B. F. BARKER.

Machine for Making Paper Pulp from Wood.

No. 202,216. Patented April 9, 1878.

Fig: 1.

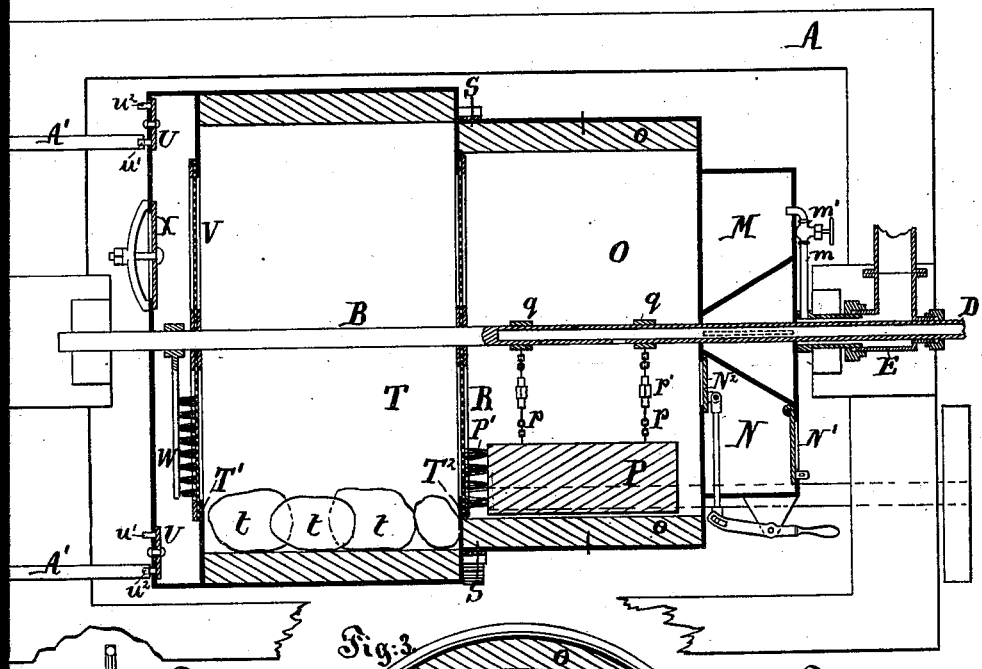


Fig: 2.

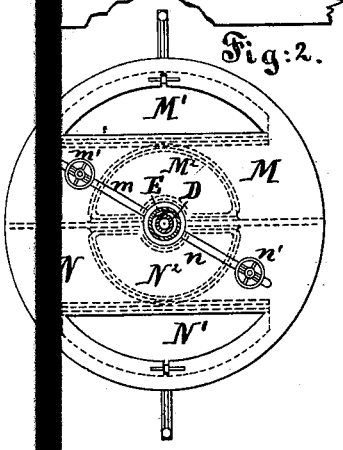


Fig: 3.

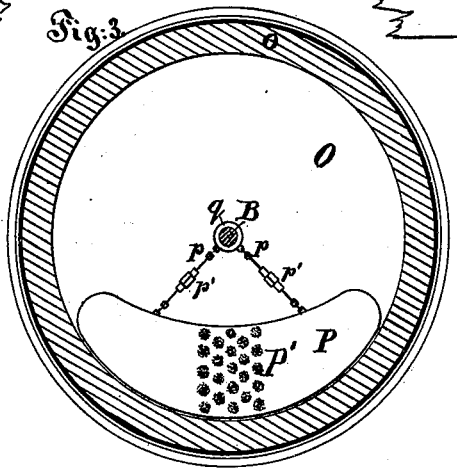
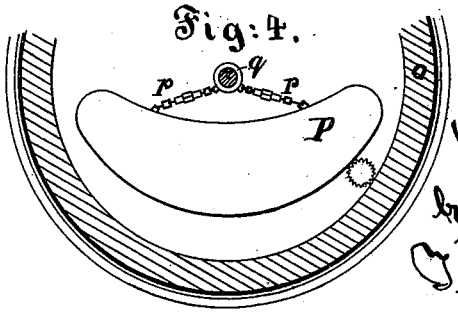


Fig: 5.

Fig: 4.



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UNITED STATES PATENT OFFICE.

BENJAMIN F. BARKER, OF CURTISVILLE, MASSACHUSETTS.

IMPROVEMENT IN MACHINES FOR MAKING PAPER-PULP FROM WOOD.

Specification forming part of Letters Patent No. **202,216,** dated April 9, 1878; application filed January 18, 1878.

To all whom it may concern:

Be it known that I, BENJAMIN F. BARKER, of Curtisville, Berkshire county, State of Massachusetts, have invented certain new and useful Improvements relating to Paper-Pulp Mills, of which the following is a specification.

My improved machine receives the wood in the shape of small chips or shavings, which can be readily permeated by boiling water or lye, and subjects them to a grinding action, while also subject to heat and moisture and to a slight chemical disintegrating influence due to the presence of weak lye.

I introduce the material at intervals, during which period the machine may be stopped. I can discharge the ground pulp constantly, or nearly constantly, while the machine is running.

The accompanying drawings form a part of this specification.

Figure 1 is a section through the entire machine on a broken line adapted to best show the peculiarities. Fig. 2 is an elevation of the small end, with a section through the shaft. Fig. 3 is a section on the line S S in Fig. 1, showing the parts in condition for working. Fig. 4 is a partial section on the same plane, showing the parts in the act of being sharpened. Fig. 5 is a view on a larger scale, showing a portion of the inside of the large end of the machine, with one of the discharge-valves.

Similar letters of reference indicate corresponding parts in all the figures.

A is a rigid framing, supporting a shaft, B, on which are mounted the revolving shells or metal chambers which form or inclose the working parts. Motion is imparted by an auxiliary shaft, which receives motion through a belt (not represented) on a pulley, and communicates the rotation through a gear-wheel to corresponding gearing on the periphery of the revolving chambers.

A more or less constant supply of weak lye is supplied to the chambers through the pipe D from a boiler or other reservoir. (Not represented. This pipe D extends along the axial line of the shaft, and communicates with the interior of the second chamber, supplying a liberal quantity of the hot fluid. The material therein escapes through a wire-gauze partition, R, into the next chamber T, but only when it has attained a degree of fineness sufficient to pass through the foraminous partition thus interposed. It is discharged from the farther end of the last chamber.

The material is first introduced into the machine at the small end of the shell. This is divided into two parts by a partition which extends diametrically across. There are two doors, which may be opened simultaneously, if desired, for cleaning or other purposes, but which, when the machine is in use, are only opened alternately. Each division is provided with a separate supply-pipe for the reception of steam, which is received from a boiler (not represented) through a pipe, E, which surrounds the pipe D, before described.

I will designate the two twin-chambers as M N, and the branch pipes, which extend thereto from the pipe E, as *m n*. The flow of steam through the pipes *m n* is controlled by cocks or screw-valves *m' n'*. These may be opened and closed by dexterous manipulation, or by any suitable connections, while the machine is running. Ordinarily these valves will be operated during the periods while the machine is stopped.

M^1 N^1 are doors, provided with means for conveniently securing them steam-tight. On stopping the machine and turning either of the chambers M or N uppermost and shutting off the steam therefrom, the door M^1 or N^1 is opened and the interior filled with stock, after which the door is again closed and secured. The machine is now to be revolved while the chamber M receives the steam, and the contents are tumbled therein. After having been thus treated with gentle mechanical agitation, subject to the full pressure of the steam for a considerable time, the discharge-valve M^2 or N^2 may be opened, and the material will commence to be discharged into the next chamber O.

To facilitate the discharge, a cone-formed shell is introduced, as indicated, so that the material, as it tumbles with the valve open, is constantly deflected toward the valve, and its discharge thereby facilitated. During this discharge the admission of steam to that cham-

ber may be partially or entirely shut off. When sufficiently empty the discharge-valve is again closed. The machine having been stopped, a fresh supply of material is introduced, as before described, and the operation repeated. The two chambers M N are filled and discharged alternately.

The chamber O is lined with stone, as indicated by *o*. The interior of the stone lining forms one grinding-surface, and the exterior of a nearly semi-cylindrical stone, P, forms another surface, between which the stock, partially softened by steaming, is rubbed as the machine revolves.

The disintegrating action is facilitated by the presence of the hot lye introduced through the pipe D, which, although not sufficiently caustic to disintegrate the wood of itself, materially facilitates the disintegration due to the grinding. It is a combination of a dissolving with a grinding treatment.

The stone P is hung up by four chains, *p*, to rings *q*, which turn on the shaft B. When a sufficient quantity of material gets between the stone P and the lining of the inclosing-casing to lift the stone P the chains *p* allow it to lift freely. When the material fails to thus support it the chains prevent the stone surfaces from rubbing harshly together. The chains *p* are provided with turn-buckles *p'*, which allow their lengths to be very delicately adjusted.

R is a sheet of fine wire-gauze, which forms the only partition between the chamber O and the last chamber T. The flow of the pulp from the chamber O, where the lye is received, to the chamber T, from which the pulp is discharged, tends to clog the meshes of the wire-gauze. I avoid this by mounting on the adjacent end of the stone P one or more brushes, P^1, which gently but effectually sweeps over the surface, and removes the fibers which, by reason of their coarseness or their crosswise position, fail to pass through the meshes.

The paper-stock in the chamber T is by the foregoing provisions assured of being approximately fine; but it is here subjected to a still further treatment between tumbling-stones *t*. These may be of uniform or differing sizes. It may in most cases be left largely to chance. Their action in tumbling upon each other and upon the bottom of the casing in the presence of the weak lye still more finely disintegrates the material.

Valves U, of which two are shown, (but there may be a greater or less number,) are provided in the end of the large case T, near the periphery. Each has two pins or arms, u^1 u^2, which are alternately touched to open and close the valve as the case revolves. As the valve descends its pin or arm u^1 is touched by the arm A', which extends inward from the stationary framing. This opens the valve U, and the weak lye, with its load of fiber, is thenceforward discharged through the valve until the valve U rises on the opposite side sufficiently to bring its pin u^2 in contact with the arm A'. This closes the valve. Each valve therefore is opened in the lower half and closed in the upper half of its circuit. The effect is to discharge the dense fluid in the bottom, and to retain whatever steam or gaseous fluid may be in the upper part.

The periphery of the chamber T, as well as that of the chamber O, is lined with stone. A screen of wire-gauze, V, is interposed within the chamber T, to serve as a strainer and prevent the escape of any material until it has become very fine. I can brush the inner face of the screen V by a revolving brush hung in a hanger analogous to the brush P', which is worked in the chamber O; but I believe that a sufficient cleaning action can be induced at this point by a properly-constructed brush working on the outer or discharging face of the wire-gauze, as represented by W. In either position the brush W hangs in the lower half of the circle, and, pressing greatly against the wire-gauze, tends to clear away any accumulation of fiber. Partial partitions T^1 T^2 extend inward near each end of the chamber T, and serve to retain the loose stones endwise. It prevents them from acting with much violence against the wire-gauze partitions. I believe that the partial partition T^2 may, in most cases, be dispensed with, and only the partition T^1 be used, relying upon the considerable offset at the other end of the chamber T to receive the greatest force of the stones *t*. It will be rare that any of the stones *t* will tumble with much violence against the screen R between O and T.

The fibrous material in the discharged stock may be separated from the weak lye by any suitable means, and the lye pumped over and again sent through the machine. The condensation of steam in the first chamber tending to weaken it, as it is successively reused, it may be compensated for by the addition of fresh soda or potash from time to time; but it should always be kept weak.

Hand-holes may be provided at suitable points. One, X, is shown in the discharge end of the chamber T, through which fresh stones may be introduced as the previous lot becomes worn down.

Modifications may be made. A single chamber may take the place of the double one M N, in which to effect the steaming, or the chamber may be divided into more than two.

There may be two or more of the chambers O, in each of which shall hang a stone, P. There may be two or more of the chambers T, in which the stones *t* shall tumble; or I may dispense entirely with one of these, and use only the chamber O or the chamber T in which to disintegrate the material after its treatment in the first chamber or chambers M N.

Instead of stopping the machine to charge it, the construction of the doors allows of their being opened and closed while the machine is run slowly, and I can supply the machine by simply slowing it and closing the steam-cocks *m' n'*, opening the doors, and introducing the

mate al by a dexterous movement while the mach e is running, and then closing the door agai and again admitting the steam.

I b ieve the machine may be worked succes ly, running constantly at so slow a rate as w allow this to be done.

I p pose to give the material a preliminary soak g in weak lye at a high temperature for a lon time, and thereby greatly shorten the time which the treatment may be complete in my mill. If the material is thus suffic ntly softened by preliminary boiling in weak ye, I believe that my machine may be used ith some success without introducing weak ye in it at all, but simply draining the previ sly-soaked material and introducing it in y machine, and treating it then with hot w ter or steam alone during the grinding.

Th wood may be introduced in any form whic s sufficiently fine to allow the several piece to be readily permeated and acted on by th gentle chemical agencies of heat and weak ye. I prefer the form of long fine shavings, nalogous to hairs used in mattresses, and f packing purposes, under the name of "Ex sior."

Fi 4 shows a plan which I propose to employ r sharpening the stony surfaces. It sharp ns the acting-surfaces both of the lining *o* and f the suspended stone P.

Th sharpening is effected by a loose roller havi its periphery armed with points of hard ed steel. To effect the sharpening, the susp ded stone P is raised by shortening the chain *p*, so that the space between that stone P an the lining *o* is nearly equal to the diamet of the sharpening-roller. This latter, havi hard steel points, is introduced, by hand r otherwise, in the proper position, and, the l being slowly turned, is allowed to roll t ough the space until it emerges at the other ide of the stone P. Then it is picked up b hand or otherwise, and is again transferre over to the entering side. A succession such treatment soon sharpens the surface the lining *o*. It sharpens the periphery o the acting-surface of the stone P to a still eater degree, because of the less surface which the action is concentrated.

A rtion or all of the stone used as the grinding-surface in my mill may be that commonly known as "emery." Some of the compounds in which emery, or other, or analogous material is employed may be used; but I prefer the natural stone. Burr-stone, emery-stone, or other hard varieties, including corundum, black diamond, &c., may be used.

My mill can be worked with no softening agent further than steam or hot water, or even without heat at all; but I believe it will be always expedient to use both heat and a weak alkali.

I claim as my invention—

1. The chambers M N, with their provisions for receiving and discharging material, in combination with the grinding-chamber O and the controlling-valves M^2 N^2, as herein specified.

2. The stone P, adjustable chains *p*, and rings *q*, inclosed within a revolving chamber, O, in combination with provisions for the reception and discharge of material, as specified.

3. The stone lining *o* of the revolving case O, in combination with the suspended stone P, as and for the purposes herein specified.

4. The foraminous partition R between the chambers O and T, and their inclosed grinding means P *t*, and with a clearing brush or brushes P′, as herein specified.

5. The revolving case T, with its loose stones *t*, in combination with provisions for the reception and discharge of the fluid or semi-fluid material, as specified.

6. A revolving casing and grinding means with provisions for introducing paper-stock and fluid, in combination with discharge-valves U and their operating means u^1 u^2, and with stops A′, adapted to serve as and for the purposes specified.

7. The partial partition T^1, in combination with the revolving chamber T, screen R, and tumbling-stones *t*, arranged to serve as and for the purposes herein specified.

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

BENJAMIN F. BARKER.

Witnesses:
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J. M. TYLER.