

(No Model.)

S. M. ALLEN.

APPARATUS FOR REDUCING WOOD AND OTHER MATERIAL TO PULP FOR PAPER.

No. 253,654.

Patented Feb. 14, 1882.

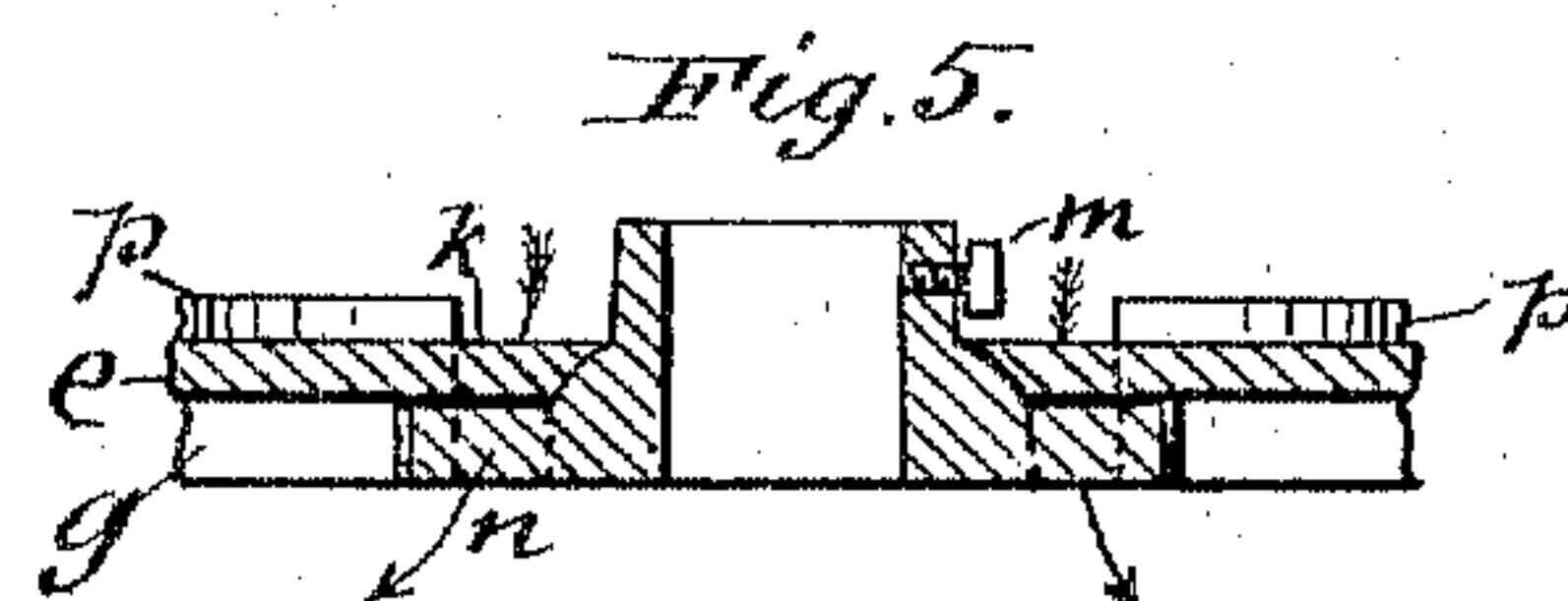
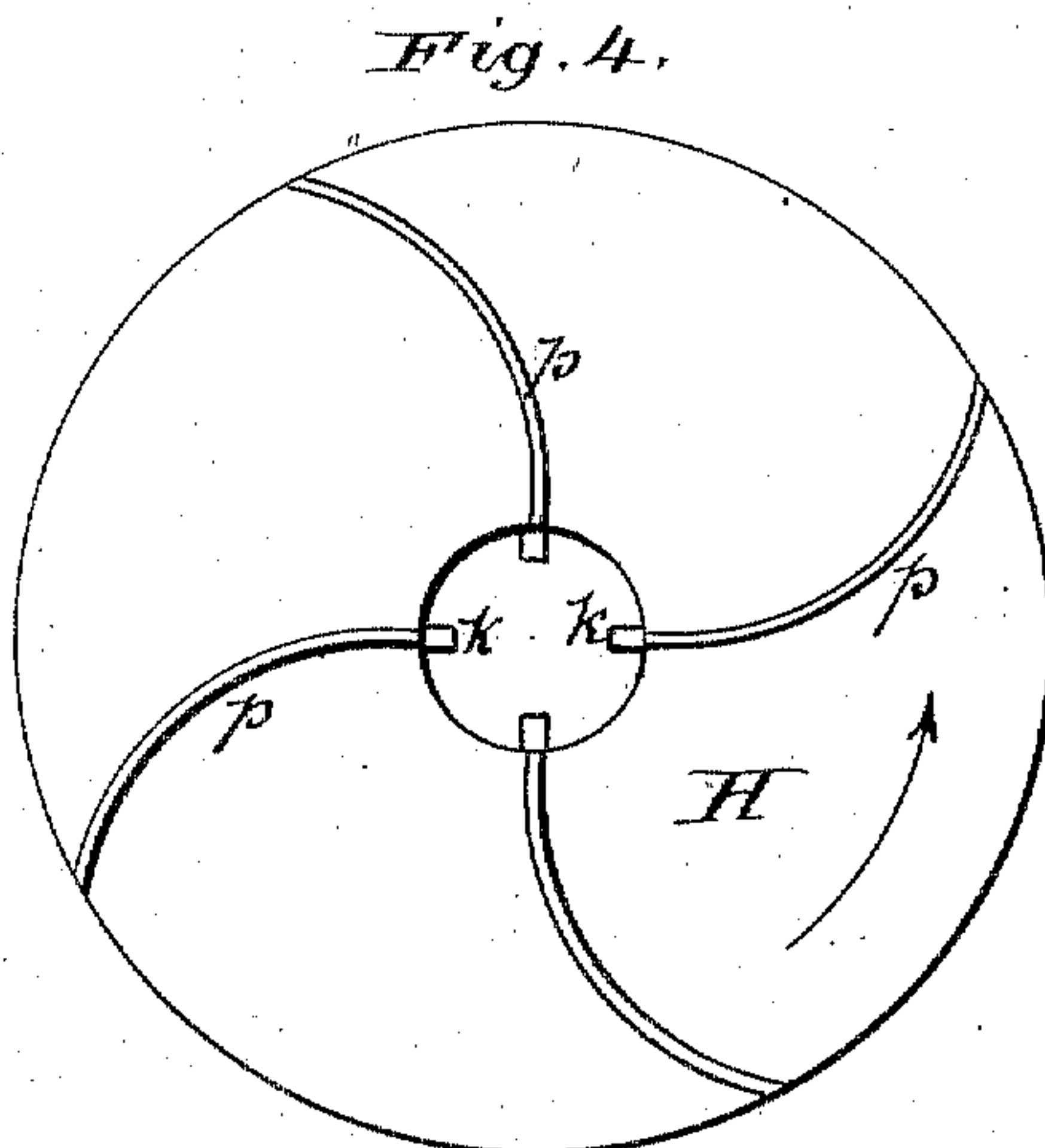
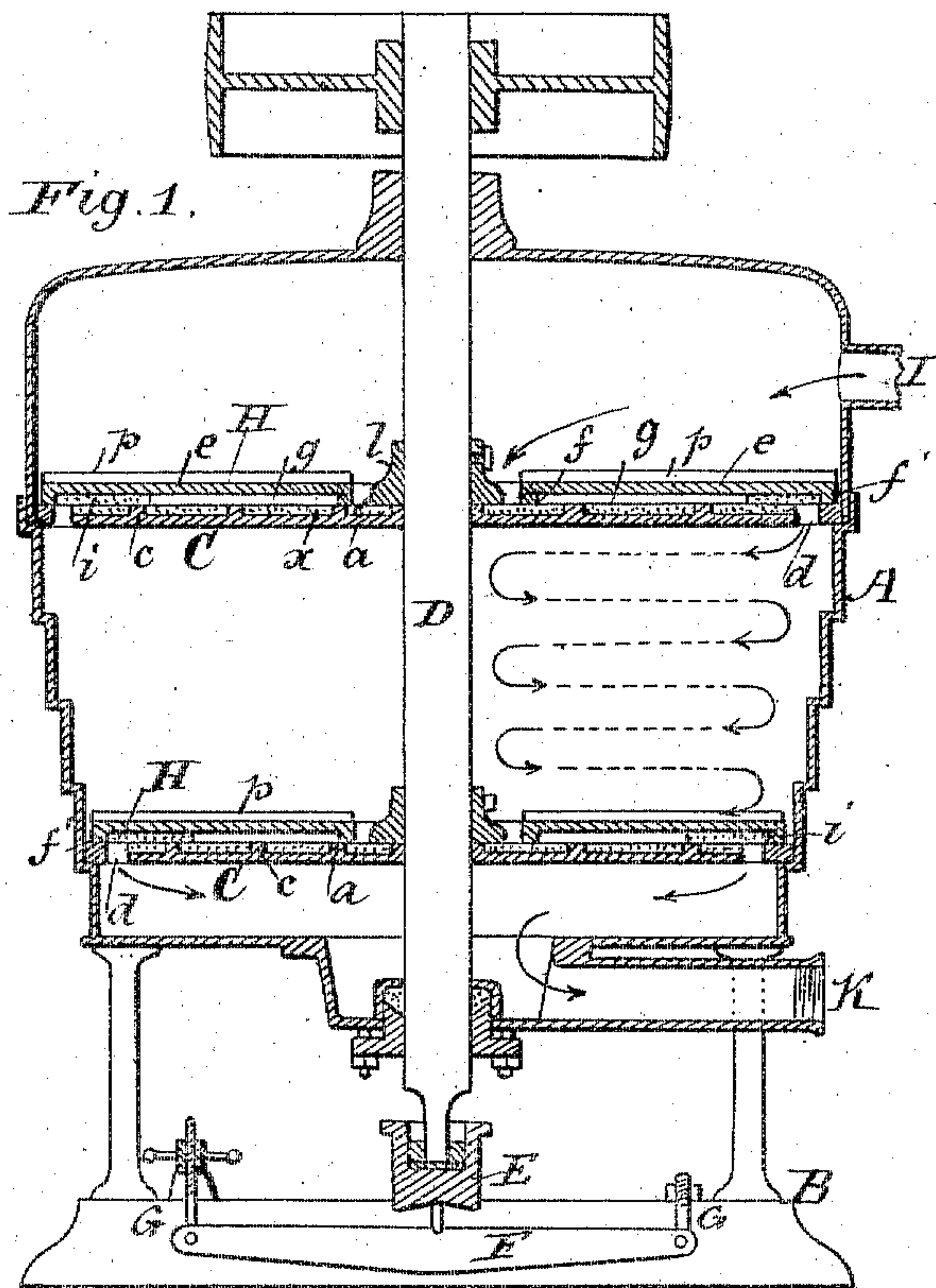


Fig. 6.

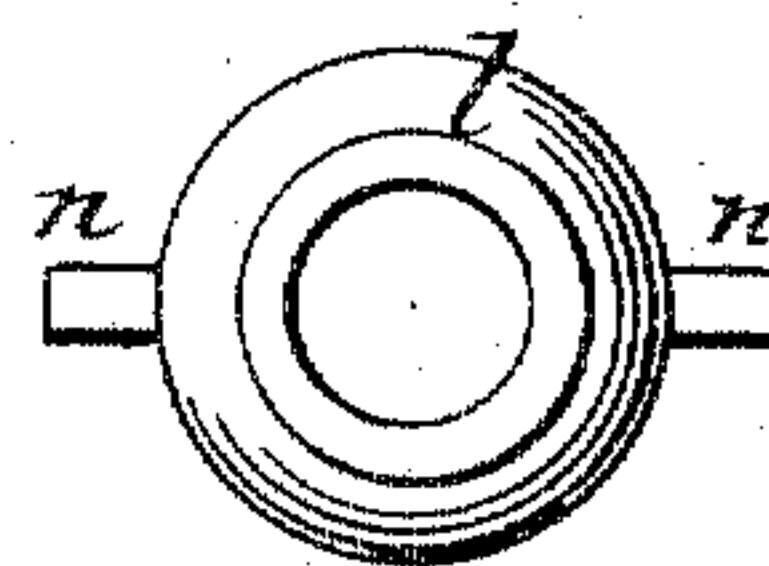
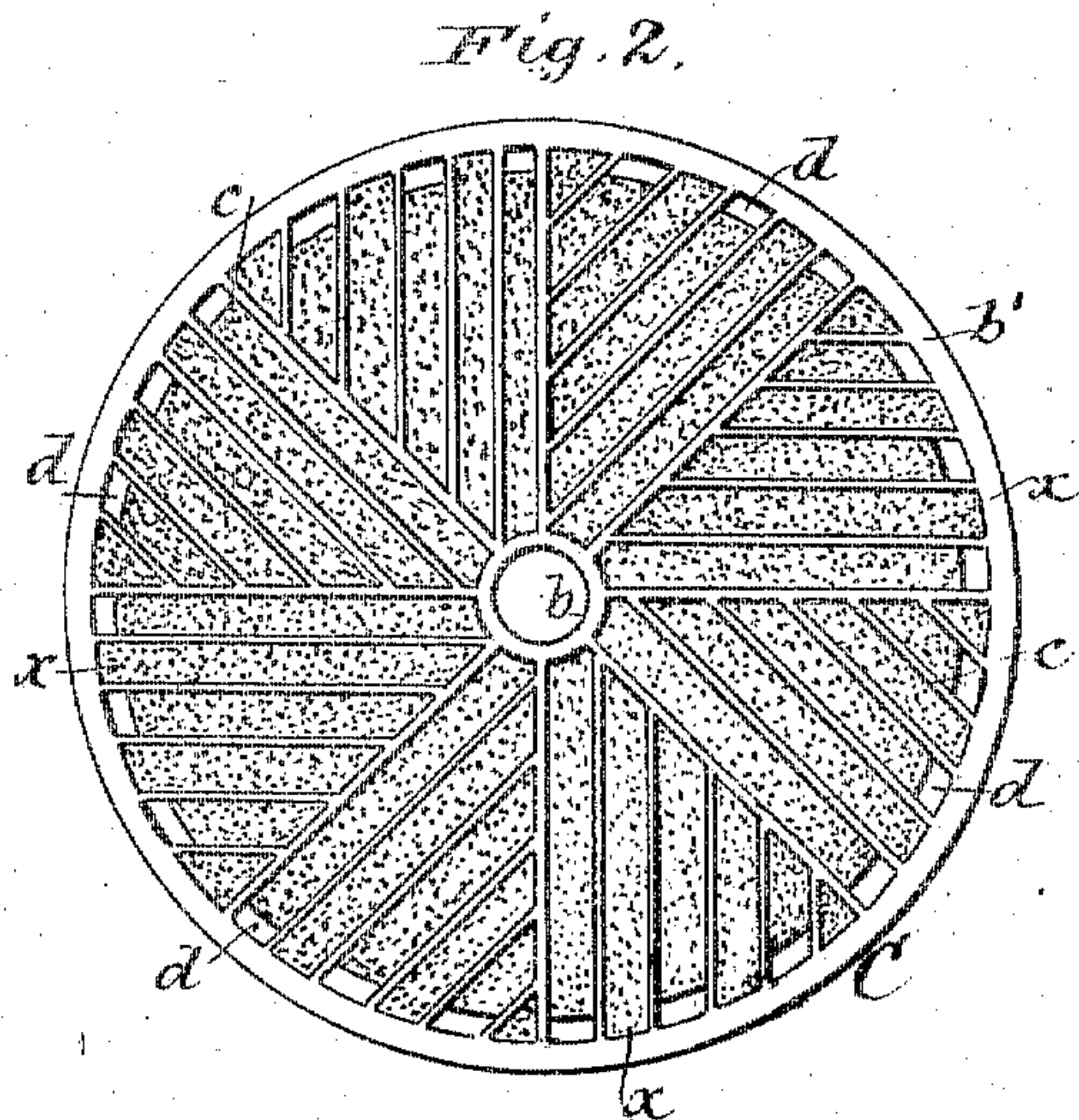
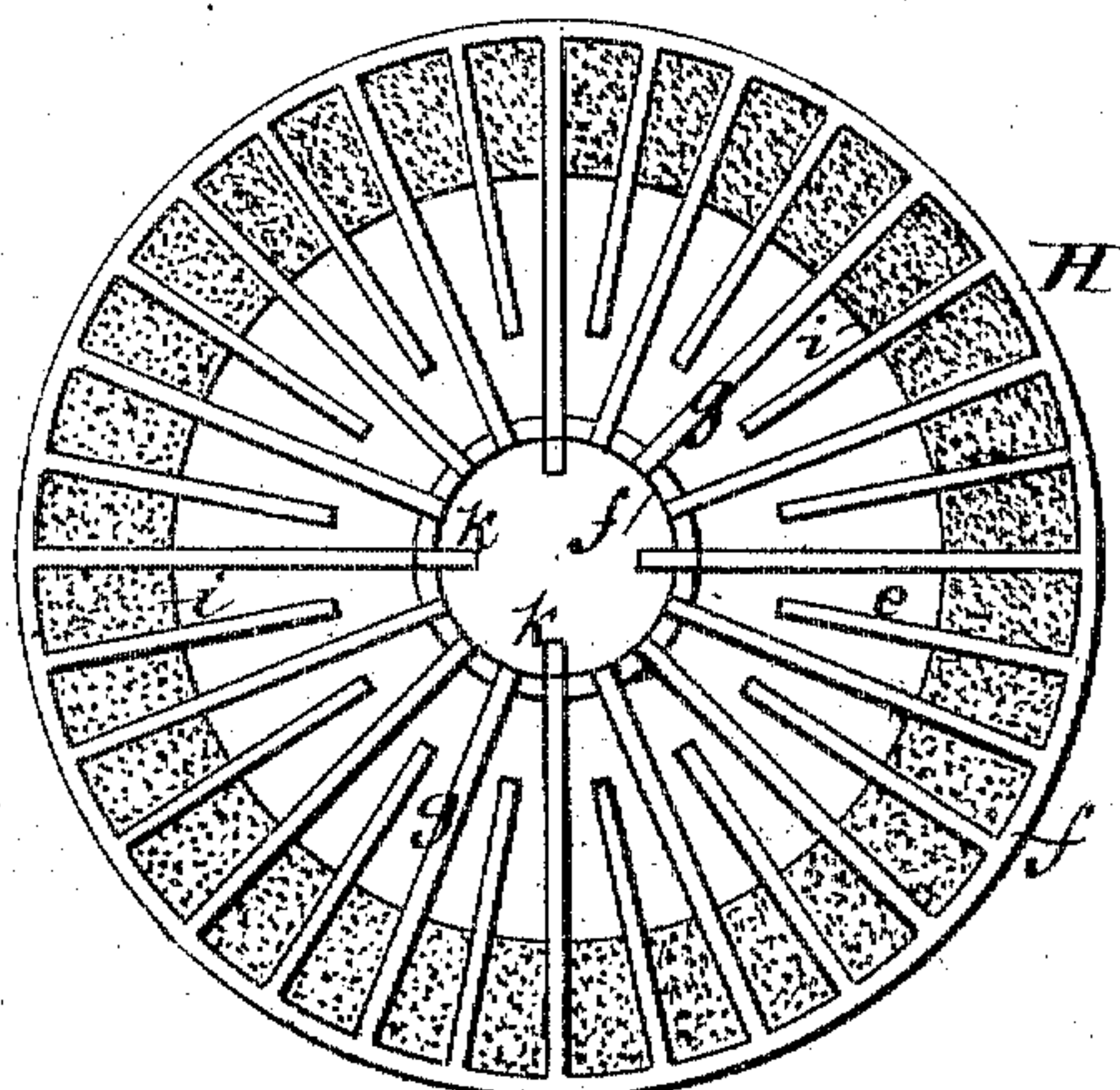


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

STEPHEN M. ALLEN, OF DUXBURY, MASSACHUSETTS.

APPARATUS FOR REDUCING WOOD AND OTHER MATERIAL TO PULP FOR PAPER.

SPECIFICATION forming part of Letters Patent No. 253,654, dated February 14, 1882.

Application filed August 17, 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
5 useful Improvement in Apparatus for Reducing Wood and other Material to Pulp for Paper, which improvement is fully set forth in the following specification.

In the reduction of wood to pulp the object
10 sought is to separate the fibers from each other without making them too short to felt. The ordinary beating-engine and improvements thereon, with knives for disintegrating the fibrous material, although well adapted for
15 making paper-pulp from rags, are not successful when applied to the pulping of wood. The ordinary stone-grinders roll the stock rather than crush it, and produce wood-flour rather than fiber capable of felting, and so do many other
20 machines. In the present invention the length of fiber is preserved by jamming or crushing the wood into proper condition between broad-faced bars in contradistinction to knife-blades heretofore used in machines for making pulp
25 from rags, the two sets of bars being arranged so that they cross each other and act to crush or jam the fibrous material, as aforesaid, instead of rolling it over and over between them. The same arrangement is common with knife-blades
30 and also with the furrows or grooves in stones; but it is obvious that the peculiar effect of the broad-faced bars in crushing the fibrous material is not obtained in such machines. The bars may be placed on two plates or upon a
35 cylinder or cone and a concave. As herein shown, the bars are placed upon plates, several pairs in one casing being employed. This is deemed the most advantageous arrangement, and forms part of the invention. A stream of
40 water or chemical solution, as in the invention patented to me November 25, 1879, by Letters Patent No. 221,992, is employed to float the fibers through the reducing-engine.

In order to assist in the reduction or elimination of the fiber, blocks of natural or artificial stone containing emery, corundum, or other
45 abrading material are placed between the bars. These blocks can also be used with advantage in connection with knife-blades or other metal
50 ribs or surfaces, instead of the wooden blocks

heretofore employed, and this part of the invention includes the combination of stone blocks or filling-pieces with blades or metal ribs or surfaces generally, as well as with
broad-faced bars.

The accompanying drawings, which form a part of this specification, illustrate a reducing or pulping engine constructed in accordance with the invention, Figure 1 being a central vertical section; Fig. 2, a plan of the bottom plates; Fig. 3, a bottom view of a top
60 plate; Fig. 4, a plan of the same; and Figs. 5 and 6, detail views, showing the connection of the top plates with the driving-shaft.

The casing A is supported upon the bed-frame B and contains the reducing or pulping mechanism. The casing, as shown, is formed tapering with a series of five internal concentric shoulders or ledges for supporting the bottom plates, C, which rest on said ledges and
65 are fastened by bolts or in any other suitable way.

In the center of the casing is the shaft D. It passes through central openings in the bottom plates, C, and its lower end, after passing
70 through a stuffing-box in the bottom of the casing, is supported in an adjustable step, E. The step is supported by a knife-edge resting on the lever F, which is suspended from the frame at opposite ends by rods G, jointed to the lever and adjustable in the frame by a screw-thread and nut. The upper end of the shaft
75 turns in a bearing at the top of the casing and carries a belt-pulley, by which it is revolved.

The top plates, H, are connected with the shaft and revolve with it. For convenience of illustration only two top and two bottom plates are shown in Fig. 1, the three intermediate pairs being omitted. At the upper end of the casing is the inlet I, and at the bottom the outlet K. The latter is a spout made of flexible material or connected with the casing with a loose or flexible joint, so that it can be raised or depressed to control somewhat the flow of the pulp.

The bottom plates are or may be all made alike, and their construction will be readily understood by reference to Figs. 1 and 2. The body of the plate a is preferably made of metal. At the center and also at the circumference is
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a rim, $b b'$, respectively, and between these two rims are the broad-faced bars c , extending, like the furrows in the ordinary millstone-dress for grinding grain, outward from the center, but for the most part oblique to the radius, as clearly shown in Fig. 2. These rims and bars may be made in one piece with the body of the plate; or they may be fastened thereto by bolts or in any other suitable way.

At the circumference, inside the rim b' , are holes d for the passage of the pulp through the plate. Between the bars c are blocks or filling-pieces x , of emery, corundum, or other natural or artificial stone, said blocks or pieces being held in place by cement, by bolts, or otherwise.

The top plates consist of a body, e , rims $f f'$, broad-faced bars g , arranged radially, and blocks or filling-pieces h , of emery or other stone, between the bars. The emery or stone on the top plates is, however, preferably placed only between the line i and the outer rim, f' . As in the bottom plates, the rims and broad-faced bars may be made in one piece with the body of the plate; or they may be fastened thereto. They are placed on the under side of the plate. The inner rim, f , is larger than the shaft, and within it are the projections k , by which the top plate is supported upon the shaft by means of a collar, l . This collar is adjustably secured to the shaft by means of a set-screw, m . Its outer surface is a portion of a sphere, and the inner ends of the projections k are correspondingly curved, so that the top plate may be accurately centered and made horizontal. Projections or ears n extend from the collar into recesses in the top plate and serve to drive the same. Openings are left between the projections k and collar l for the passage of the pulp downward between the reducing-plates $C H$.

On the upper side of the top plate are curved ribs p , which have for their object to carry the pulp from the circumference of the top plate to the opening at the center. The top plates, being each adjustably connected with the shaft D , can be raised or lowered independently to regulate the distance between each pair of the plates C and H , and the shaft being movable up or down by means of the lever F , the whole series of plates can be simultaneously adjusted to grind the pulp coarser or finer. The wood, before it is introduced into the engine, is to be shaved, split, sawed, cut, stripped, or otherwise divided into shavings, slivers, or chips, or into small blocks. The shaft being revolved at the proper speed, these pieces are introduced with a stream of hot or cold water or chemical solution alone or together with rags or similar fibrous material, and being carried by the ribs p on the first top plate to the center thereof, they pass through and between the broad-faced bars, by which they are jammed or crushed, and also in contact with and between the emery-blocks or filling-pieces, by the sharp corners of the abrading material in which the fibers are more or

less torn asunder. The partially-reduced fiber flows through the openings at the circumference of the first bottom plate onto the next top plate, by the ribs in which it is conveyed to the center. Thence it passes between the second pair of plates, descends to the next pair, and so on, as indicated by the arrows and dotted lines, until at last it passes out at the outlet reduced and refined to the desired degree.

The space between the reducing-plates is preferably greater at the top than at the bottom, being gradually diminished, so that quite large strips, chips, or blocks, being introduced at the top, will be reduced to the required degree of fineness by the time they reach the outlet.

The speed at which the shaft should rotate depends upon the character of the wood. That which will be most advantageous in a given case must be left in great measure to the discretion of the user.

It is obvious that the apparatus described could be used for pulping or reducing to fiber materials other than wood, and that modifications may be made in the details of construction without altering the essential principles. Either or both sets of bars could be revolved. The length of the fiber in passing between the reducing-plates is kept approximately parallel with the radii of the plates.

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

1. The improvement in reducing wood and other material to fiber for paper-pulp, consisting in crushing or jamming the same between broad-faced bars, substantially as described.

2. The improvement in reducing wood and other material to fiber, consisting in crushing the material between metallic bars, plates, or other devices, and at the same time tearing or disintegrating the fiber by abrading material—such as natural or artificial stone—substantially as described.

3. A pulping-engine having reducing-surfaces provided with broad-faced bars for crushing the fibrous material between them, substantially as described.

4. The combination, in a pulping-engine, of bars, blades, or other metallic devices with blocks or filling-pieces of natural or artificial stone, substantially as described.

5. The combination of the top and bottom plates or their equivalents, provided each with broad-faced bars arranged so that the bars on one plate cross those on the other, and means for removing one or both plates, substantially as described.

6. A series of reducing-plates arranged in pairs, in combination with a shaft carrying one plate of each pair and a casing supporting the other plate, substantially as described.

7. The combination, with the shaft and casing and a series of reducing-plates arranged in pairs, and attached one plate of each pair to the shaft and one to the casing, of means for

raising and lowering the shaft and attached plates, so as to bring them closer to or farther from those attached to the casing, substantially as described.

5 8. A pulping-engine for reducing wood and other material to fiber for making pulp, comprising, in combination, a casing, supporting-frame, shaft, reducing-plates arranged in pairs and attached to said shaft and casing, an in-
10 let for introducing the material into the engine, and an outlet for the pulp, substantially as described.

15 9. The combination, with each other, of two or more pairs of reducing-plates or their equivalents—such as cylinders and concaves—provided each with bars, blades, or other metallic devices, with or without blocks or filling-pieces

of abrading material arranged in series with the space between the plates or their equivalent gradually diminishing, substantially as 20 described.

10. A reducing-plate or its equivalent provided with bars, blades, or other metallic devices on its surface, and with blocks or filling-pieces of abrading material—such as natural 25 or artificial stone—between the bars or blades, substantially as described.

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

STEPHEN M. ALLEN.

Witnesses:

MINNIE L. WITHAM,
H. G. ALLEN.