

W. A. DOANE.
Machinery for Grinding Wood for Paper-Pulp.
No. 224,002. Patented Feb. 3, 1880.

Fig. 1.

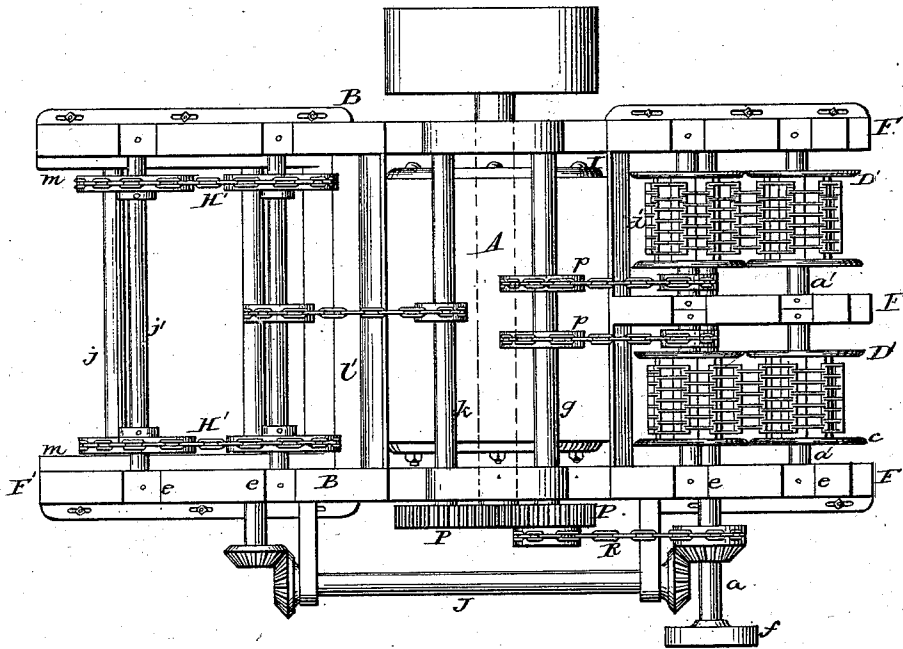
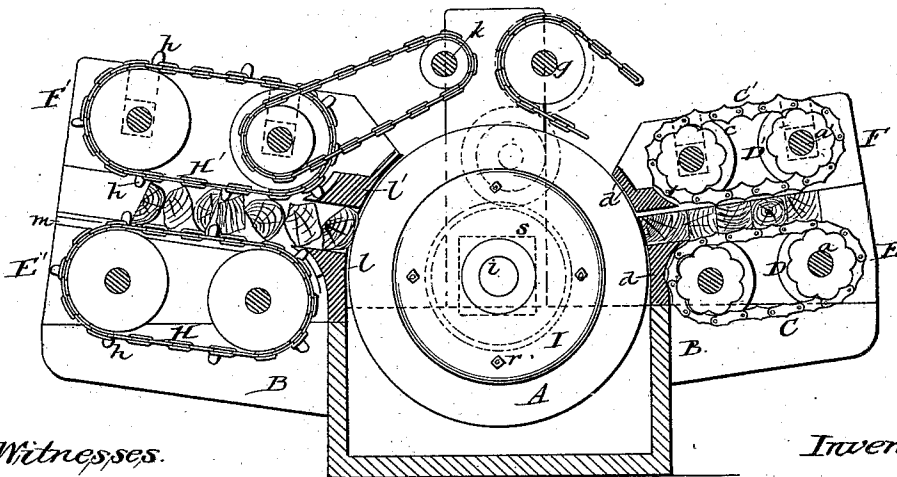


Fig. 2.



Witnesses.

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Inventor

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Fig. 3.

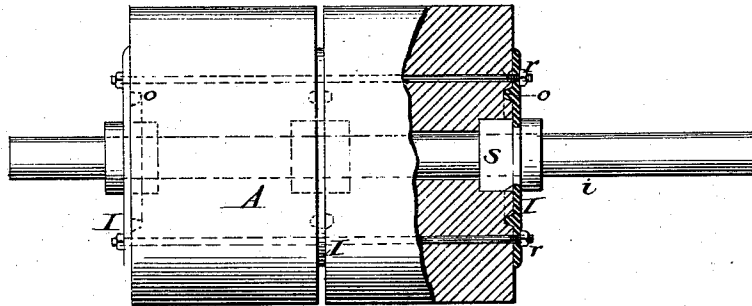


Fig. 4.

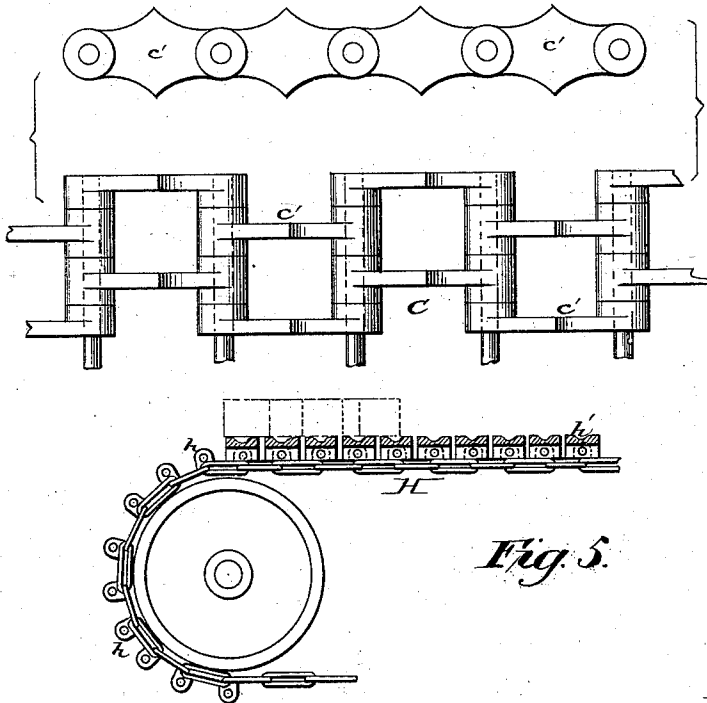


Fig. 5.

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WILLARD A. DOANE, OF ROCHESTER, NEW YORK.

MACHINERY FOR GRINDING WOOD FOR PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 224,002, dated February 3, 1880.

Application filed November 23, 1878.

To all whom it may concern:

Be it known that I, WILLARD A. DOANE, of Rochester, in the county of Monroe and State of New York, have invented certain useful Improvements in Machines for Grinding Wood for Paper-Pulp; and I do hereby declare the following to be a full and accurate description of the same, reference being had to the accompanying drawings, in which—
Figure 1 is a plan view of my invention.
Fig. 2 is a sectional side elevation. Figs. 3, 4, and 5 show details and modifications.

The object of my invention is to provide an automatic and self-adjusting feeding device for wood-pulp grinders, which shall receive blocks of various sizes and shapes, and feed them in a continuous mass to the grinding-surface, the grain of the wood always lying parallel with the latter; and it consists more especially in the employment of continuously-revolving metallic chains or platforms having suitable lugs or teeth, which engage with the surface of the material and force it constantly forward against a cylindrical grinder; and it further consists in a method of supporting the grinding wheel or stone upon its shaft, and in various devices for practically carrying out the more important parts of the invention.

It is well known to those acquainted with the art of grinding wood for paper-pulp that the varieties of wood generally used for that purpose contain knots, dark spots, and portions unfit for pulp, and that these have to be removed by sawing or splitting the wood into fragments of various sizes.

In many of the machines heretofore in use the feed-works were not arranged to receive any but dimension stuff regularly cut or sawed, and consequently all the material had to be reduced to the size of the smallest block or such pieces be entirely lost.

By the coaction of the feeding devices hereinafter described I am enabled to reduce to pulp blocks of various sizes and shapes, but one dimension only being uniform, or approximately so.

A is a grinding-wheel, which I prefer to make of some close-grained hard sandstone. B is the main frame, having suitable bearings for the shaft *i* of the grinding-wheel and a tank underneath the latter for receiving the

pulp. C C' are endless metallic belts or platforms, supported and driven by sprocket-wheels D D' and shafts *a a'*. These belts are preferably made up of metallic links *c'*, Fig. 4, shaped substantially as shown, so as to present to the wood a corrugated or uneven surface, and thereby grasp it and force it along to the grinding-surface.

The sprockets D D' are made to conform to the inner surface of the belts for the purpose of driving them.

I prefer to use two of these belts together, as indicated in Fig. 2, between which the wood is forced to the grinding-surface; but one belt only may be used, the other being replaced by a smooth bed-plate or channel, along which the wood is forced by the corrugations of the belt. The set of shafts *a*, driving the lower belt, have stationary bearings in the secondary frame E, attached to the main frame by bolts through slots, as indicated in Fig. 1, and the shafts *a'* of the upper belt are journaled in boxes *e*, made vertically adjustable in a second frame, F, which is attached to frame E in the same manner as E is to main frame. I have shown two sets of these endless belts lying side by side and arranged to feed against the same grinding-surface; but it may be advisable to use four or six sets together, either of the same or different widths, to accommodate blocks of various lengths, the total space occupied being about equal to the length of the grinding-surface, and when so duplicated or multiplied the shafts *a* extend through and carry all of the lower sprockets, D, while the upper shafts are separate and independent for each belt C'. These shafts and feeders may be driven as follows: Power is conveyed to the wheel *f* on one of the non-adjustable shafts *a* in any suitable way, so that its speed shall correspond with the grinding capacity of the stone. From this shaft the counter-shafts *g k* are driven by means of a chain-belt, R, and gears P, (shown in dotted lines in Fig. 2.) The counter-shaft *g* has a series of sprocket-wheels, *p*, corresponding to the number of belts C', and chain-belts run therefrom to drive the latter.

It will be seen from the foregoing that each feeder C' is independent of every other, and that each will adjust itself to variations in the size of the blocks fed in, the weight of the

sprockets, shafts, belts and boxes being utilized in securing a sufficient adherence of the corrugations to the material to feed it along. By judiciously proportioning the width of the belts C' C, when several pairs are used in the same machine, each pair may be used for blocks of a certain length; or they may be wide enough to receive several lengths of blocks together, the depth or thickness only being uniform, or nearly so, thus providing for the working up of stock of almost any size or form. If for any reason the weight of the belts and wheels should not be sufficient to force in the stock, weighted levers may be placed over the boxes *e*.

A bed-plate, *d*, for supporting the blocks against the grinding-surface, is secured to the lower adjustable frame, B, and a corresponding guide-plate, *d'*, is attached to the frame F. Thus all these parts may be adjusted to the stone as it wears away, the feeders C' C' advancing equally and retaining their relative position to the plates *d d'*.

The sprockets D D' are provided with flanges *e*, Fig. 2, to prevent the belts from getting out of line; and if desirable these flanges may extend somewhat beyond the surface of the belts, as shown in Fig. 1, so as to form a channel, down which the blocks pass.

H H' is a set of chains and sprockets, arranged on the side of the axis *i* opposite the feeders C' C', said chains being provided with lugs *h* at suitable intervals for the purpose of engaging with and forcing in the blocks presented to them. The upper and lower sets of sprocket-shafts are boxed, respectively, in frames E' F' in the same manner as the shafts *a a'*, and these frames are similarly adjustable on the main frame B. Grinding bed-plates *l l'* are also provided on these frames, similar to *d d'*. I prefer to have this set of feeders occupy the entire width of the grinding-surface, so as to receive sticks as long as the inside width of the frame B, or thereabout; but two or more sets of such chains may be used, as may be deemed desirable. Guide-bars *m* are attached to the frame B at or near the upper surface of the chains H, upon which the ends of the sticks rest as they are fed to the grinding-surface.

The object of this arrangement is to receive and feed irregular or split wood, as indicated in Fig. 2, the length being the only essential dimension, and that not necessarily exact. The sticks are laid upon the lower set of chains with the grain parallel to the periphery of the grinding-cylinder, or nearly so, and the lugs *h* force the mass continuously toward the grinding-surface. As the lugs reach the plates *l l'* they pass through slots therein, and, being rounded at their extremity, they pass away from the sticks at that point without interfering with the continuous movement of the mass.

Thus it will be seen that by the combination of the devices for feeding the material above described I am enabled to utilize and

reduce to pulp all of the fragments into which it is necessary to cut the stock without being obliged to render it into blocks of uniform size, and, furthermore, that the material is presented to the grinding-cylinder upon both sides of its axis in a continuous mass, which may be replenished from time to time as it is ground away without intermitting the feeding action.

One pair of chains, H, only may be used if desirable, the other being replaced by a smooth plate or channel, as mentioned with reference to the platforms C' C'.

When long sawed blocks are to be pulped fluted slats *h'*, Fig. 5, may be attached to the lugs on the chains H H' in any suitable manner, thus forming a wide endless platform extending the entire width of the frame B, and operating similarly to the narrower belts, C' C'.

The lower chains, H, are driven from the feed-shaft *a* by means of the shaft J, Fig. 1, and suitable gearing, and the upper set, H', may be operated from the counter-shaft *k*, already mentioned, by means of sprocket-wheels and chains or other suitable devices.

A great objection heretofore existing to the use of sandstone as a grinding medium has been the difficulty of obtaining blocks of sufficient size that were homogeneous in texture.

To obviate this trouble, and at the same time provide a secure fastening of the stone to the shaft, I provide large plates I, Figs. 2 and 3, securely bolted to the ends of the cylinder of sandstone by bolts *r*, passing entirely through the latter, and the cylinder may be made up of several longitudinal sections or disks, either placed with their faces in contact or plates I placed between them, as indicated in Fig. 3, the bolts binding the whole firmly together. The plates I are fitted to the shaft *i* and are rigidly secured thereto in any suitable manner. A circular flange, *o*, is formed upon the plates I, which projects into and exactly fits a groove cut in the sections of stone. A square boss, *s*, is also provided at the center of the plate I, which is fitted into a corresponding recess in the eye of the stone.

The boss *s* and bolts *r* operate to drive the stone circumferentially, assisted by the friction of the plates and flanges *o*, while the latter support the sections in exact centrality to the axis and in relation to each other, and at the same time act as bands to prevent bursting.

This construction can also be applied to advantage to stones cut from a single block.

When it is desirable to have a continuous grinding-surface the plates I may be let into the disks and the faces of latter thus brought together.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In combination with a cylindrical grinding stone or wheel, one or more continuously revolving chains or belts provided with lugs or projections for engaging directly with the

material to be reduced to pulp and forcing it against the grinding-surface, substantially as described.

2. In combination with a cylindrical grinding stone or wheel, the endless revolving corrugated platform or platforms *C C'*, arranged to receive the wood and feed it in a continuous mass to the grinding-surface, substantially as set forth.

3. In a wood-pulping machine, the endless feeding belt or platform composed of links *c'*, having projections on their edges for engaging with the surface of the wood, substantially as set forth.

4. In combination with the endless revolving-feeding platform *C*, the secondary feeding chains or belts *C'* and sprockets *D'*, the shafts of which are free to move vertically and permit the passage of blocks of various sizes, substantially as set forth.

5. In combination with a grinding wheel or stone and endless revolving platform or platforms *C*, the chain-feeders *H' H'*, provided with lugs *h*, and the guide-bars *m*, for feeding irregular and split sticks, substantially as set forth.

6. In combination with the self-adjusting feeding platforms or belts *C'*, the counter-shaft *g* and sprockets or pulleys *p*, driven in any convenient manner from the main feed-shaft *a*, for the purposes set forth.

7. In combination with the feeding mechanism *C C' a a'*, the connecting-shaft *J* and gears, arranged to operate the feeding-chains *H*, substantially in the manner set forth.

8. A cylindrical grinding stone or wheel composed of two or more longitudinal sections or disks supported and driven by plates *I* and flanges *o* thereon, such plates being placed at the ends of cylinder or between the sections, or both, substantially as and for the purposes set forth.

9. As an improvement in hanging stones for grinding wood-pulp, the flanges *I*, provided with flanges *o* and square boss *s*, said plates being secured to the stone and to each other by bolts *r*, substantially as and for the purposes set forth.

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Witnesses:

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