W. A. DOANE.

Machine for Making Paper Pulp from Wood.

No. 202,097. Patented April 9, 1878.

Fig 1.

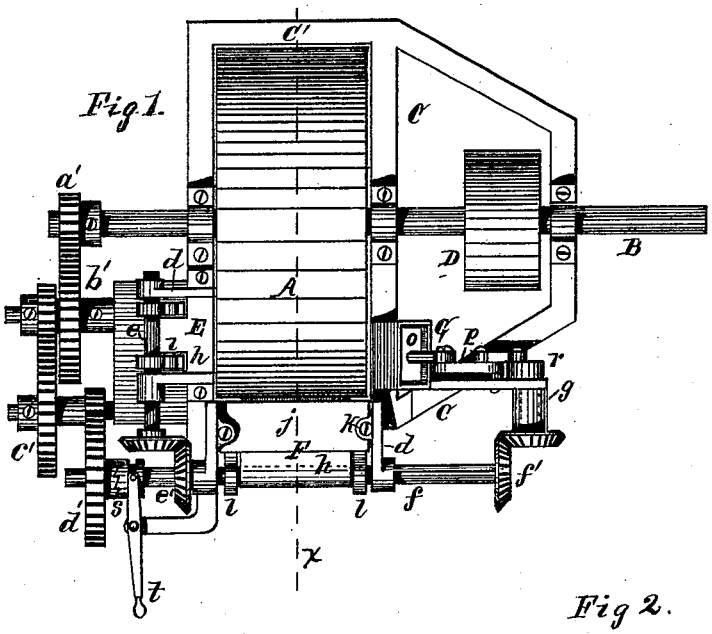


Fig 2.

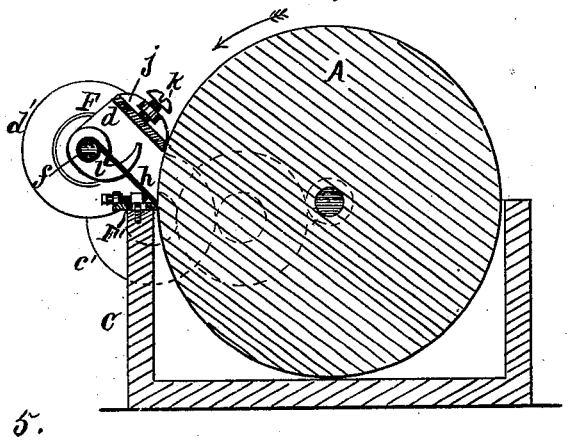


Fig 3.

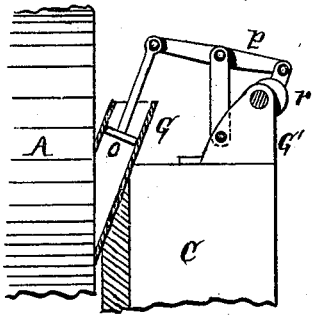


Fig 4

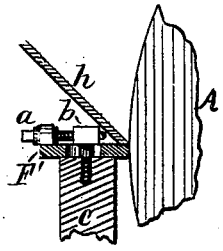


Fig 5.

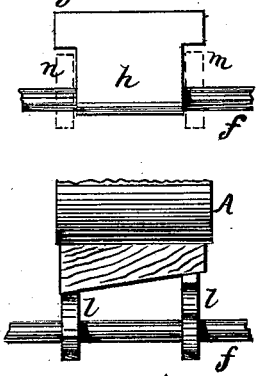
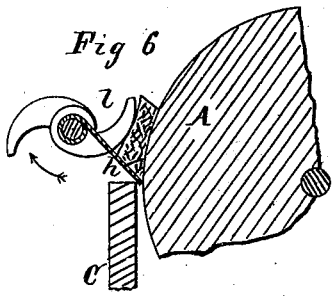


Fig 6



Witnesses:

Thos. L. Turner

John Mitchell

Fig 7.

Inventor:

Willard A. Doane

per Frank H. Clement

Atty

UNITED STATES PATENT OFFICE.

WILLARD A. DOANE, OF ROCHESTER, NEW YORK.

IMPROVEMENT IN MACHINES FOR MAKING PAPER-PULP FROM WOOD.

Specification forming part of Letters Patent No. **202,097**, dated April 9, 1878; application filed March 5, 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 new and useful Improvements in Paper-Pulp Machines; and I hereby declare that the following is a full and accurate description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of my invention. Fig. 2 is a sectional elevation, showing the parts to the left of the dotted line *x*, Fig. 1. Fig. 3 shows a modification of one of the feeding devices. Figs. 4, 5, 6, and 7 show other modifications and details.

My invention relates, mainly, to methods of feeding blocks of wood or other similar substances to a rotary disintegrating wheel or wheels, for the purpose of reducing them to pulp, and to mechanism for operating the several feeding devices; and it consists, principally, in such an arrangement and combination of feeders that the stone or wheel is utilized to its greatest capacity; and it further consists in various devices and combinations of parts by which such arrangement is made practically available.

A is the disintegrating wheel or stone, secured to the shaft B, which has bearings in the frame C, and is driven by the pulley D. This disintegrator is preferably made from a sharp, close-grained, tough sandstone, known as "Hulberton" sandstone, and it is dressed to grind upon its periphery and upon both sides nearly to the eye. It might, however, be desirable to use a metallic wheel, roughened on its faces and periphery, or carrying a coating of emery or sand, the material used for disintegrating not affecting my invention in any substantial manner.

That part of the frame C immediately under the stone A is a water-tight box or trough, into which the reduced pulp falls, together with the water used in the grinding process, and from which the said contents may be removed in any convenient way.

E, F, and G are cells or chutes for holding the stock to be reduced, and they are arranged two upon the opposite sides or faces of the stone, and one upon the periphery, as indicated. These chutes are firmly but adjustably attached to the frame C, and are placed with their inner edges close to the grinder A. As the latter wears slowly away it will be necessary to adjust the chutes toward it, and for this purpose I use the plan shown in Fig. 4. F′ is the base-plate of the chute, which is slotted to receive the bolt *b*. The latter is a shoulder-screw, and, while firmly holding the chute to the frame C, still allows it to be adjusted thereon by means of the lateral screw *a*, which is shouldered into a lug on the flange F′, and threaded into the head of the bolt *b*.

The cells E and F are, preferably, similar in construction, the sides *d* being formed in one piece with the base-flange F′, and arranged to carry the bearings for the feed-shafts *e* and *f*, as indicated.

The bottoms *h* of these cells are supported by the shafts *e* and *f* or by their bearings, and their inner ends rest upon the flange F′ or upon the top of the frame C. This construction forms an incline from above the feed-shafts down to the stone upon which the stock moves. Cams *l* are secured to these shafts, and arranged to revolve just inside the cells E and F, notches *m n*, Fig. 5, being cut out of the incline *h* at the sides to allow them to pass. These cams are preferably made in the involute form shown, and, as they revolve slowly in the direction indicated in Fig. 6, force the blocks of wood down the inclines *h* into contact with the revolving stone; and it will be observed that the relative position of the incline and the stone is such that this feeding action is thereby induced to a great extent, thus preventing the blocks from being thrown out when the cams leave them. The inclines *h* also conduct water and pulp, which is thrown from the stone back into the vat under the latter.

The cams *l* are shown as extending half a circumference, and thereby are in action during but one-half the revolution of the feed-shafts; but this proportion may be varied according to circumstances, as, for instance, they may occupy three-fourths or two-thirds of a circumference, the interval during the remaining portion of the revolution giving the operator opportunity to introduce the blocks into the cell, which is done by laying them upon the pro-

jecting cams, by which it is carried into the cell and down the incline *h*, with the grain parallel to the grinding-axis.

It may be advisable in some cases to set the cams opposite each other on the feed-shaft, as indicated in Fig. 6, whereby two sets of short blocks may be fed in alternately, either one or the other being in constant contact with the grinding-surface; or the cams of each pair may be so relatively set that the blocks will be forced down diagonally with the grain, as indicated in Fig. 7. By this method a shorter fiber would be produced than that obtained by feed-cams in exact alignment; for it is plain that the nearer parallel with the grain the grinding is done the longer will be the fiber.

Furthermore, if it is desirable to produce a very short-fibered pulp, several cams may be placed near together along the shaft *f*, and the wood fed to the grinding-surface endwise of the grain. In fact, my method of feeding is capable of many modifications, so as to produce pulp of different grades and quality from various materials; and it may be used on stock in any condition, as well as for waste pieces and chips, that are usually lost with other machines.

Above the incline *h*, and nearly or quite parallel with it, I place a presser-plate, *j*, which is held and adjusted by means of screws *k*, threaded into lugs on the sides of the cell F. The blocks of wood are first sawed to a definite thickness, and the presser-plate is then adjusted so that they move easily down the incline. By this means the blocks are held firmly up to the stone, and are prevented from being rolled over by the latter or lifted by the action of the cam.

The feeder G is of somewhat different construction. It consists of a square or rectangular box placed at a slight angle with the face of the stone, in which a plunger, *o*, Figs. 1 and 3, fits loosely. This plunger is worked by a crank, *r*, upon the feed-shaft *g*, by means of a lever, *p*, and its stroke is such that when at its upper extreme there is space enough to allow the introduction of stock into the cell G. This feeder is designed to be used in connection with the regular block-feeders E and F, for the purpose of working up small pieces, chips, &c., which would otherwise be wasted, and it is obvious that the plunger will push such material down the inclined cell against the stone, where it is reduced to pulp. The cell G is also made adjustable toward the stone, in the manner shown in Fig. 4, or in any other suitable manner.

For the purpose of operating the feeding devices described I provide a pinion, *a'*, on the main shaft B, which actuates the train *b' c' d'*, the latter moving the main feed-shaft *f*. Bevel or miter gears *e'* and *f'* convey motion to the feed-shafts *e* and *g*. Upon the shaft *f* I provide a clutch, *s*, and shifting-lever *t*, by which all the feed-works may be stopped or started at will, and similar clutches may be provided upon each of the other feed-shafts, if desirable.

In the adjustment of the several feeding devices I prefer that the two upon opposite faces of the stone be set to feed at the same time, thereby balancing the pressure upon the latter, and that the main feeder F be set to operate at alternate intervals therewith. By this means the speed of the stone is rendered more uniform, and the power applied is utilized to better advantage; for if all the feeders were relieved at once the stone and driving machinery would tend to run away, and if all were thrown into action at once the parts would be subjected to undue strain.

It might, however, be advisable in some cases to work these feeders simultaneously, and place a duplicate set upon the opposite end of the frame at C', Fig. 1, and adjust the feeders of the latter set to operate at alternate intervals with the first. This arrangement I should consider an equivalent or modification of that portion of my invention which I call the "conjoint alternate action of the feeders."

Another modification of the same idea may be carried out in the application of the cams to the feed-shaft, as shown in Fig. 6, and hereinbefore described, and in this case the alternate action would be secured by the use of one feeding-cell only.

In practical pulp-making with my within-described apparatus, I prefer to use what is known as "cooked wood"—that is, wood which has been steamed, boiled, soaked, or chemically treated, whereby the fiber is softened and partially separated, and the sap and resinous matter to a great extent removed.

The material thus prepared is reduced with much less expenditure of power than when it is used in a dry or partially dry state, although my apparatus will also operate well on dry stock—much better, indeed, than the disintegrators heretofore in use.

I find that the stone or wheel may be run about three hundred and fifty revolutions, more or less, per minute; but the speed of the feed-shafts *e f g* will depend upon the material to be reduced and its condition, as well as upon the contour of the cams *l*. To regulate such speed it is only necessary to change the proportion of the gearing *a' b' c'* by means of suitable extra gears.

It will be found desirable to cover the grinding-stone with a suitable casing, to prevent the water and pulp from being thrown about the factory; and pipes for conveying water to the stone may be introduced at proper points.

What I claim as my invention is—

1. A rotating disintegrating stone or wheel, A, in combination with cells E, F, and G, and suitable coacting feeding mechanism, whereby reduction of material to pulp is performed upon both sides and the periphery of the stone or wheel, substantially as described.

2. In combination with a grinding stone or wheel, cell or cells E F, and feed-shafts *e f*, the automatically-acting feeding-cams *l*, arranged with reference to each other to feed at alternate

intervals, whereby stock is kept continuously in contact with the grinding-surface, substantially as set forth.

3. A revolving cam, *l*, in combination with a suitable feeding-cell, F, and a grinding stone or wheel, for the purposes set forth.

4. In combination with a feeding cam or cams, *l*, and incline *h*, the presser-plate *j*, for the purposes set forth.

5. In combination with a cam or cams, *l*, and shaft *f*, the incline *h*, provided with slots *m n*, for the passage of the cams, substantially as set forth.

6. In combination with a grinding stone or wheel, A, and feeding-cell G, with plunger *o*, the crank-shaft *g* and suitable connections for operating the plunger, substantially as set forth.

7. In a feeding-cell for pulping wood, the combination of the incline *h*, the adjustable presser-plate *j*, and side plates *d*, the whole made adjustable toward the grinding wheel or stone, for the purposes set forth.

8. In combination with a grinding wheel or stone, the feed-shafts *e f g* and cells E F G, operating conjointly, for the purposes set forth.

9. The combination of a grinding stone or wheel, A, the gear-train *a' b' c' d' e' f'*, the feeding-shafts *e f g*, and clutch *s*, arranged to operate conjointly, substantially in the manner set forth.

WILLARD A. DOANE.

Witnesses:
F. H. CLEMENT,
EDMUND M. DOANE.