

(No Model.)

G. H. POND.

PROCESS OF AND APPARATUS FOR MANUFACTURING PAPER PULP FROM
WOOD.

No. 296,780.

Patented Apr. 15, 1884.

Fig. 1.

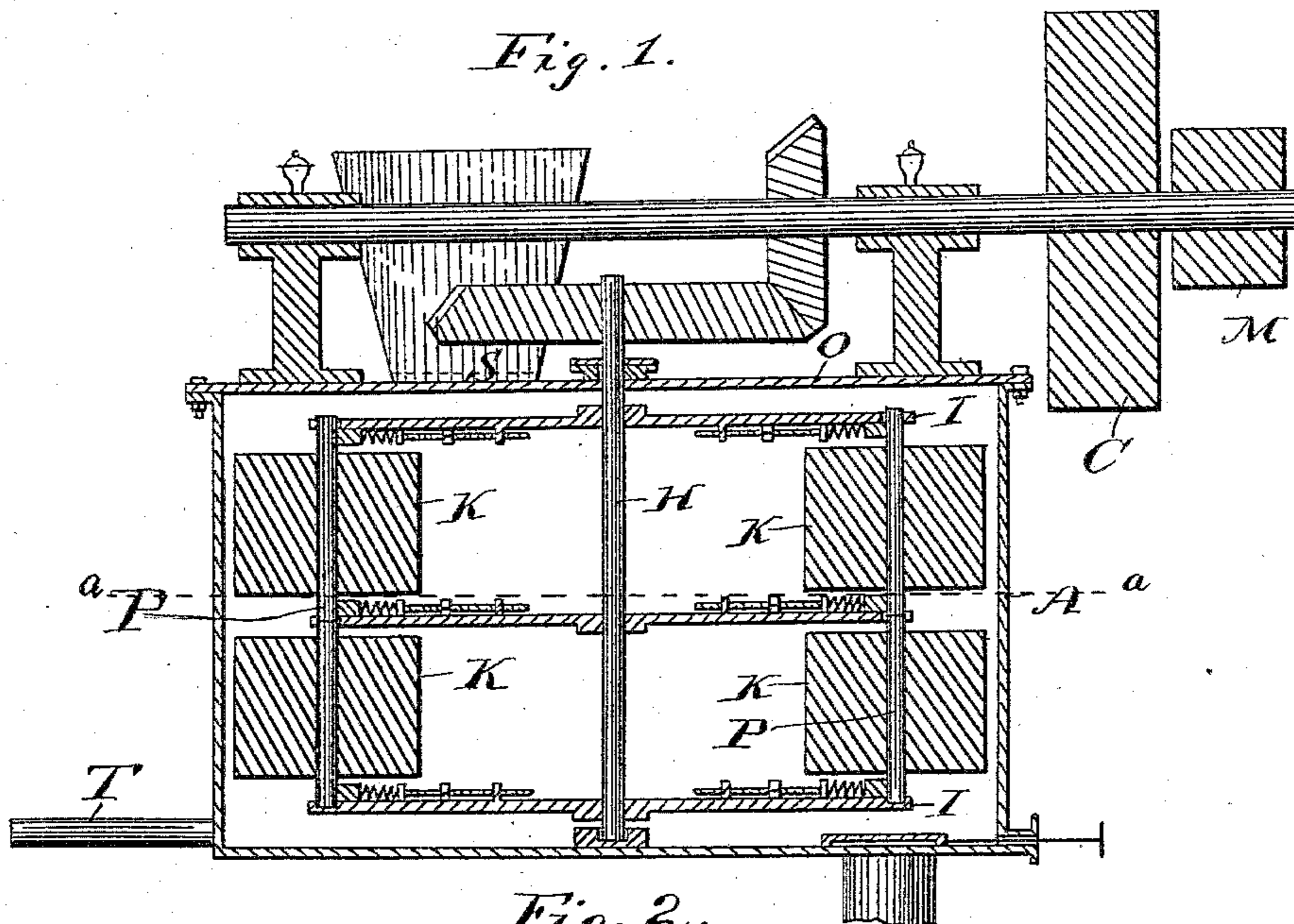


Fig. 2.

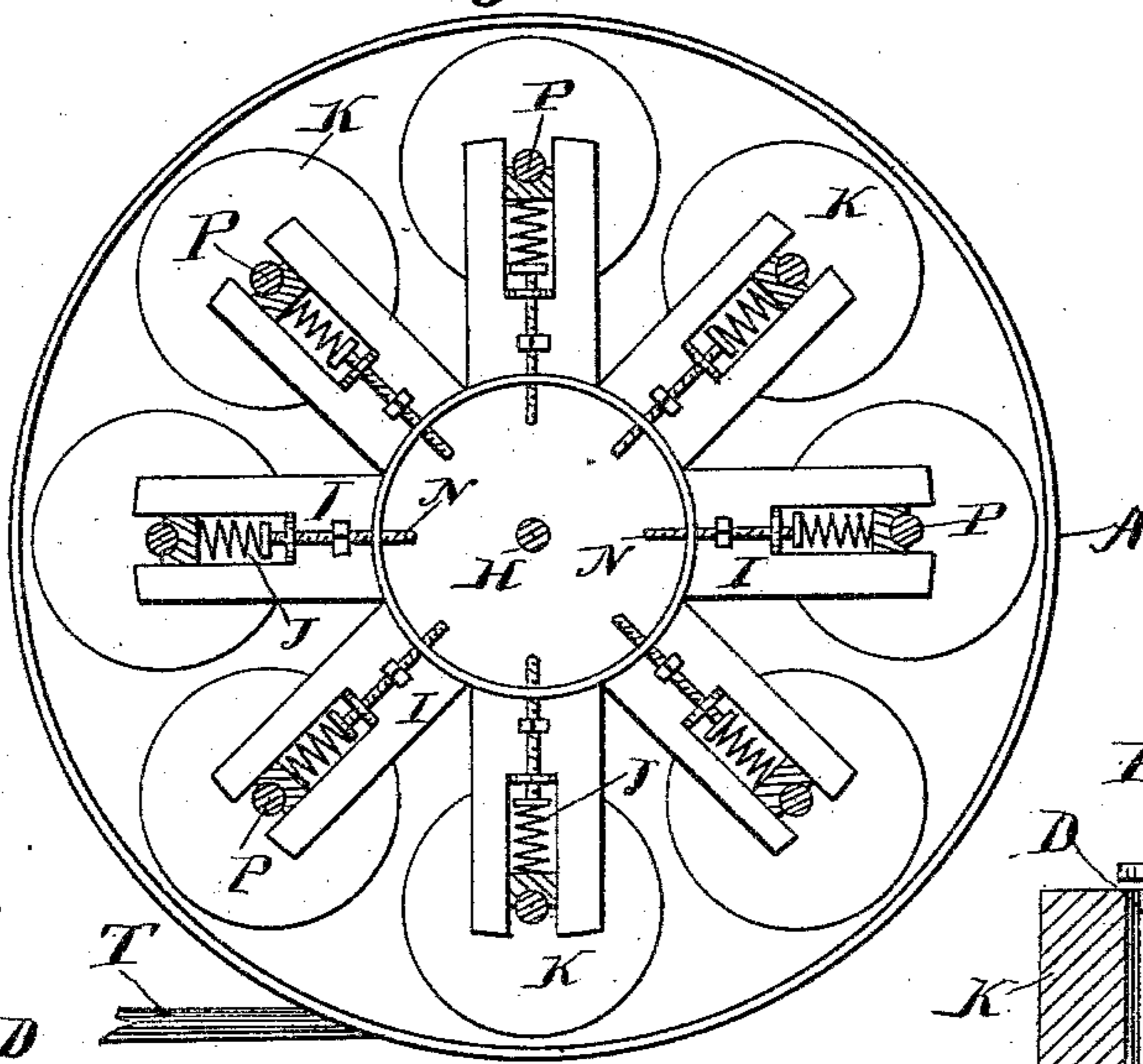


Fig. 4.

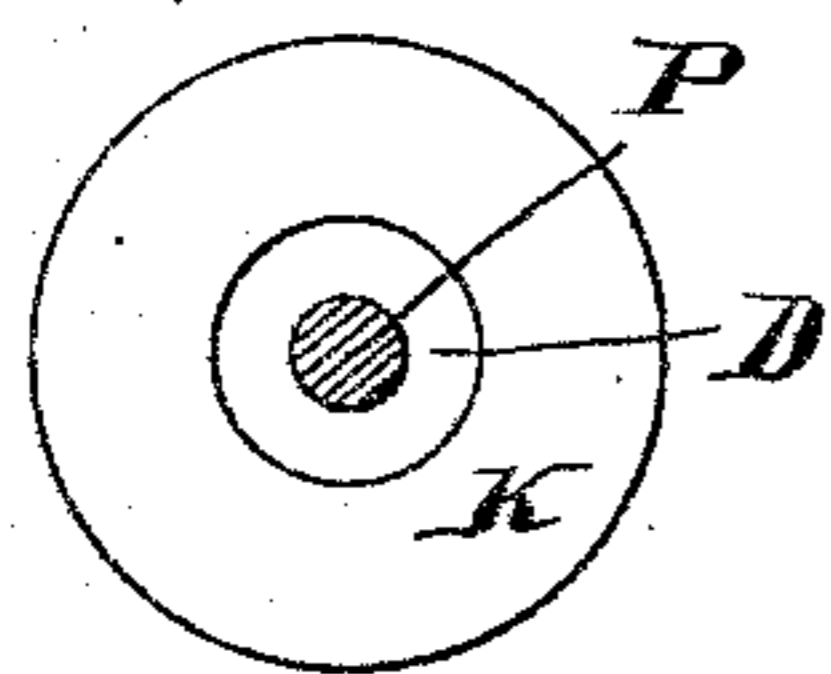
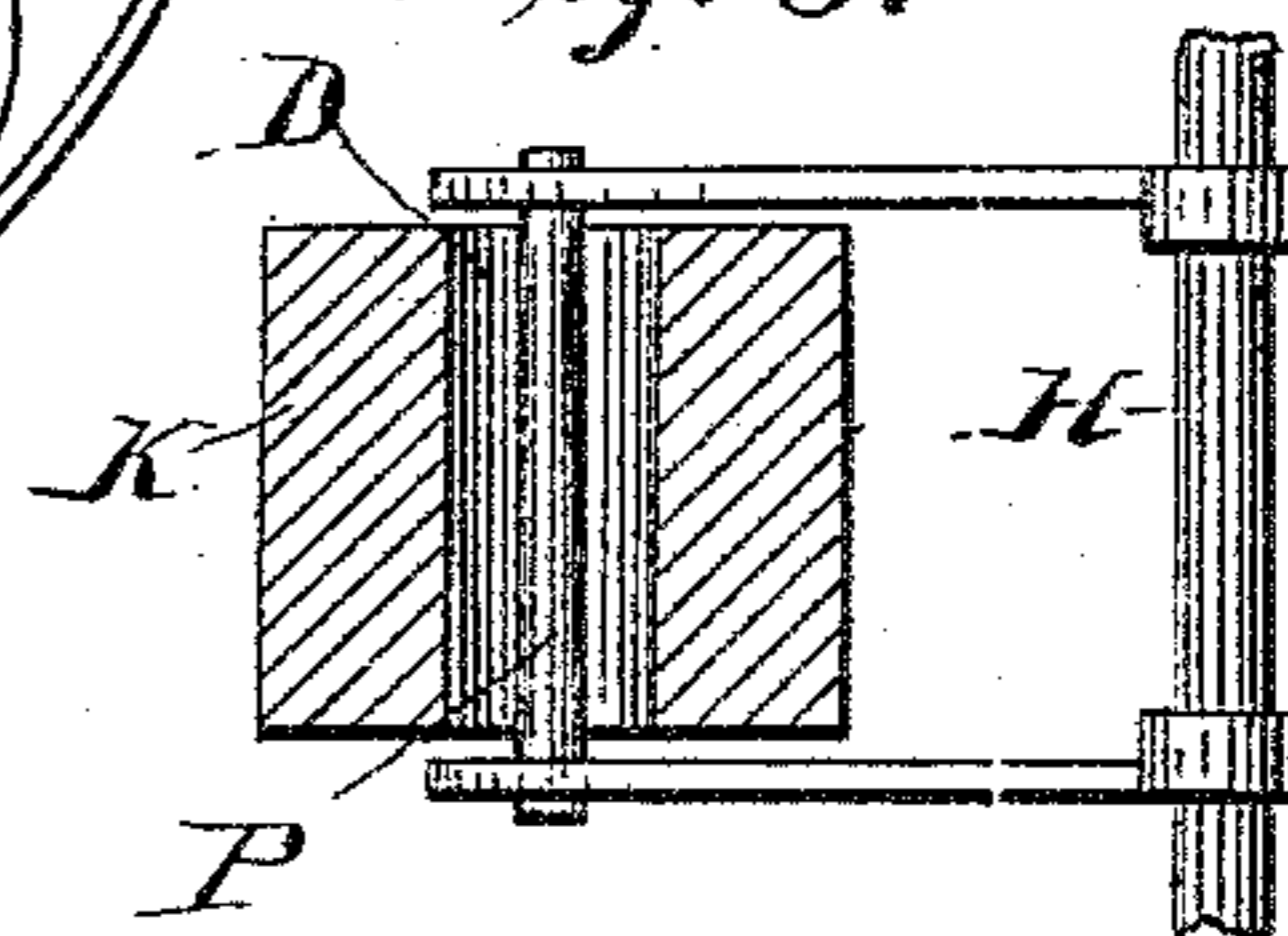


Fig. 3.



WITNESSES

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PROCESS OF AND APPARATUS FOR MANUFACTURING PAPER-PULP FROM WOOD.

SPECIFICATION forming part of Letters Patent No. 296,780, dated April 15, 1884.

Application filed July 18, 1883. (No model.)

To all whom it may concern:

Be it known that I, GOLDSBURY H. POND, a citizen of the United States, residing at New York, county of New York, State of New York, have invented a new and useful Improvement in the Process of and Apparatus for Manufacturing Paper-Pulp from Wood and other Fibrous Material; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

Heretofore wood pulp has been made by grinding and other machines which consume a large amount of power, and which in their operations make a large proportion of the pulp into a powder with a very small portion of fiber; therefore it is nearly an impossibility to use over one-quarter of it in making paper of any commercial value. The chemical wood pulp is made by digesting pieces of wood in concentrated caustic soda, being a very expensive process. It produces good pulp and fiber, but the cost bars it from general use in the manufacture of paper.

The object of my invention is to produce in a cheap and expeditious mode and with a small expenditure of power a wood pulp from sawdust, shavings, chips, and the waste products of saw-mills, and all other kinds of wood and fibrous material suitable for pulp, a long and clear fiber without breaking it, and without making a powder of the least portion of it, leaving the fiber as long as the pieces and particles of the material used.

To carry my invention into effect I use the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of a cylinder, A, turned smooth on its inner side, and preferably smooth and true from top to bottom, and fitted with a cover, O, steam-tight with an opening, S, provided with a strong cover, also steam-tight, through which the cylinder A is charged with sawdust or other material; also a vertical section of the shaft H and its arrangement within the cylinder A, and rollers K and arms I I. Fig. 2 is a top view of one of the plates through the line a a, with arms I I and the rollers K K, set-screws N, and springs J, showing their arrangement between the plates and arms, and their mode of adjustment against the inner side of the cylinder A, by the set-screws and springs;

also showing the steam-pipe T and the direction of the current of steam in moving the charge and toughening it. Fig. 3 is a sectional view of the rollers K and their arrangement between the arms I I, without the set-screws and springs. Fig. 4 is a top view of a roller with the large opening D and pin P, which allows of its automatic adjustment and operation by the centrifugal force against the inner side of the cylinder A when the rollers are moving at a high speed.

The cylinder A is made steam-tight, and provided with a center shaft, H, on which are securely fastened the plates and arms I I. Between these plates and arms are hung the rollers K K, with an adjustable hanging, made with the set-screws N and springs J, to set the rollers up to the inside of the cylinder A, so that when any large piece of wood or other material should get under the rollers K K, the springs would give and let the rollers back, passing over the obstacle without disturbing the working of the machine. A slow speed is used for a light pressure. A high speed gives a greater pressure and sets the rollers out against the sides of the cylinder by the centrifugal motion.

The rollers may be hung so as to work entirely automatically. To accomplish this a large hole is made in the center of the roller where the pin P goes through, as shown at D, Figs. 3 and 4. The setting out of the rollers is entirely operated by the centrifugal force, the hole in the center of the roller being so much larger than the pin P that it allows the roller K to move back over any large piece of wood or other material that might get into the charge. In this mode of hanging no work would be done except as the charge is moved and circulated round by the steam in toughening it until the shaft H revolves fast enough to throw the rollers K K out to the side of the cylinder.

The cylinder A is charged through the hopper and opening S with a cord or more of sawdust, shavings, chips, or other pieces of wood or fibrous material suitable for making pulp, and filled nearly full with water enough to float the entire mass and allow the charge to be moved round easily by the force of the steam passing through the pipe T. The cylinder A is then closed steam-tight and the steam let in from the boiler, through the pipe T, under a

pressure of not less than fifty pounds to the square inch. The steam soon heats the mass in the cylinder up to the heat of the steam in the boiler, with a corresponding pressure, keeping the charge constantly moving and circulating around in the cylinder and toughening it, so that the rollers will not break the fiber. A small per cent. of alkali—such as lime, soda, or potash—may be used and added to the charge when it is put into the cylinder, which will help toughen the fiber of the wood and other fibrous material of which the charge is composed and cleanse it of any impurities it may have. The charge is kept under pressure and motion by the steam for two hours, when the particles of wood will be found to be tough, pliable, and strong, the charge being well stirred by the steam and slowly worked while being toughened. For this purpose the driving-shaft is provided with pulleys of different sizes, C and M. The belt is run on the large pulley for this part of the work. After two hours the speed is increased by running the belt on the smaller pulley, to finish the working of the charge. The rollers commence to work at the first revolution of the shaft H, and for that purpose are set up to the inner side of the cylinder A by the set-screws N, and springs J, so as to press lightly against it, the rollers covering nearly the whole of the inside of the cylinder, and, rolling round continuously on it until the work is completed, the charge being moved by the force of the steam and the revolution of the shaft, arms, and rollers, circulates around over the inner surface of the cylinder, distributing the particles and pieces of which the charge is composed over it and under the rollers as they roll along. By this continuous motion of the rollers the particles of wood or fibrous material are rolled thinner and thinner without breaking across the grain and shortening the fiber, and are brought again and again under the rollers until the fibers of the wood are at first loosened and finally entirely separated from each other, making the whole charge into a mass of fine fiber the same length as the pieces and particles of wood which first composed the charge.

A charge may be worked without the addition of a small per cent. of alkali by using the steam under pressure to toughen the wood; but it will not work a charge as fast or as well. A cylinder can be arranged horizontally, turning on its axis provided for that purpose, with rollers or balls running loosely upon its inner side, but it will work very slowly.

I am aware that prior to my invention two or more rollers running face to face were used for breaking, crushing, and drawing fiber and other materials; also, that the steaming of various kinds of material as well as paper-stock has been in use a long time; also, that concentrated caustic-soda has been used to digest wood under a high pressure for the manufacture of "chemical pulp." I do not claim either of them; but

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

1. The cylinder A, with cover O, shaft H, provided with plates and arms I I, the rollers K K, and the steam-pipe T, to hold and work a charge of sawdust, chips, shavings, or other pieces of wood or fibrous material, producing a pulp of fine fiber, as herein set forth and described.

2. The cylinder A, provided with a shaft, having plates and arms I I, between which are hung the rollers K K, either singly or in a series, one above the other, substantially as described.

3. The rollers K K, hung between the plates and arms I I, with adjustable hangings, consisting of the set-screws N, and springs J, to set them out against the inner side of the cylinder A with any pressure required, whereby the rollers are allowed to pass over any large pieces that may be in the charge and resume their regular pressure upon the sides of the cylinder, as fully described and set forth.

4. The cylinder A, provided with shaft H, having secured thereto plates and arms I I, and rollers K K, having an opening, D, as described, revolving loosely on the pin P, whereby the rollers are automatically set out onto the inner side of the cylinder by the centrifugal force, substantially as set forth.

5. In a machine for reducing sawdust or other pieces of wood or fibrous material to pulp, the combination, with the cylinder A, of the shaft carrying arms and plates on which are secured rollers adapted to being operated by the centrifugal force.

6. In a machine for reducing sawdust or other pieces of wood or fibrous material to pulp, the combination, with the cylinder A, of a shaft carrying arms and plates, and the bifurcated ends of the arms having rollers, held in place by set-screws and springs, substantially as set forth.

7. The process of reducing sawdust or other pieces of wood or fibrous material to a pulp, consisting of inclosing the same in a tight vessel containing a sufficient quantity of water to float the charge, giving it motion and circulation by a jet of steam under pressure, thereby toughening the fibers, then subjecting it to a light pressure by rollers set out by centrifugal force, as herein described.

8. The process of reducing sawdust or other pieces of wood or other fibrous material to a pulp, consisting of inclosing the same in a tight vessel containing a sufficient quantity of water to float the charge, giving it motion and circulation by a jet of steam under pressure, thereby toughening the fibers, and adding a small per cent. of alkali, then subjecting it to a light pressure by the rollers rolling over it on the inner side of the vessel as they are set out onto it by the centrifugal force.

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Witnesses:

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