predetermined minimum size and passing the remainder to the next classifier in the series, the material thus extracted being conducted to mills for regrinding adapted to treat material of the respective approximate sizes.

6. A process of manufacturing wood-pulp consisting in providing a series of pulp-grinding mills each adapted to treat material of different sizes and provided with a classifier connected with its discharge end, returning the heavier particles from each classifier to the mill just evacuated, and delivering the lighter particles to the next sized classifier in the series.

7. A process of producing wood-pulp consisting in grinding fibrous vegetable material in a mill, discharging same into a classifier adapted to separate the material into relatively heavier and lighter grades, returning the heavy material to the mill just evacuated for regrinding and delivering the lighter material to a mill adapted to work upon material of such grade.

8. A process of producing wood-pulp consisting in grinding fibrous vegetable material in a mill, discharging same into a classifier adapted to separate the material into relatively heavier and lighter grades, returning the heavy material to the mill just evacuated for regrinding and delivering the lighter material through another classifier to a mill adapted to work upon material of such grade.

9. In apparatus for carrying out the herein-described process, a series of grinding mills adapted to treat material of predetermined progressively reduced sizes, a classifier connected to the discharge of each said mill to receive the partially ground contents of its respective mill and selectively grade and return to said mill for regrinding mate-

rial approximating in size that for which said mill is particularly adapted, and means to convey the remaining material through the successive classifiers of the series and such other mills only as are adapted to treat the approximate sized material.

10. In apparatus for carrying out the herein described process, a grinding mill particularly adapted to treat material of a predetermined size, and a classifier provided with a feed-inlet communicatively connected with the discharge of said mill, said classifier arranged to return to said mill for regrinding material approximating said predetermined size and eliminating material of sufficiently reduced size.

11. In apparatus for carrying out the herein-described process, a plurality of grinding mills each provided with a classifier whose feed-inlet is communicatively connected with the discharge end of the respective mill and whose larger classified material is arranged to be returned to the feed-inlet of said mill, and communicative connections between the several classifiers arranged to transfer the smaller classified material of a classifier to the feed-inlet of the next suitable classifier in the series.

12. In apparatus for carrying out the herein-described process, the combination of a series of grinding mills each adapted to treat material of certain approximate size, a classifier for each said mill provided with a feed-inlet, a discharge for light material, and a discharge for heavier material, communicative connections between the discharge of each mill and the feed-inlet of the respective classifier, communicative connections between the discharge of the heavier material of each classifier and the feed-inlet of the respective mill, and communicative connections between the discharge of the lighter material of a classifier and the feed-inlet of the next classifier in the series.

13. In apparatus for carrying out the herein-described process, a series of grinding mills adapted to treat material of predetermined progressively reduced sizes, a classifier for each said mill adapted to receive the partially ground contents of its respective mill and graded material from previous classifiers in the series, said classifier arranged to selectively grade said material and deliver to its respective mill the separated material approximating the size for which said mill is adapted and deliver the remaining material to lower classifiers in the series

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Witnesses:

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