E. M. HALL.

PROCESS AND APPARATUS FOR REDUCING WOOD TO PULP.

APPLICATION FILED NOV. 27, 1914.

1,132,258.

Patented Mar. 16, 1915.

2 SHEETS—SHEET 1.

Fig. 1

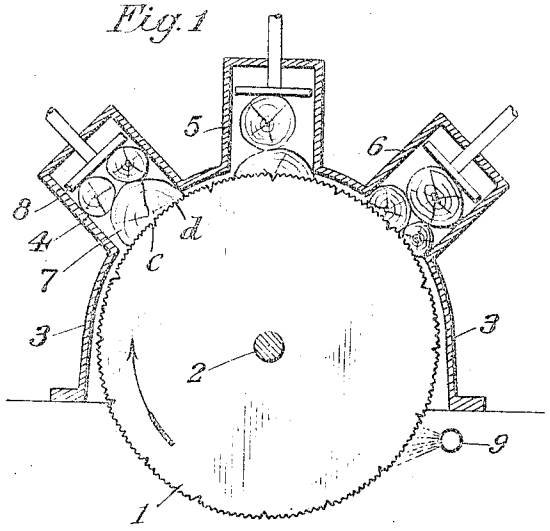


Fig. 2.

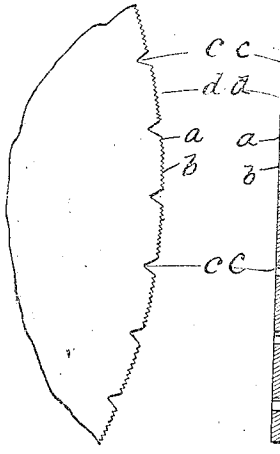
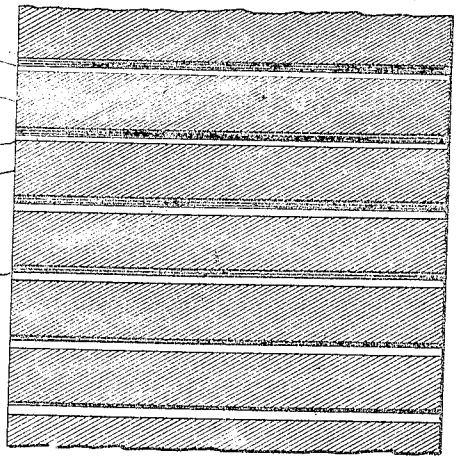


Fig. 3.



Witnesses:

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2 SHEETS—SHEET 2.

Fig. 4.

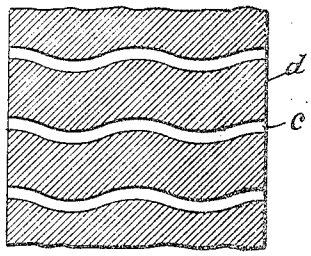


Fig. 5.

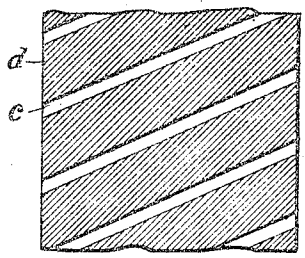


Fig. 6.

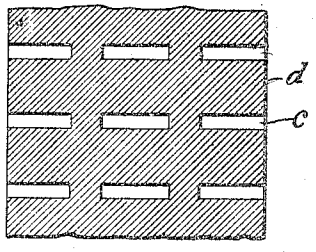


Fig. 7.

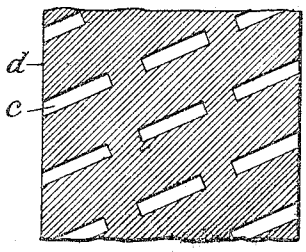
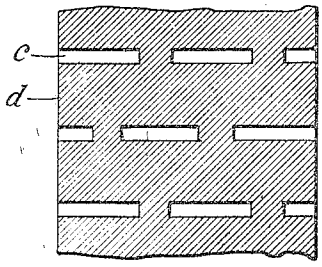


Fig. 8.



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UNITED STATES PATENT OFFICE.

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PROCESS AND APPARATUS FOR REDUCING WOOD TO PULP.

1,132,253. Specification of Letters Patent. Patented Mar. 16, 1915.

Application filed November 27, 1914. Serial No. 874,207.

To all whom it may concern:

Be it known that I, EDWARD M. HALL, a citizen of the United States, residing at Deferiet, in the county of Jefferson and State of New York, have invented new and useful Improvements in Processes and Apparatus for Reducing Wood to Pulp, of which the following is a specification.

The object I have in view is to produce wood pulp, the fibers of which shall be longer, stronger and more uniform than those secured by any of the mechanical processes now in use. The most widely used mechanical process consists in subjecting logs of wood to the abrasive action of the surface of a revolving circular stone. In this process the fibers separated from the wood are lodged on the surface of the stone, and are subjected to a rolling and grinding action, as the stone passes under the surface of the logs, thereby weakening the fibers and breaking them into short lengths.

My invention relates to a method and means for preventing this grinding of the separated fibers, and I accomplish this by depositing the fibers in suitable depressions located in the periphery of the stone, whereby they are protected from the grinding action as the surface of the stone passes under the various logs to be ground.

In the drawings, forming a part hereof, Figure 1 is a vertical section of a well known form of pulp machine in which the stone is prepared in accordance with my invention. Fig. 2 is an end view and Fig. 3 a front view of a portion of the stone showing one method of practicing my invention, and Figs. 4, 5, 6, 7 and 8 are front views respectively, of a portion of the stone showing other methods of practicing my invention.

The circular stone 1, employed for reducing the wood to fiber, is mounted in a vertical position on a shaft 2, turning in suitable bearings. The upper half of the stone is covered with a hood 3, containing one or more pockets or magazines for the reception of the wood to be reduced to fiber. In Fig. 1 I have shown a machine having three magazines 4, 5 and 6, which is the usual number in machines most generally in use.

In the operation of this device the stone is caused to revolve in the direction of the arrow, and the logs 7, having been first barked and otherwise prepared, are placed into the magazines, so that they lie on the surface, and with their sides parallel to the axis of the stone. Pressure is applied to the followers 8, and the logs are forced against, and subjected to, the abrasive action of the surface of the revolving stone.

At a point below its axis a spray of water 9 is directed onto the surface of the stone. A sufficient amount of the moisture is carried around on the surface of the stone to moisten the surface of the logs, and convert the fibers into a soft mass, which is washed off the surface of the stone and falls into the vat below.

For many years prior to my invention it has been the practice to roughen the surface of the stone used in these pulp machines and one customary plan for sharpening the stone is illustrated in Figs. 2 and 3, wherein the surface *d*, between the grooves *c* is shown as being seared, with shallow depressions *a*, extending across the surface of the stone at an angle to its axis, between which are the slightly raised portions *b*. The stone 1 is caused to revolve in the direction of the arrow at a high rate of speed, varying from 150 to 250 revolutions per minute, depending on the size of the stone. Points on the slightly raised diagonal ridges *b*, pass over the surface of the logs in lines substantially perpendicular to the length of the fibers, which are torn out and separated from the mass which makes up the log. Those fibers which are torn out of the left hand portion of the log in magazine 4 are caught on the surface of the stone and as it moves forward the fibers are subjected to a rolling or grinding action between the surface of the stone and the under surface of the logs in the same magazine, and as the stone moves forward all of the fibers separated at the first magazine, are subjected to further grinding action in magazines 5 and 6. The fibers are, therefore, not only ground in the same magazine in which they are separated, but are subjected to additional grinding in other magazines, and this results in bruising the fibers and breaking them up into short lengths. This process, practised for many years without substantial change, results in the production of pulp, the fibers of which are so short and so weak, that it is impracticable to attempt the commercial production of print paper solely from such pulp. Hence it is the usual practice to mix the

pulp produced by the mechanical process I have described, with chemically prepared pulp, the fibers of which are longer and stronger, in the proportion of 75 to 80 per cent. mechanically prepared pulp to 25 to 20 per cent. chemically prepared pulp.

I have discovered an important, and, I believe, a radically new, improvement in the above described mechanical process of reducing wood to pulp.

My invention consists in subjecting the wood to be reduced to pulp to the abrasive action of a rapidly moving roughened surface, and then withdrawing the separated fibers and depositing them in depressions in the abrasive surface so as to protect the fibers from being subjected to an appreciable and objectionable grinding action between the abrasive surface and the under surface of the logs.

One plan for utilizing my invention, in connection with the pulp machines I have described above, is shown in Figs. 2 and 3, wherein a series of grooves *c*, are indicated extending across and located in the surface of the stone. The surface of the stone between the grooves is roughened in the usual manner. As an abrasive surface *d* comes under the left hand under surface of the log 7 in magazine 4, the fibers which are torn out, instead of remaining on the surface of the stone, are pushed down into the next, or one of the succeeding grooves *c*, and are thus removed from the abrasive surface of the stone and protected from the grinding action to which they would otherwise be subjected in the same and succeeding magazines. This is the action which takes place as each abrasive surface passes under the logs in the various magazines, and thus the fibers, or the greater portion of them, are collected in the grooves *c*, and protected from the objectionable grinding action as they pass under the logs in the various magazines, until they pass under the spray 9, which washes them out of the grooves into the tank below. I have shown the grooves *c* of triangular shape and disposed in a straight line across the surface of the stone, and parallel with its axis, I prefer to make the grooves one eighth of an inch deep and one eighth of an inch wide at their mouths, and to dispose them around the surface of the stone about three quarters of an inch apart, measuring from center to center of the grooves.

It has been my experience that grooves of the shape and general direction of location shown in Figs. 2 and 3, and separated from each other about three quarters of an inch, are most readily produced in the surface of the stone, and that they are well adapted to collect the fibers, from which they are easily discharged by the action of the spray, assisted by the centrifugal force of the revolving stone. But without departing from my invention, the shape and dimensions of the grooves, the distance between them and the direction in which they extend across the stone may, of course, be varied. The grooves may extend across the face of the stone in a wavy line or in a straight line, but at an angle to the axis of the stone, as is shown in Figs. 4 and 5 respectively.

Instead of grooves extending entirely across the surface of the stone, I may use cells distributed over the surface of the stone, and located in lines either parallel or at an angle to the axis of the stone, and the cells of one line may be staggered with reference to those of another line, as are shown in Figs. 6, 7 and 8 respectively. It is also to be understood that I am not confined in the practice of my invention to the use of a circular stone, but the abrasive implement may be of any suitable form and its surface may be made of any suitable material.

By the use of my process I secure an increased output and a superior quality of pulp for the amount of power consumed. The fibers of the pulp produced by my process are long and strong enough to permit of the manufacture of paper, wholly from this pulp without the addition of any chemically prepared pulp. This results in a very considerable saving in the cost of manufacture of paper, and the elimination of several troublesome features experienced in the production of paper from mixed pulp.

The fibers of chemically prepared pulp shrink more readily than the fibers of mechanically prepared pulp when subjected to the heat necessary to evaporate the water in the process of manufacture of the paper, resulting in the drawing of the web to such an extent that the paper sometimes "curls" on the rolls. Also, the chemically prepared pulp is frequently "gummy" which tends to cause the paper to stick to the rolls as it passes through the presses. These objectionable features, present in the manufacture of paper from mixed pulp, are entirely eliminated when paper is made wholly from pulp produced by my process, in which the fibers are clean and uniform in strength and quality.

I claim as my invention:

1. The process of reducing wood to pulp, which consists in subjecting the wood to successive abrasive actions in direction substantially perpendicular to the length of the fiber, whereby the fibers are separated out from the wood, and protecting said fibers that have been separated by preceding abrasive actions from being broken and injured during succeeding abrasive actions and then removing the said separated fibers.

2. Apparatus for reducing wood to pulp, comprising, in combination, a movable implement, the surface of which consists of a

series of abrasive portions adapted to rub the fibers in a direction substantially perpendicular to the length of the fibers, said abrasive portions being separated by depressions for the collection and protection of the separated fiber, said depressions extending across the surface of said implement, and means for pressing the wood against the surface of the implement.

3. Apparatus for reducing wood to fiber, comprising, in combination a movable element having an abrasive surface adapted to rub the fibers in a direction substantially perpendicular to their length, in which surface are located a series of depressions for the reception and protection of the separated fibers, and means for subjecting the wood to the action of said abrasive surface.

4. Apparatus for reducing logs to pulp, comprising, in combination, an implement mounted in a vertical position and adapted to revolve on a shaft, a number of detached magazines located around the surface of said implement for the reception of the logs to be reduced to fiber, means in each of said magazines for pressing the logs against the surface of said implement, depressions located in the surface of said implement, the surface of the implement between each of said depressions being roughened, said depressions being formed for the purpose of collecting substantially all of the separated fibers and protecting them from grinding action when passing under the wood to be ground, and means for removing the fibers from said depressions after they have passed from under the last of the logs to be reduced.

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Witnesses:
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