

(No Model.)

2 Sheets—Sheet 1.

S. M. ALLEN.

MANUFACTURE OF PAPER PULP.

No. 253,655.

Patented Feb. 14, 1882.

Fig. 1.

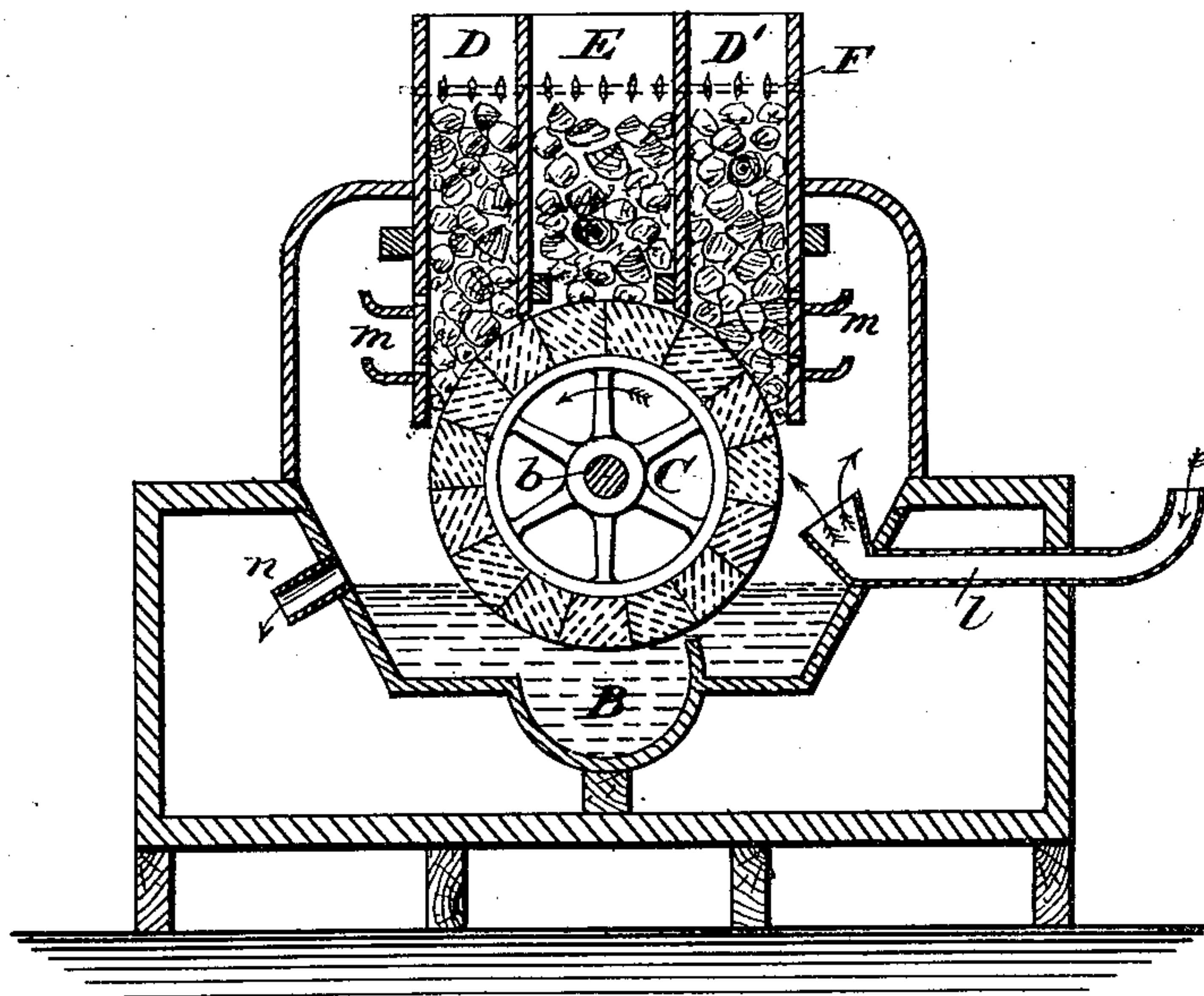


Fig. 2.

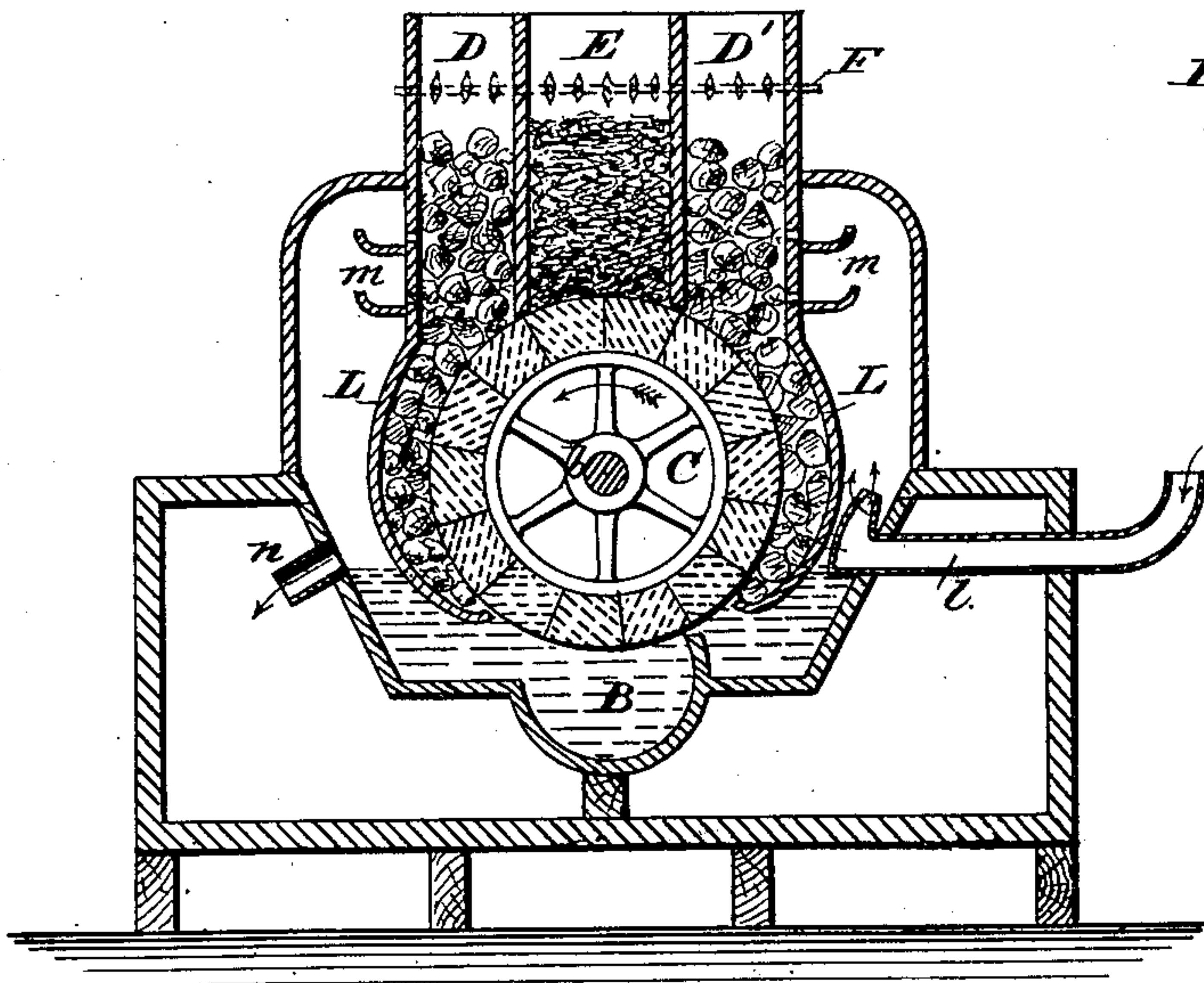
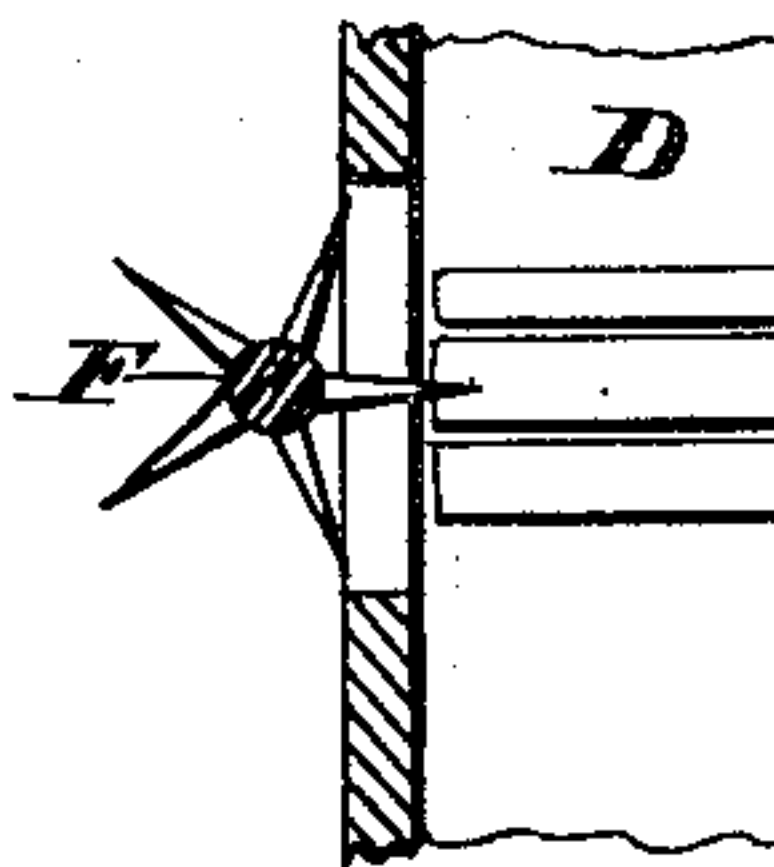


Fig. 7.



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

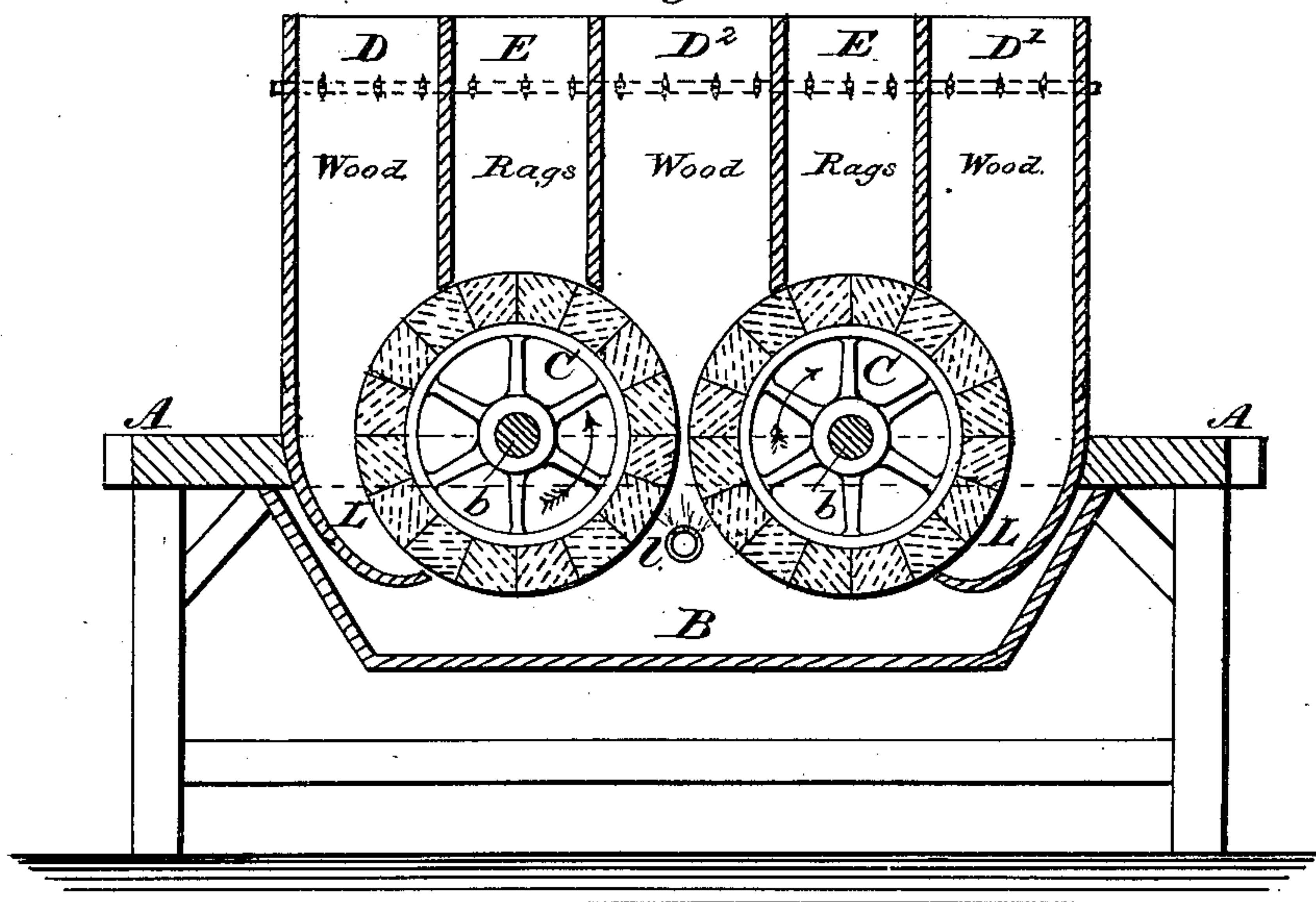


Fig. 4.

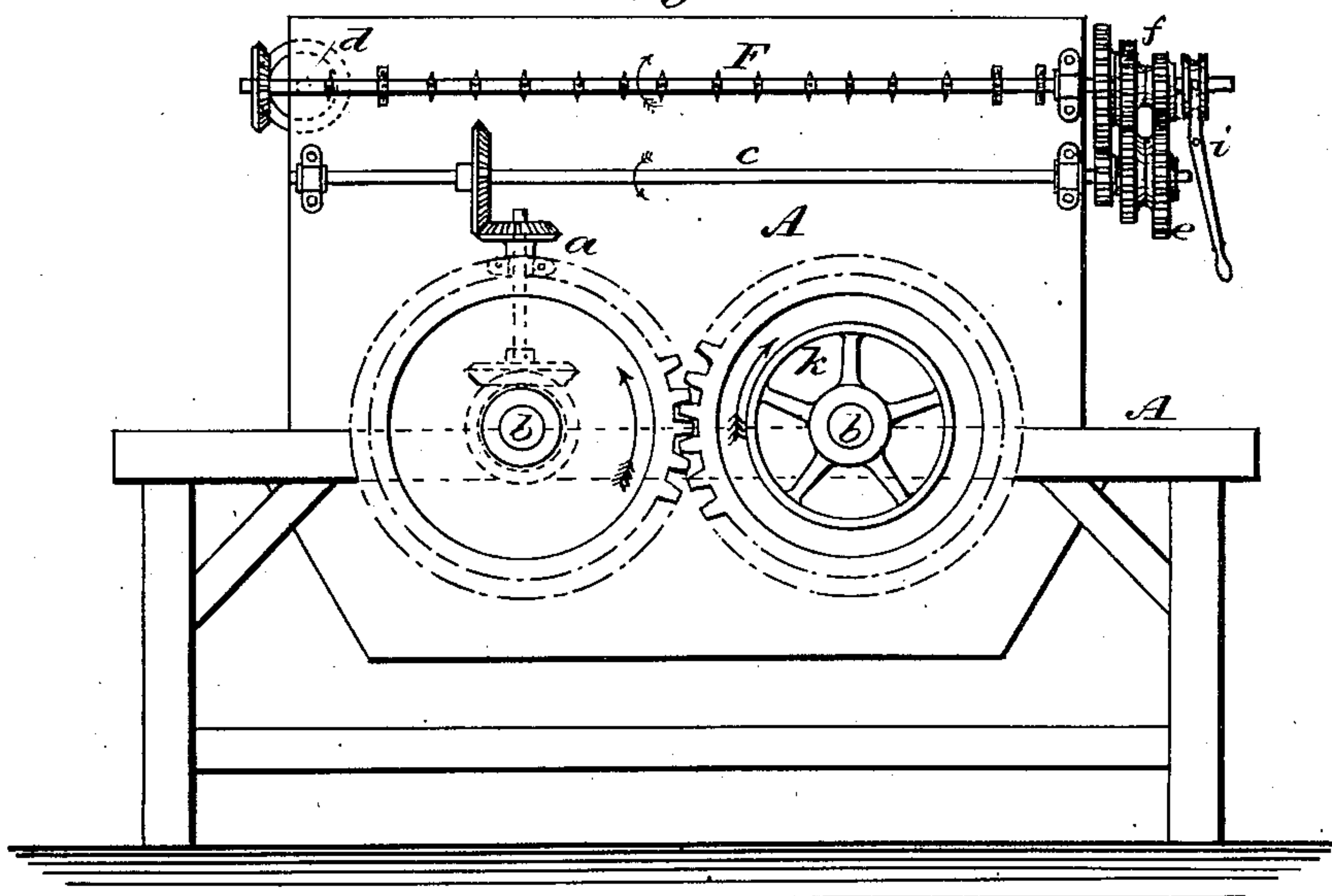


Fig. 6.

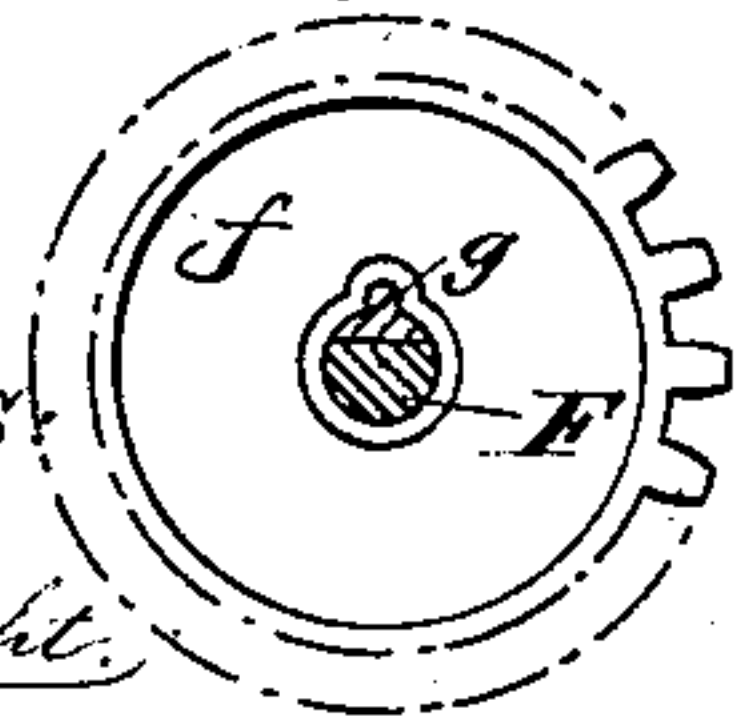
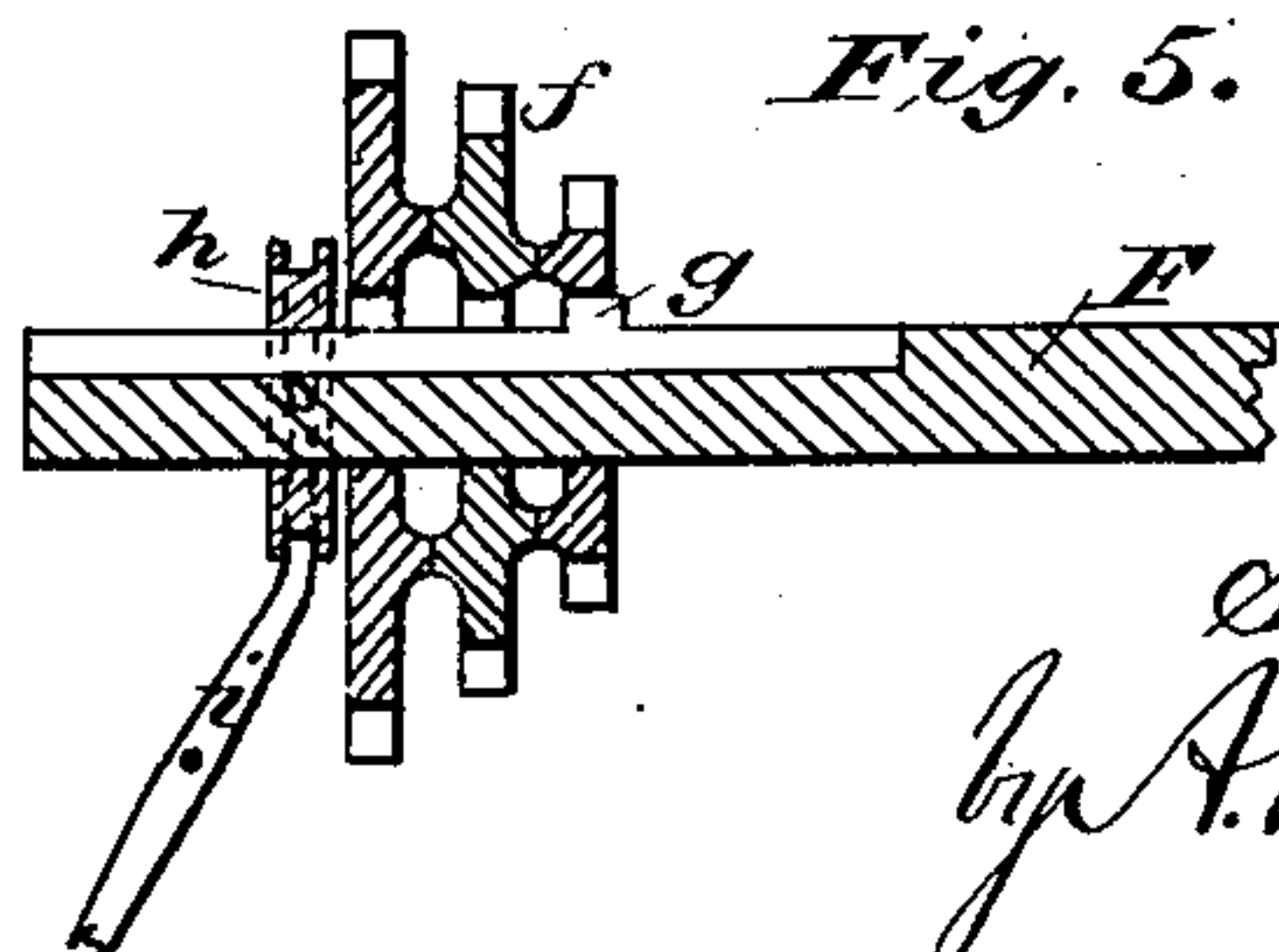


Fig. 5.



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UNITED STATES PATENT OFFICE.

STEPHEN M. ALLEN, OF DUXBURY, MASSACHUSETTS.

MANUFACTURE OF PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 253,655, dated February 14, 1882.

Application filed August 15, 1881. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN M. ALLEN, of Duxbury, in the county of Plymouth and State of Massachusetts, have invented a new and useful Improvement in the Manufacture of Paper-Pulp from Wood and other Materials, which improvement is fully set forth in the following specification.

This invention relates to methods and apparatus for reducing wood and other stock to paper-pulp, and may be considered, in part, as an improvement on those described in Letters Patent numbered 201,083 and 229,073, granted to me March 12, 1878, and June 22, 1880, respectively.

It has for its object to enable the pulp to be prepared in the grinder or reducing-engine so as to be made at once into paper, and to secure increased economy and efficiency in the grinding apparatus.

Heretofore the wood has been ground by itself, and often in the shape of "half-stuff" sold by paper-makers, by whom it has been mixed with the pulp from rags and similar material, and after proper manipulation run off onto paper-machines.

The first part of the present invention consists in reducing the wood and rags or similar material to pulp in the same apparatus, and also in introducing thereinto sizing or coloring-matter, so that the pulp made is suitable for running off directly into paper as it flows from the reducing apparatus. Preferably the two materials, wood and rags, are reduced by a common grinder, being held in separate hoppers.

The improved apparatus, which may be employed for grinding wood by itself as well as in connection with rags and similar materials, embodies the following new features:

In connection with each cylinder, one or more being employed, hoppers for the wood are arranged as near as may be tangential to the periphery on opposite sides of the center, so that on one side the cylinder revolves against and on the other with the pressure of the wood. The hoppers for the rags (or other material to supply its place in connection with wood pulp) are placed between the wood-hoppers, ordinarily over the center of the grinder, since the pressure thereof will be small in comparison with the pressure of the wood. The feed of

material in the several hoppers is effected by a common feeder, preferably a continuously-moving spiked surface, as described in my aforesaid patent of June 22, 1880. A special system of gearing, which, however, in itself is not my invention, is combined with the feed-shaft, so as to vary at will the speed at which the material is fed through the hopper or hoppers. The hoppers preferably are placed upright and deliver the stock onto the upper part of the grinder which revolves in a pit for collecting the pulp. Where two or more grinders are employed one of the hoppers is placed between two cylinders, so as to supply stock to both. Suitable pipes are employed for introducing one or more streams of water to carry off the pulp as it is ground. Sometimes the outer wall of the hopper is extended so as to embrace a considerable portion of the cylinder's periphery. Heretofore a number of hoppers or pockets have been combined with a single cylinder, and the pockets have sometimes been curved and arranged to extend around a portion of the cylinder's periphery.

The novelty with relation to the apparatus consists in the special arrangement and combination of parts as indicated above, or as hereinafter more fully set forth.

The following description will enable those skilled in the art to which the invention relates to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and illustrate grinding apparatus constructed in accordance with the invention.

Figures 1 and 2 are views in vertical section of a single-cylinder machine, taken in each case at right angles to the axis of the cylinder; and Fig. 3, a similar view of a two-cylinder machine. Fig. 4 is a view in elevation of the machine shown in Fig. 3; Figs. 5 and 6, sectional views in planes at right angles of the cone-gears on the feed-shaft; and Fig. 7 a view in cross-section, showing the spiked feeder in its relation to the end wall of the hopper.

A is the frame. It is provided with a pit, B, and supports the grinder or grinders C, the hoppers for wood D D' D², and the hopper or hoppers for rags E. The grinders are preferably cylinders with surface of artificial stone, containing emery, corundum, or similar abrading material, and are supported in bearings

in the machine-frame, and revolved by belt and pulleys, or other suitable gearing. The arrows indicate the direction of revolution in the machine shown; but they may be arranged to
 5 revolve in either direction. The hoppers are arranged upright and parallel, being substantially one large hopper divided by one or more vertical partitions extending lengthwise of the grinder or grinders. The outside hopper, D D',
 10 may be above the axis of the cylinder, as shown in Fig. 1, or the outer wall can be extended downward, as shown in Figs. 2 and 3, so as to form tapering pockets L.

In the two-cylinder machines the central
 15 hopper, D², supplies two cylinders, being placed between them. As shown, the cylinders are so close together as not to allow any considerable portion of the stock to pass unground between them; but they may be placed farther
 20 apart, and in that case a guide-piece should be inserted to divide the stock and force it against the grinding-surface. The guide-piece may be curved, and should in any case be so constructed and arranged as to form tapering
 25 pockets between itself and the grinders.

A feed-shaft, F, is placed at each end of the hoppers and extends across them all, so as to act upon the stock. It is spiked, as shown, the spikes passing through slots in the ends of
 30 the hoppers. The two feed-shafts are supported in bearings attached to the hoppers. They may be operated by a belt and pulley; but it is more advantageous to use the gearing shown in Figs. 4, 5, and 6.

35 An upright shaft, *a*, receives motion from the grinder-shaft *b*, by means of bevel-gears, (shown in dotted lines,) and conveys it to a counter-shaft, *c*, which actuates the feed-shafts F, the two shafts being connected by a cross-shaft, *d*. (Shown in dotted lines, Fig. 4.) A set
 40 of cone-gears, *e f*, are used to convey motion from the counter-shaft to the feed-shaft. The gears *f* are all loose on the shaft, and any one of them is engaged at will by means of a projection, *g*, on a sliding piece fitted in a groove in the shaft F. The sliding piece may be operated
 45 through a collar, *h*, fastened thereto by means of a lever, *i*, so as to shift the projection *g* from one of the gears to another.

50 A belt running on a pulley, *k*, drives the machine. When there are two or more grinders in one machine the shafts are connected by gears, as shown in Fig. 4.

Suitable pipes, *l*, are provided for introducing
 55 a stream of water into the machine. The same or other pipes may be employed for introducing size or coloring-matter, or both. The shelves or gutters *m*, Figs. 1 and 2, may extend entirely around the hoppers. They catch the
 60 water introduced through the pipe *l*, which water thereupon flows through openings in the walls of the hoppers and wets the stock. Additional pipes for introducing liquid directly into the hopper may be provided.

65 One or more outlets, *n*, are provided for carrying off the pulp.

In operation sticks of wood of a length equal to that of the grinder are placed in the hoppers D D' D², and the spikes on the feed-shaft F, entering into their ends, force them down
 70 through the hoppers into contact with the grinders. The hopper or hoppers E are filled with rags or similar material, which is also pressed down by the spikes on the feed-shafts. The rags are usually compressed in the hopper
 75 by a weight or plunger, independent of the spike-feed.

The wood and rags are simultaneously ground and mixed. The stream of water keeps the stock wet and carries off the pulp as formed.
 80

Sizing or coloring-matter, or both, are introduced into the stock or pulp as required. The pulp thus formed, containing, as it does, wood fiber mixed with rag fiber in proper proportion, may be run off directly into paper.
 85

The pulp is different from pulp heretofore made by mixing wood pulp and rag pulp, the two kinds of fiber being more perfectly felted and interlaced by grinding together than when pulped separately and mixed.
 90

The process of production inheres, as it were, in the product, and enables it to be distinguished by one skilled in the art.

Animal fiber, as well as vegetable fiber, may be ground and reduced to pulp by this invention.
 95

The wood employed may be cooked before grinding, or not, as desired. Different grades of wood may be used in the different hoppers. Sometimes the wood fiber is reground, and
 100 sometimes bark of trees is ground in the central hopper.

As many spiked feed-shafts may be used with each hopper as may be desired.

Having now fully described my said invention and the manner of carrying the same into effect, what I claim is—
 105

1. The improvement in making paper-pulp, consisting in grinding or reducing to pulp wood and rags or similar material simultaneously in
 110 the same machine, substantially as described.

2. The method of preparing wood pulp so that it may be run off directly into paper by grinding wood and rags together and introducing sizing or coloring-matter, or both, into the
 115 pulp in the grinding apparatus, substantially as described.

3. The improvement in making wood pulp, consisting in reducing the wood to pulp by grinding it in the manner explained, introducing
 120 sizing between and around the fiber as it is reduced or disintegrated, and carrying off the pulp with a stream of water, substantially as set forth.

4. The combination, with a grinding-cylinder, of hoppers arranged as near as may be tangential to the periphery of the cylinder on opposite sides of the center, so that on one side the cylinder revolves against and on the other with the pressure of the stock, substantially
 130 as described.

5. The combination, with one or more grind-

ers, of three or more hoppers arranged side by side, substantially as described.

5 6. The combination, with one or more grinders and two or more hoppers, of feed mechanism and a feed shaft or shafts common to the several hoppers, substantially as described.

10 7. The combination of one or more grinders, two or more hoppers, a feed shaft or shafts common to said hoppers, and a spiked feeder, substantially as described.

15 8. The combination, with the feed-shaft of a grinder for reducing wood or other stock to paper-pulp, of a set of cone-gears and means for changing at will the speed conveyed to the feed-shaft through said gears, substantially as described.

20 9. The combination of a pit, one or more grinders revolving in or above the same, two or more hoppers for each grinder, and one or more pipes or troughs for introducing water or other fluid, substantially as described.

25 10. The combination, with two or more grinding-cylinders, of a hopper between each adjacent pair of grinding-cylinders, and one or more additional hoppers for the several cylinders, substantially as described.

11. The combination, with a grinding-cylinder, of a hopper having a straight position as near as may be tangential to the periphery of the cylinder, and terminating in a tapering pocket, substantially as described. 30

12. A machine for reducing stock to pulp, comprising, in combination, a pit, one or more grinding-cylinders, two or more hoppers to each cylinder, a spiked feeder, and a pipe or pipes for introducing water or other fluid, substantially as described. 35

13. Pulp of wood and rag fiber ground or reduced to pulp by the same grinder or reducing-surfaces, substantially as described, said pulp being distinguishable by the character of the felting and interlacing of the fibers, as set forth. 40

In testimony whereof I have signed this specification in the presence of two subscribing witnesses. 45

STEPHEN M. ALLEN.

Witnesses:

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