(No Model.) 2 Sheets—Sheet 1.

J. JORDAN.

APPARATUS FOR BEATING AND MANIPULATING PAPER PULP.

No. 314,248. Patented Mar. 24, 1885.

Fig. 1.

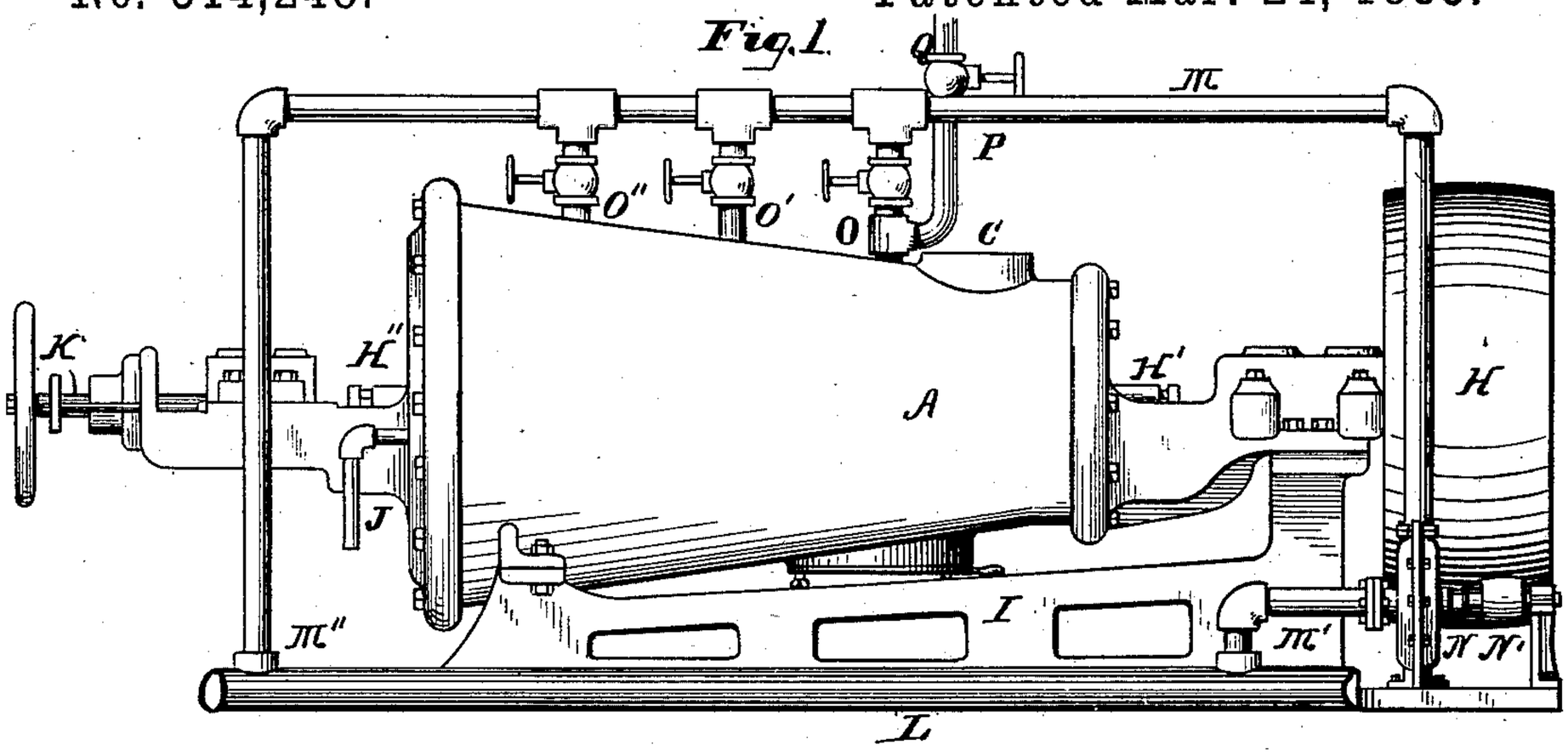


Fig. 2.

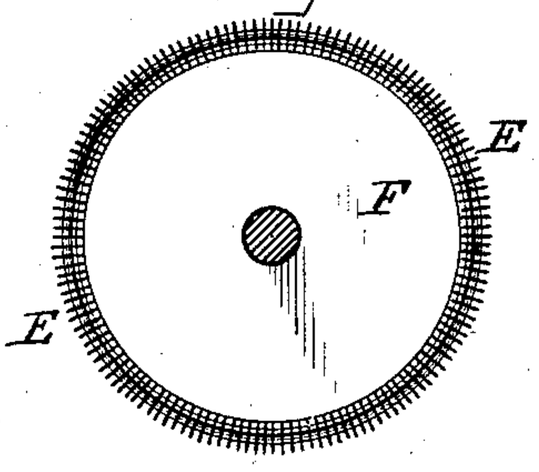


Fig. 3.

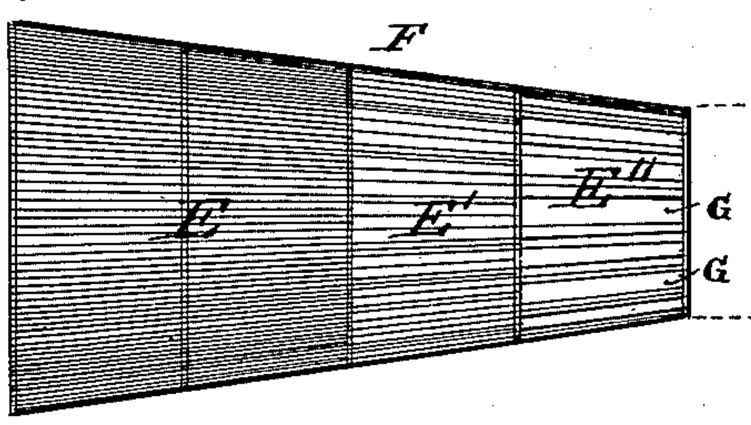


Fig. 4.

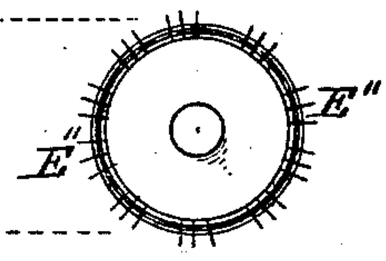


Fig. 5.

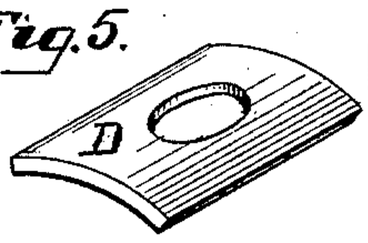


Fig. 6.

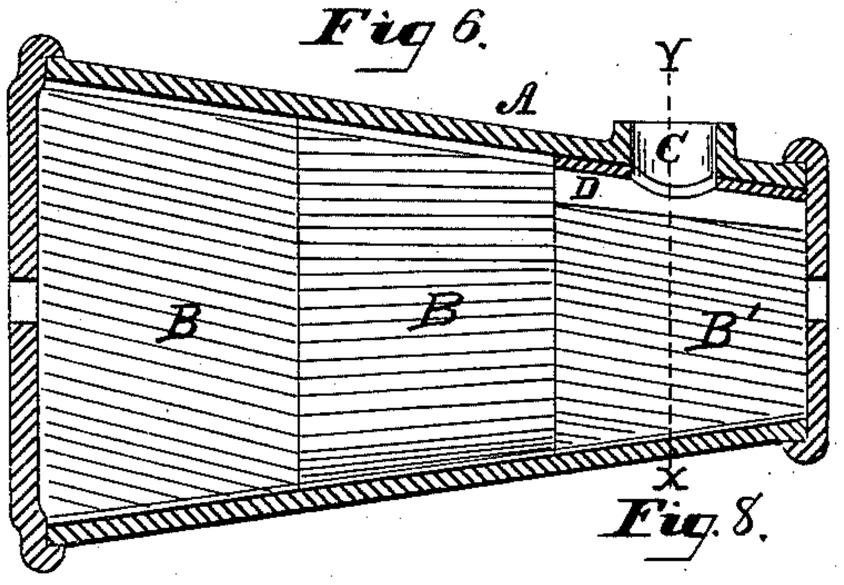


Fig. 7.

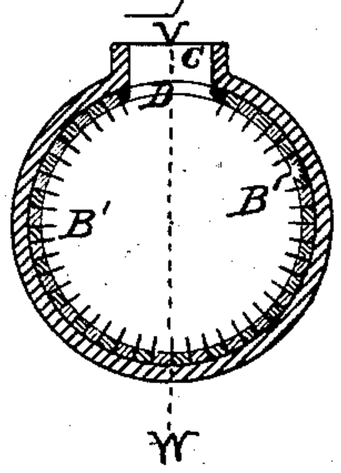
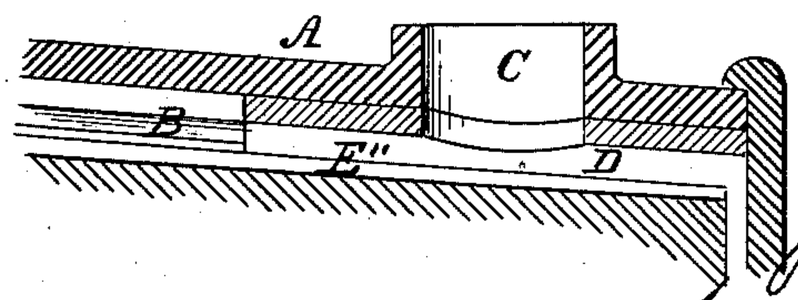


Fig. 8.



WITNESSES:

John W. Orr.

Thos. H. Carson.

INVENTOR:

Joseph Jordan

per George C. Buckley.

Atty.

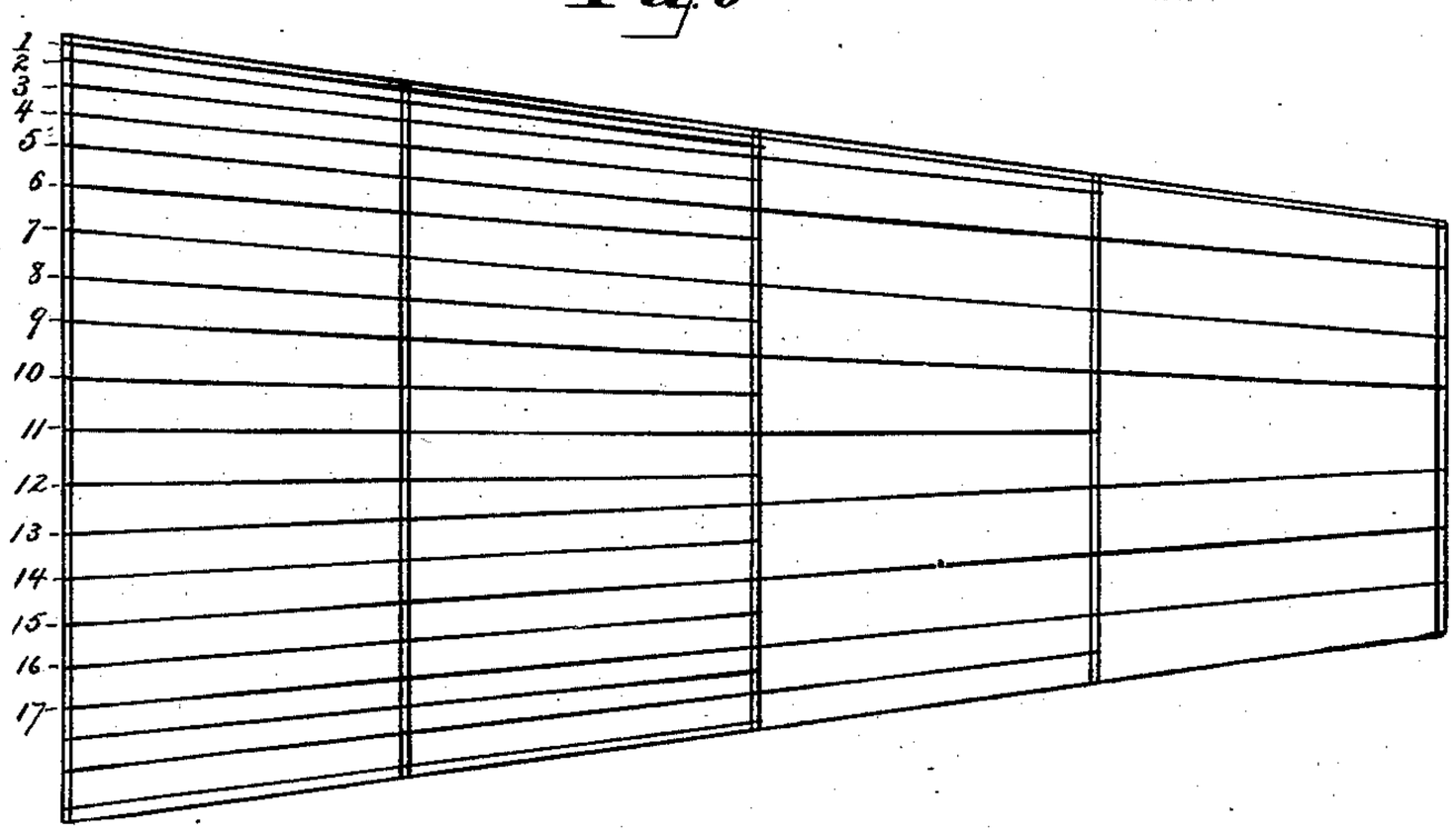
(No Model.) 2 Sheets—Sheet 2.

J. JORDAN.

APPARATUS FOR BEATING AND MANIPULATING PAPER PULP.

No. 314,248. Patented Mar. 24, 1885.

Fig. 9



WITNESSES:

Wm. H. Carson.

John W. Ary

INVENTOR

Joseph Jordan

per George G. Buckley

Atty.

UNITED STATES PATENT OFFICE.

JOSEPH JORDAN, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR BEATING AND MANIPULATING PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 314,248, dated March 24, 1885.

Application filed February 18, 1885. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH JORDAN, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Apparatus for Beating and Manipulating Paper-Pulp; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the annexed drawings, making part hereof.

The object of my present invention is to thoroughly beat the pulp in course of treatment, and to permit the operator to manipulate the same while it is passing through an inclosed pulp-engine, and to secure any desired attenuation, elongation, or drawing of the fibers compatible with the quality of the pulp under treatment, in my specification following I will set forth fully how this is accomplished.

The nature of my invention will fully appear from the following description and claims.

In the drawings, Figure 1 is a side elevation of my device; Fig. 2, an end view of the large end of the revolving beater; Fig. 3, a side elevation of the same, showing the variation in the number of knives from the large to the small end and the pockets or spaces left around the smaller surface between certain of the knives; Fig. 4, an end view of the small end of the revolving beater; Fig. 5, a detached perspective view of the smooth plate surround the interior of the hole where the pulp enters the outer shell; Fig. 6, a vertical longitudinal sectional view on the line V W of Fig. 7; Fig. 7, a cross-sectional view on the line X Y of Fig. 6; Fig. 8, a detached longitudinal view on the line V W of Fig. 7 to show the plate, Fig. 5, when in position. In Sheet 2, Fig. 9, is an enlarged side view of the rotating beater, showing more particularly my arrangement of the knives.

This device is an improvement upon that described in my Letters Patent of May 18, 1858, for grinding and sizing paper-pulp.

A is the outer shell of my engine, consisting of a hollow iron conical frustum armed interiorly with a series of staggered knives, B B B′. (See Fig. 6.) I have shown three sets or series of these knives, but the number of series can be varied—that is, increased in proportion to the length of the engine. The series lettered B′, I carry around the interior face of the shell A to points a short distance upon each side of the hole C, where the pulp enters, and in this space I set a concave metal plate, D, pierced to correspond with the hole C, and extending longitudinally to the small end of the shell A in one direction and to about a corresponding distance along the inner surface of shell A in the other direction. This plate D is of a thickness considerably less than the depth of the knives B′, whereby, as the knives of the inner cone revolve past the point occupied by this concave plate, they will pass an open elongated space of greater area than that of the feed-hole C, which will insure the spreading of the incoming mass of pulp over a greater area of revolving knives than if the feed were direct and simply from the hole C upon the revolving knives. I thus feed upon a greater surface of revolving knives than if the feed were from the hole C alone.

F is the interior revolving conical frustum armed longitudinally with knives E E′ E″. While in the drawings, Fig. 3, there appear to be four series of knives, I generally use but three series, E E′ E″, those of the first series, E, being equidistant from each other at any point of their length. These knives are of three lengths. Every other knife of section E stops upon reaching section E′. In order, however, that my arrangement of the knives may be fully understood, I will number them as shown in Fig. 9, Sheet 2. Knife 1 passes the whole length of the three sections E E′ E″. Number 2 stops upon reaching section E′; number 3 at section E″; number 4 at section E′, numbers 5, 7, and 9 over all three sections; number 6 at section E′; number 8 at section E″; number 10 at section E′; 11 at section E″; 12 at section E′; numbers 13, 15, and 17 over all three sections; 14 and 16 at E′; and so the disposition of the knives is continued until they are all in place. They are set into depressions in iron rings on the face of the rotating beater, and are wedged into place by wooden strips between them, the strips being of less thickness than the depth of the knives. The manner of securing the knives in place is well known in the arts as applied to the well-known Jordan pulp-engine.

I provide the open spaces G G G, which facilitate the traverse of the pulp, by increasing

the propelling force of the small end of the cone, and the clustering of the knives of section E″ will give them strength from their being in juxtaposition, whereas if the large open spaces or pockets were guarded or flanked by only single knives the mass of pulp in the open spaces would place too great strain upon the detached knives. The combined action of three knives in a cluster will result in a more thorough beating of the pulp than would result from that of isolated knives separated by large spaces.

H, Fig. 1, is a pulley mounted upon the shaft of the revolving beater E. This shaft passes through both ends of the engine and is provided with stuffing-boxes H′ H″.

I is the base or bed on which the engine is mounted; J, the exit-pipe for the pulp after treatment; K, a hand-wheel and screw for shifting the position of the inner beater, F. This screw controls an iron strap, attached to which are two bolts connected with the movable bearing in which the end of the shaft of the beater rests, and by turning this wheel or screw this bearing of the shaft is shifted, (drawn out or pushed in,) whereby the beater is moved toward one end or the other of the frustum A and the space between it and the inner face of the frustum A—that is, between the grinding-surfaces—is increased or diminished. The details of construction of this device are, however, well known to those skilled in the art of making these engines.

L is a main water-pipe connected with the street-main; M, a water-pipe leading from the main water-pipe at M′ and uniting with it again at M″; N, a fan or other pump located upon pipe M to drive water through the latter under greater pressure than that from the main pipe for the purpose of driving water into the engine under force sufficient to overcome the back-pressure caused by the revolving grinder or beater.

O O′ O″ are three short pipes furnished with cocks or valves, and connecting the pipe M with the interior of the engine at three different points along the top of the latter.

P is a steam-pipe from a boiler, to admit steam to the engine below the cock of pipe O; Q, a valve on the same. The pump N is driven by a pulley, N′. The object of these pipes is to permit the operator to admit a strong current or jet of water into the engine between the grinding-surfaces at any desired point of the manipulation of the pulp, and to regulate the quantity so admitted. The object of so admitting water is to attenuate the pulp being treated by thinning it, to increase the rapidity of its travel in the closed engine. By so attenuating it the pulp becomes spread over a larger amount of surface than it would occupy while in a denser condition. This I control in transit. The old method necessitated the attenuation of the pulp or its conversion to a desired density to flow in a current before it entered the engine, while by my method I accomplish this while it is in transit through the engine, regulating my supply of water at any one or more of the pipes O O′ O″ in such manner that I control the trituration, manipulation, or attenuation of the fibers best suited for the manufacture of the various grades, qualities, or textures of paper desired to be produced. In this way I can produce a stronger and more flexible paper from less of the stronger and most expensive fibers, commonly called "hard stock," than would be necessary by old methods, thereby lessening the cost and increasing the product. In old methods, as I mentioned above, the pulp flowed or passed through the engine at one uniform density, as there was no means of changing the density of the pulp from its entrance to its exit from the engine. The passage of the pulp depended entirely upon the motion of the grinder.

The operation of my device is as follows: My pulp is fed to the engine through opening C in as dense a condition as is compatible with its reception into the engine. It then spreads over the area of knives opposite to the space made by the thin plate D, and the grinding begins. The knives of the revolving beater keep the pulp in motion, and the increasing diameter of the engine toward the large end thereof induces a gradual traverse of the pulp from the entrance-point to the large or discharge end. The judgment of the operative, which in old methods was required to be exercised in converting the pulp to the proper density before it entered the engine, is now exercised in manipulating and attenuating it during its transit through the same. The feed and discharge of the pulp are continuous. The condition of the pulp coming from the engine will be his guide, if he is skilled in the art. Should he find it too "slow"—that is, the pulp and the water having too great an affinity for each other—he applies the water at an early stage, say from cock O, near the small end of the engine, which decreases the density of the pulp and increases the velocity of its movement, whereby it is subjected a less time to the beating action of the grinding-surfaces. In consequence the water is caused to shed or separate from the pulp more freely. If, on the contrary, it is necessary to create the greatest affinity between the fiber, water, coloring-matter, and other foreign material, the less application of water through the pipes at the small end the better. The water should then be applied at a point where the mass is subjected to the greatest amount of grinding-surface—viz., say through pipe O′ or pipe O″, near the discharge end. All the variations necessary to produce variously desired results will suggest themselves to one skilled in the art of beating pulp, according to the nature of the fibers to be treated from time to time.

When my engine is in operation, I provide means to keep up an even supply or pressure of water to the pipes O O′ O″. In the apparatus shown I use a rotary pump, N, from a main water-pipe, as shown. There are other

means of keeping up a steady pressure—for instance, a supply from an elevation, an elevated tank or reservoir, would insure the necessary uniform pressure. The rapid revolution of the beater F creates a pressure outward, and the head of the incoming water through pipes O O′ O″ must be sufficient to overcome this pressure to insure its entrance.

If it becomes necessary to increase the temperature of the contents of the engine, the cock of pipe O is closed and the valve Q is opened, when steam is admitted through the pipe P.

R is a box, called a "sand-catcher," to catch sand, grit, and other deleterious matters which might injure the knives. It opens through the lower part of outer shell, A, into the interior.

The pipe M enters the main pipe L after passing pipe O″, and returns thereto any surplus water not used, thus keeping up a constant circulation of water and maintaining an even pressure.

The feed of pulp to the engine is sustained in the usual way by a pump or other well-known device.

In addition to the advantages above named, I might mention that my invention increases the product, results in less flouring, and creates greater affinity between the fibers than other methods. It increases the fulling properties of the same, and results in producing greater affinity of the fibers for all foreign or mineral substances which may be manipulated with the pulp, and it lessens the amount of coloring-matter necessary to produce the desired result.

I have shown my knives in section E″ in clusters of three knives, each with spaces or pockets G between the clusters. This arrangement, so far as regards the number of knives in a cluster, can of course be varied and the principle of the construction be still maintained. Thus two or four or five knives could be used in a cluster and approximately the same results be obtained. The passages, pockets, or spaces G G in either case will insure the rapid passage of the pulp toward the larger end of the engine.

I am well aware that pulp has been heretofore attenuated by the addition of water before it enters the closed grinder or as it runs in, and I do not claim this process, which is well-known. This part of my invention refers particularly to watering it after it has actually entered the grinder and is being ground.

What I claim as new is—

1. In a closed pulp-beating engine, the combination of the outer conical frustum, A, the inner conical frustum, F, the opposing frictional surfaces of which are armed with grinding serrations or knives, and two water-pipes, O O″, provided with suitable cocks, whereby water can be projected into the interior at one or two different points in the operation of grinding, substantially as described.

2. In a closed pulp-beating engine, three water-pipes, O O′ O″, provided with suitable cocks and projecting through the outer shell, A, whereby water can be projected into the interior at one, two, or three different points in the operation of grinding, substantially as described.

3. In a closed pulp-beating engine, a water-pipe O, provided with a suitable cock and projecting through the outer shell, A, whereby water can be projected into the interior at a point beyond that where the operation of grinding begins, substantially as described.

4. In a closed pulp-beating engine, the water-pipe O, projecting through the outer shell, A, and provided with a suitable cock, and steam-pipe P, connected with an opening through the outer shell, A, whereby either steam or water can be projected into the interior between the grinding-surfaces at will, substantially as described.

5. In a closed pulp-beating engine, the water-pipe O, projecting through the outer shell, A, at one end provided with a suitable cock and connected at the other with a water-supply pipe or conduit, whereby water can be projected into the interior, substantially as and for the purposes described.

6. In a closed pulp-beating engine, the water-pipe O, projecting through the shell A, at one end provided with a suitable cock, and connected at the other end with a water-supply pipe or conduit, and a pump, N, to project water under pressure into the interior of the pulp-engine, substantially as described.

7. In a closed pulp-beating engine, the water-pipe O, provided with a suitable cock and projecting through the shell A at one end and at the other attached to a water-supply pipe, M, which latter is connected at both ends with and draws from and empties into a main water-supply conduit or holder, L, substantially as and for the purpose described.

8. In a closed pulp-beating engine, the combination of the outer conical frustum, A, and the inner conical frustum, F, the opposing frictional surfaces of which are armed with grinding serrations or knives, the section E″ of the smaller end of the inner frustum having its knives arranged in close clusters of two or more, with open spaces or pockets G between the clusters wider than the spaces between the knives forming said clusters, substantially as and for the purpose described.

9. In a closed pulp-beating engine, the combination of the outer conical frustum, A, and inner conical frustum, F, the opposing frictional surfaces of which are armed with grinding serrations or knives, the section B′ at the smaller end of said outer frustum being provided with a space containing the concave plate D, free from knives, immediately surrounding the opening C, to attain a larger feeding-surface upon the revolving interior frustum, substantially as described.

10. In a closed beating-engine where pulp

is ground between two grinding-surfaces, the process of continuously grinding the same and introducing water at various stages of the process of grinding to attenuate the mass being treated, substantially as described.

11. In a closed beating-engine, wherein pulp is ground between two grinding-surfaces, the process of continuously grinding the same and introducing water to the mass actually being treated at various stages of the operation of grinding to attenuate the mass being treated, substantially as and for the purposes described.

JOSEPH JORDAN.

Witnesses:
H. V. BUCKLEY,
WM. H. CARSON.