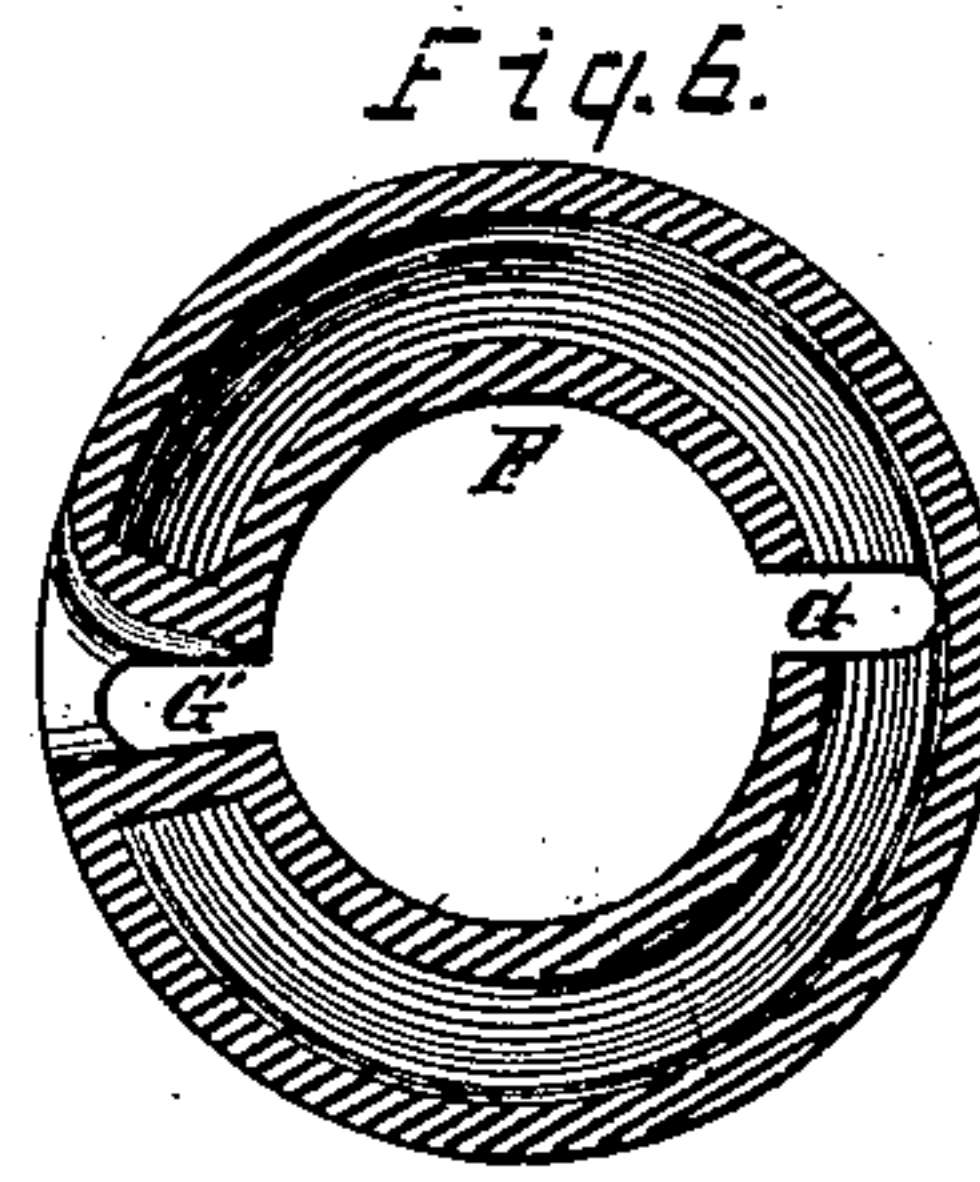
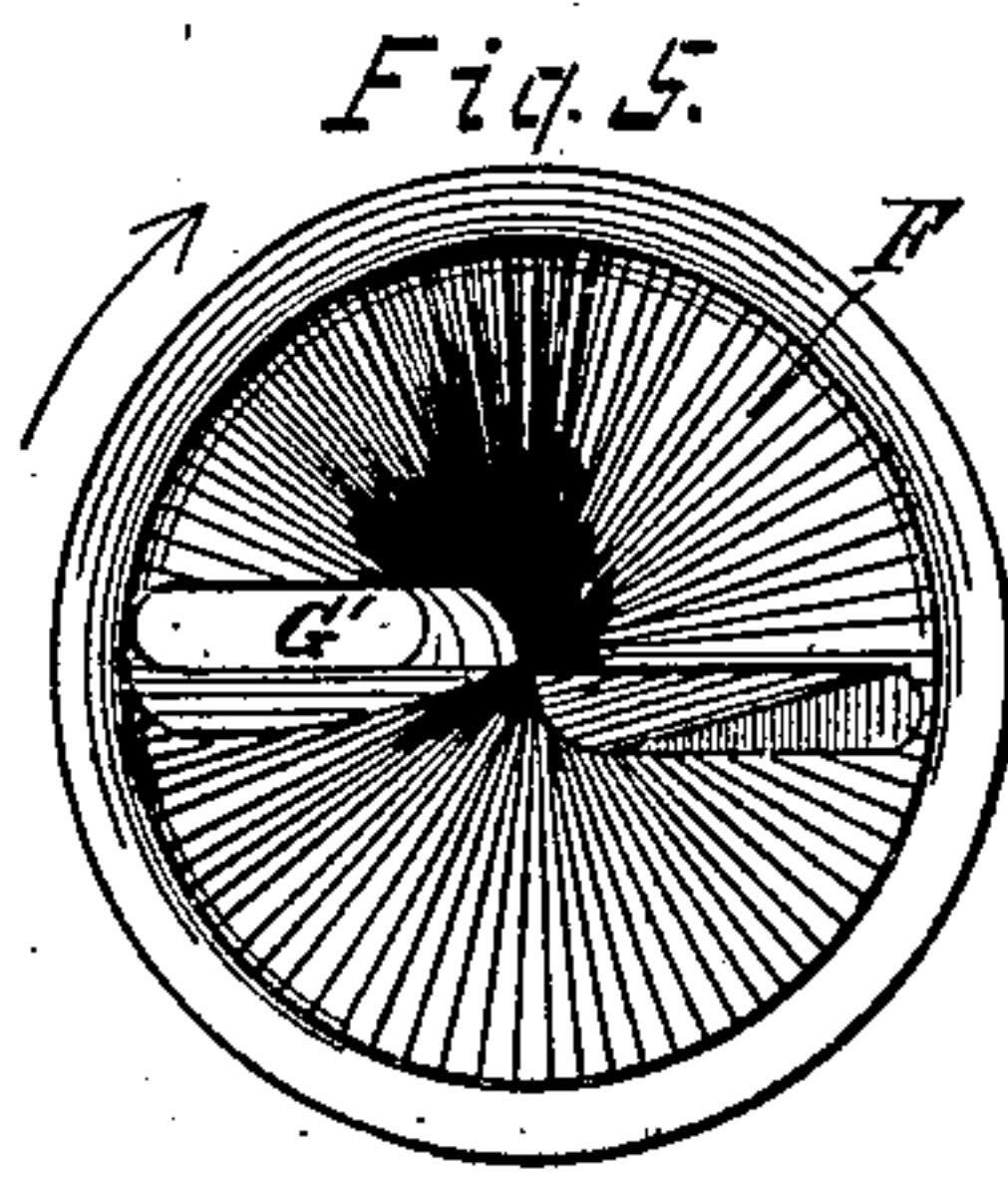
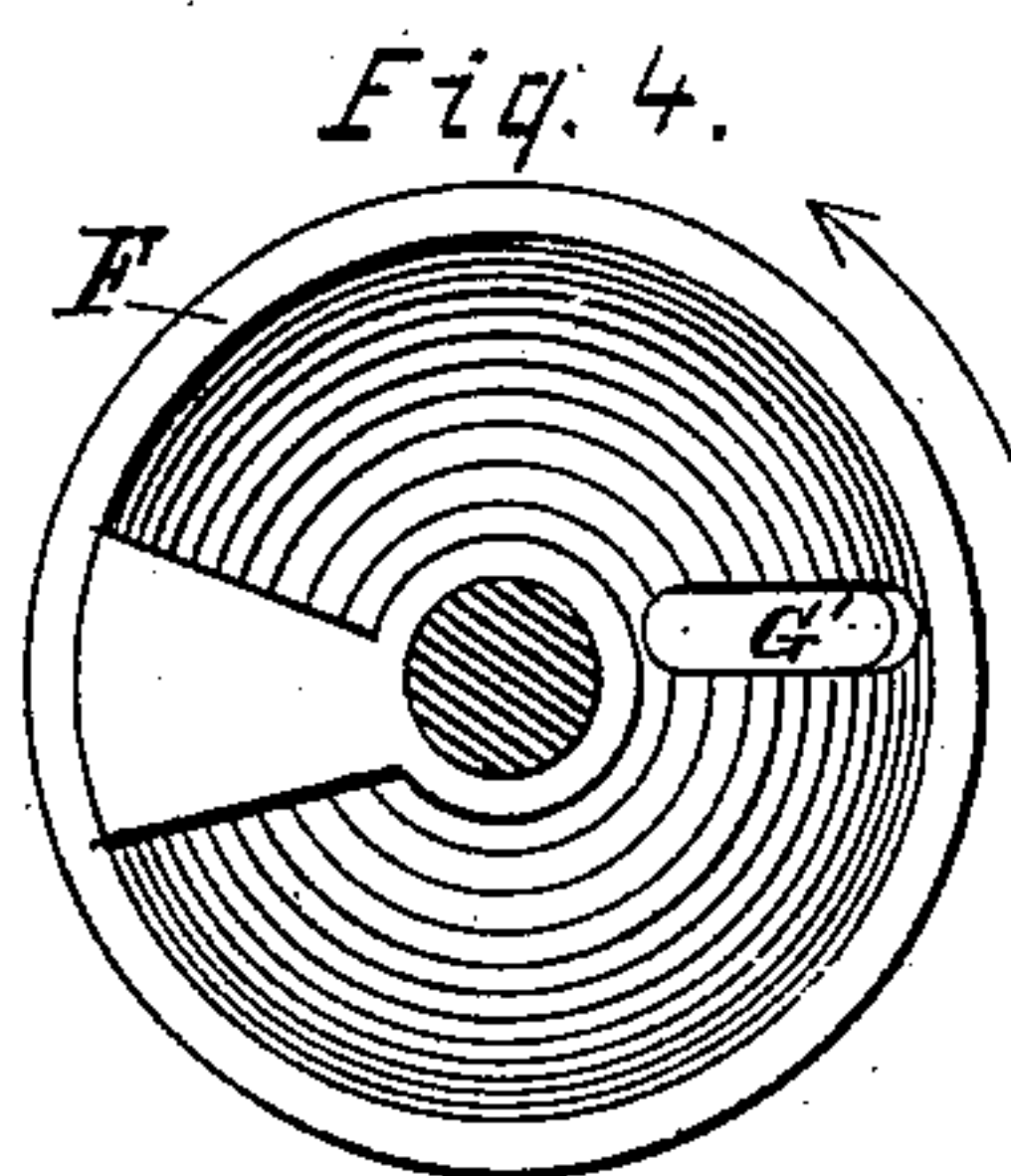
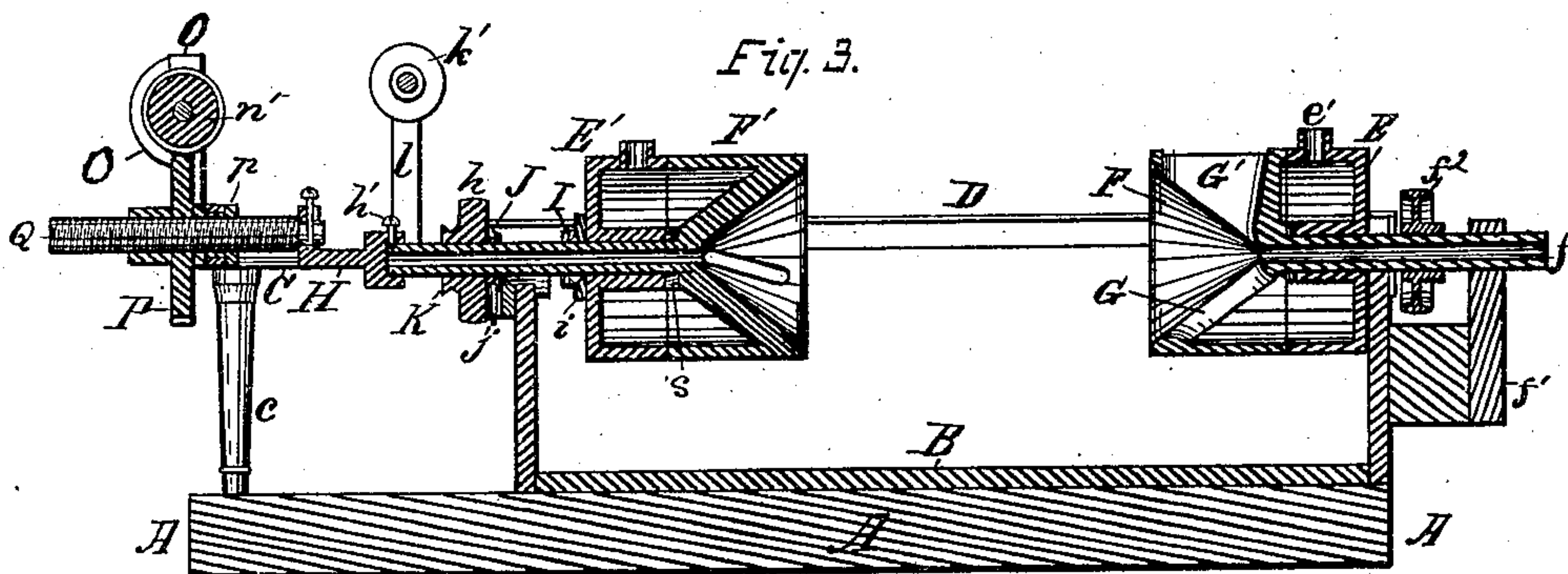
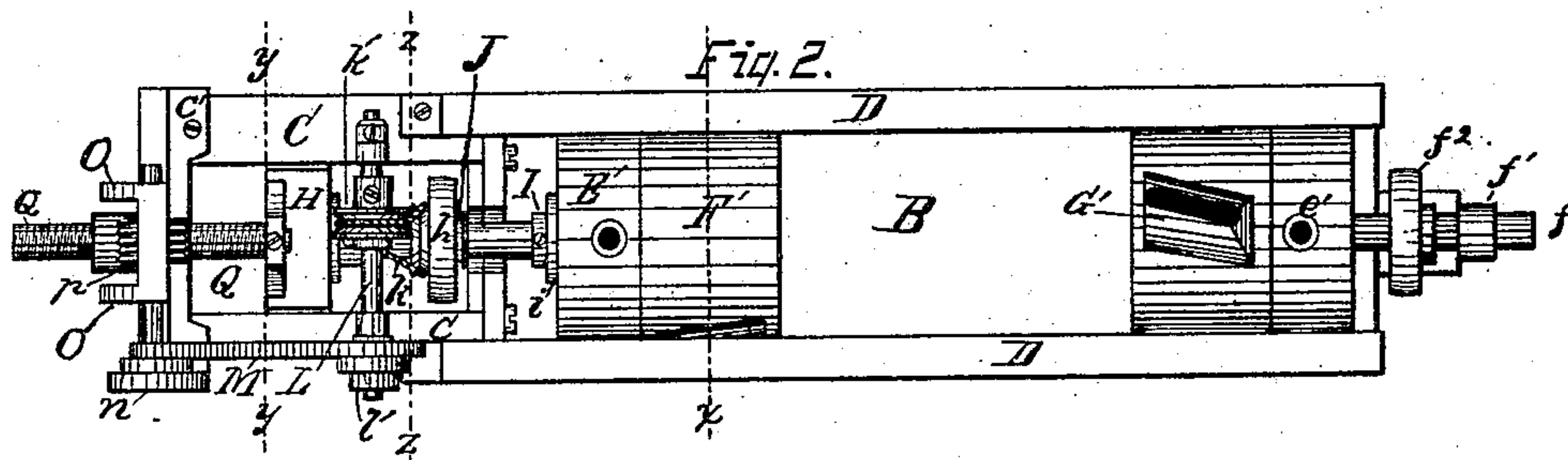
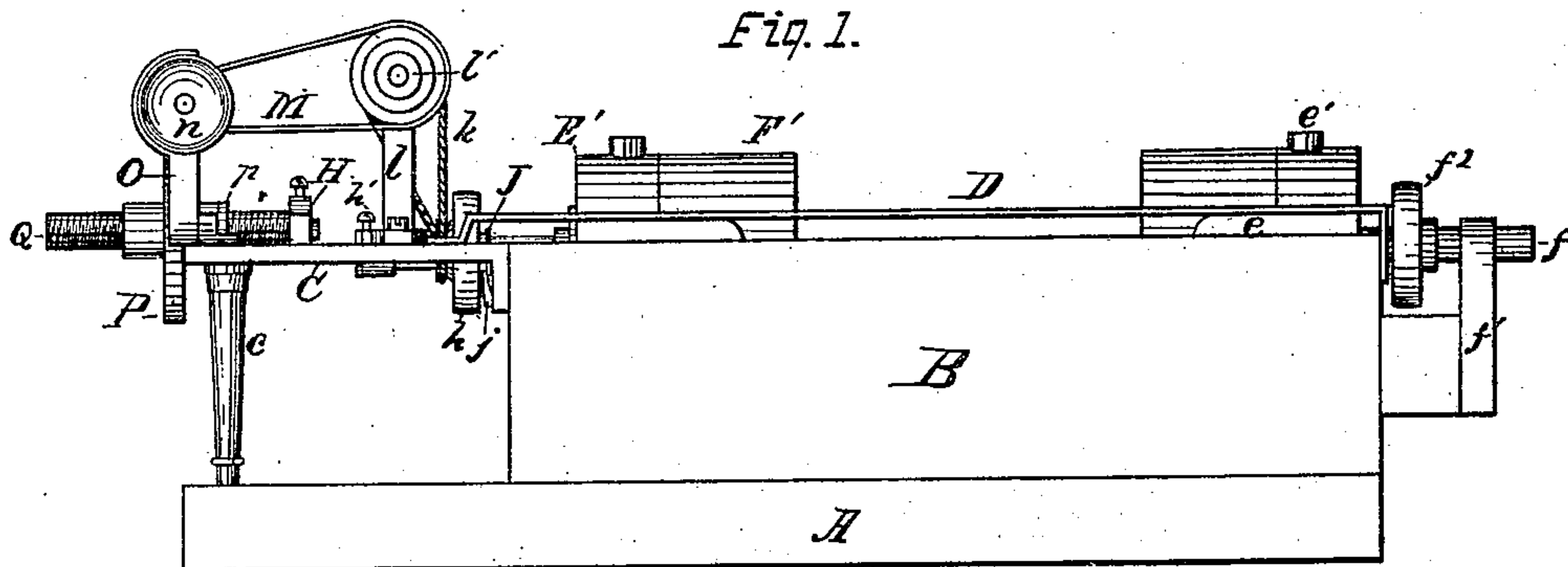


(No Model.)

2 Sheets—Sheet 1.

E. M. BALL.

Machine for Manufacturing Paper Pulp from Wood.
No. 241,277. Patented May 10, 1881.



Witnesses:
M. H. Gilman,
Geo. B. Fisher

Inventor:
Edward M. Ball.
per
Wise & Large
Attorneys.

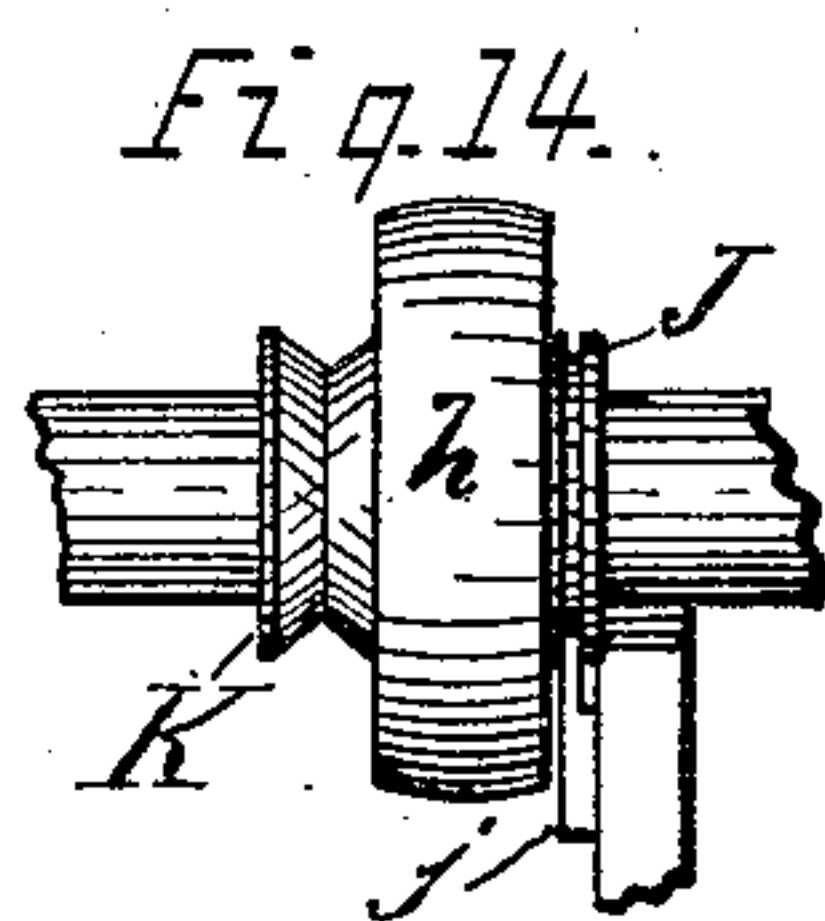
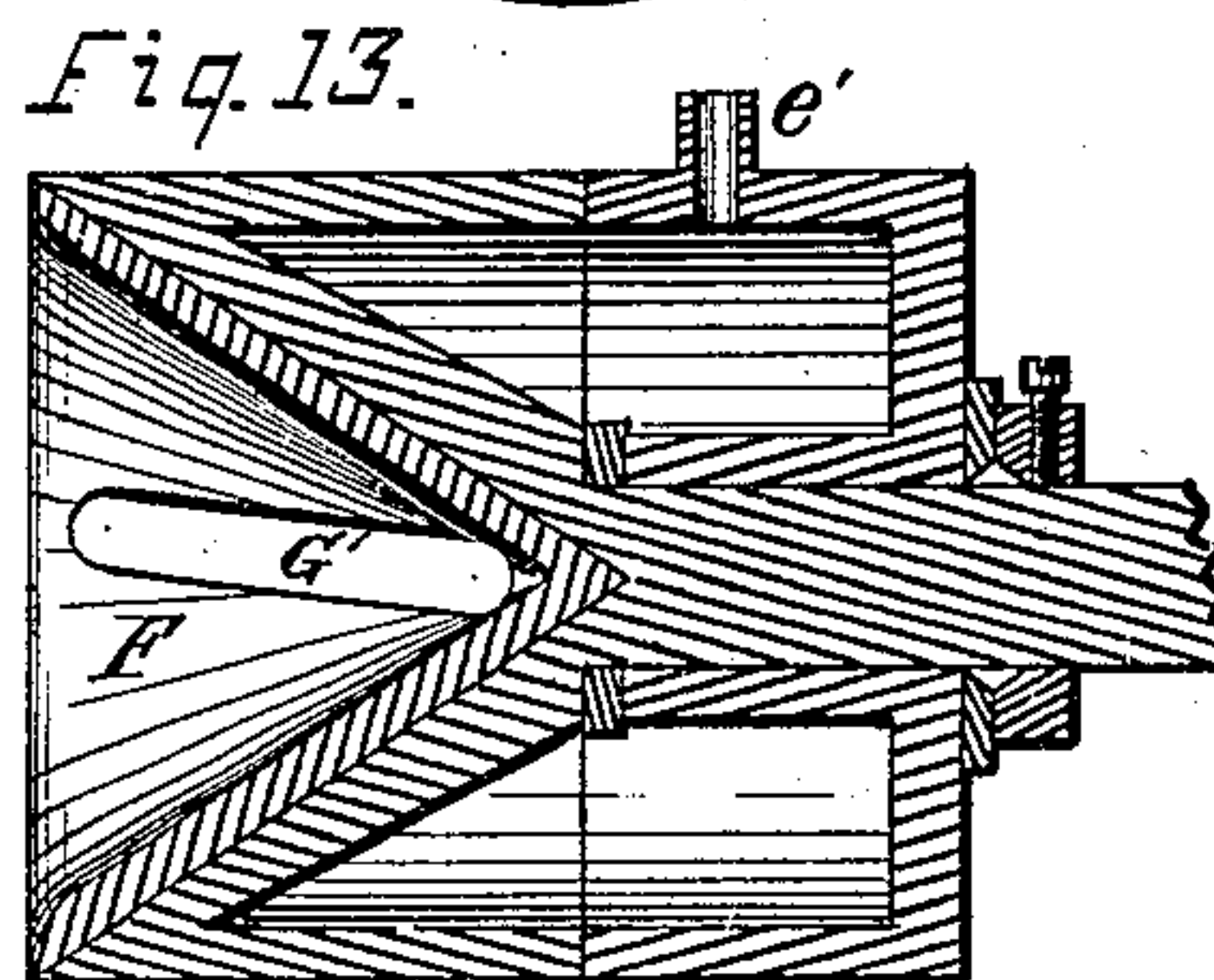
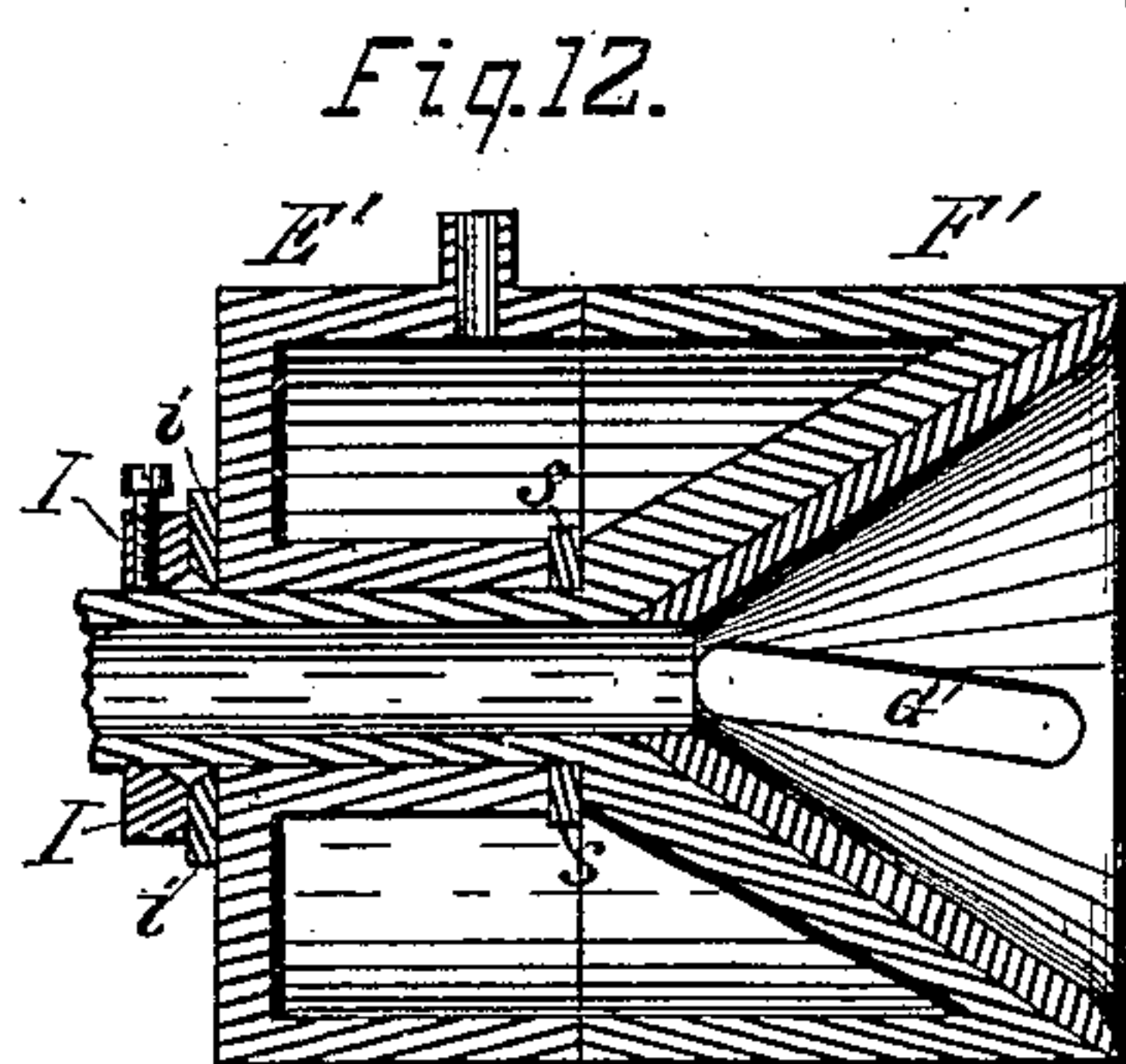
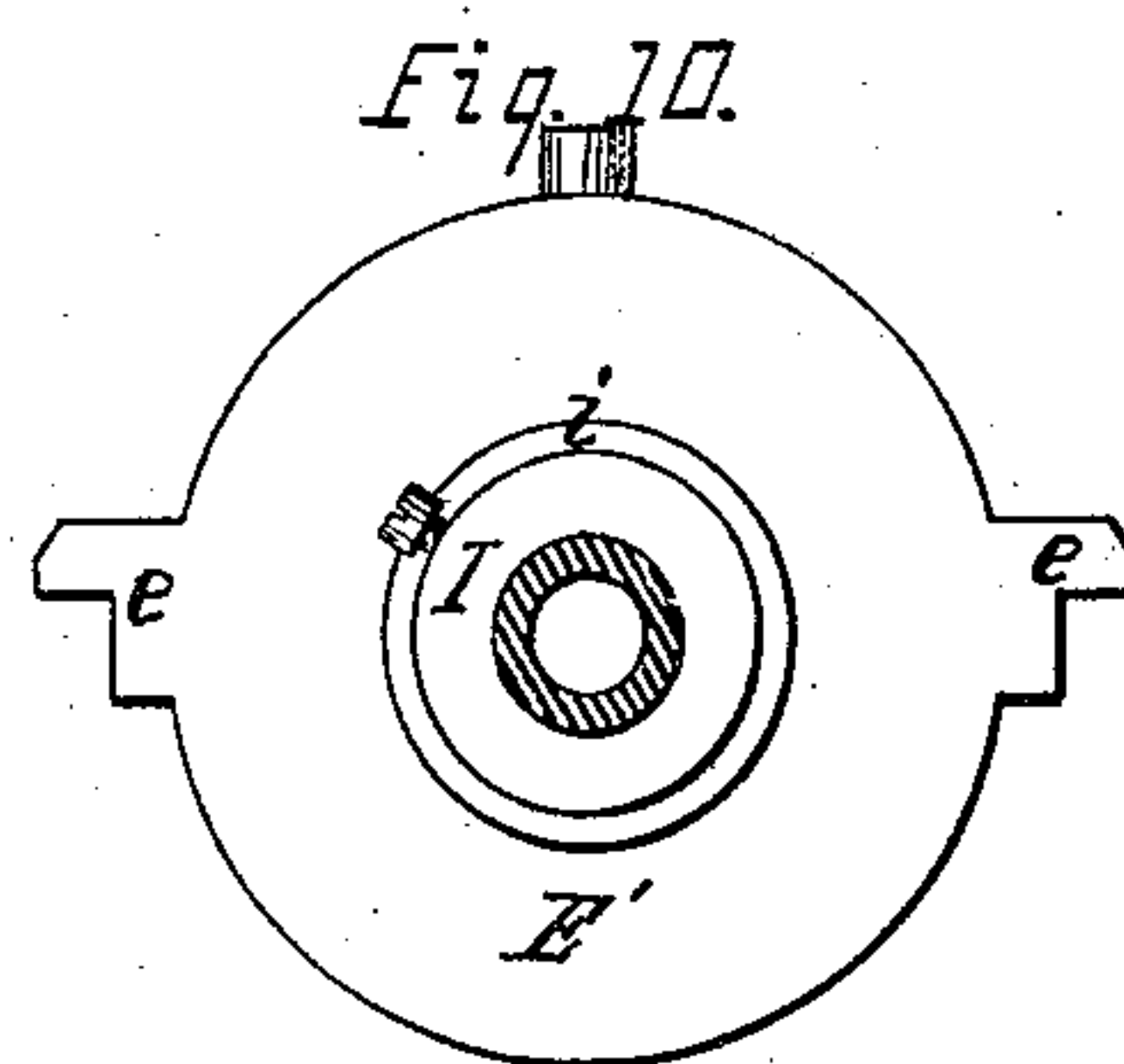
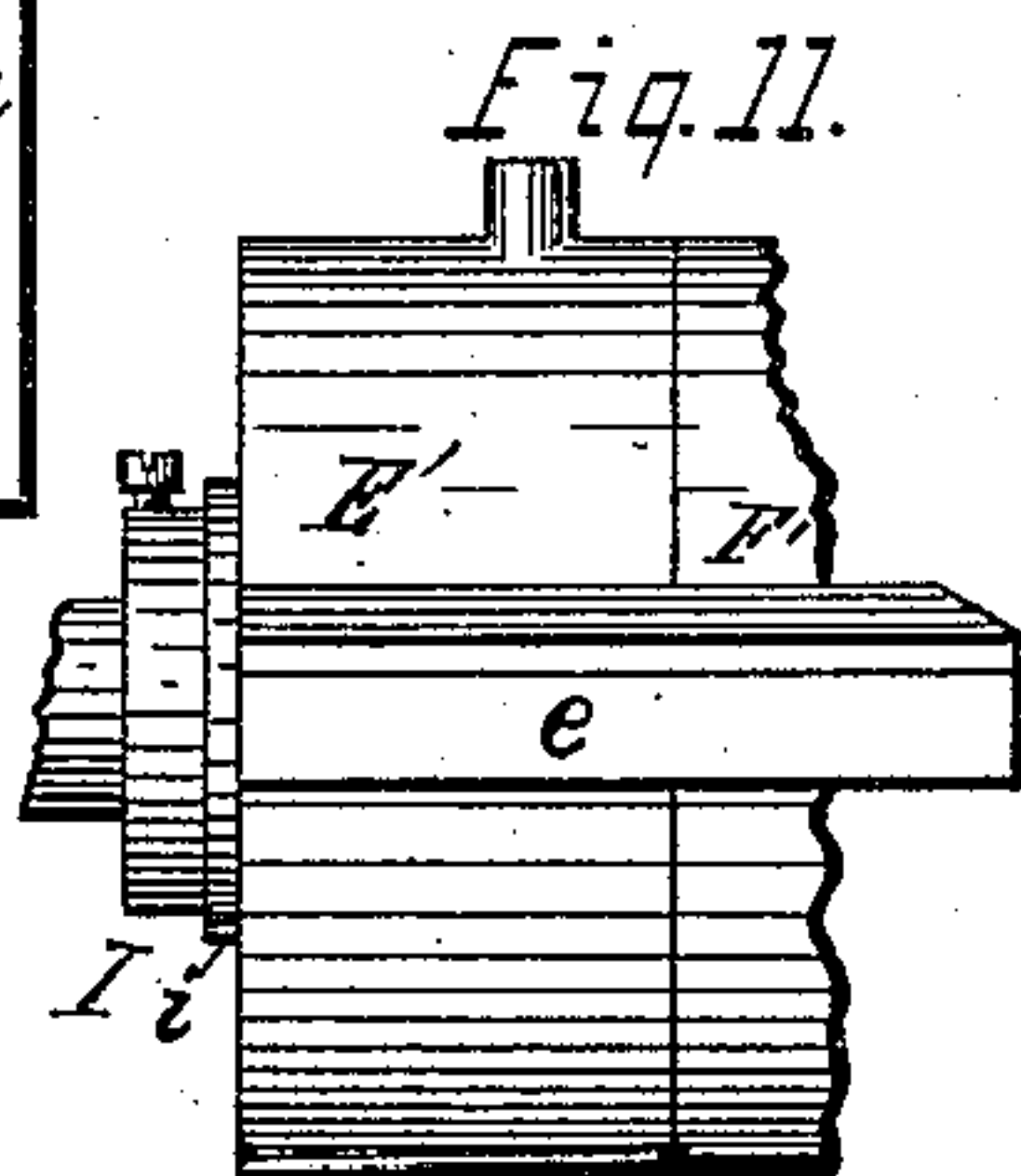
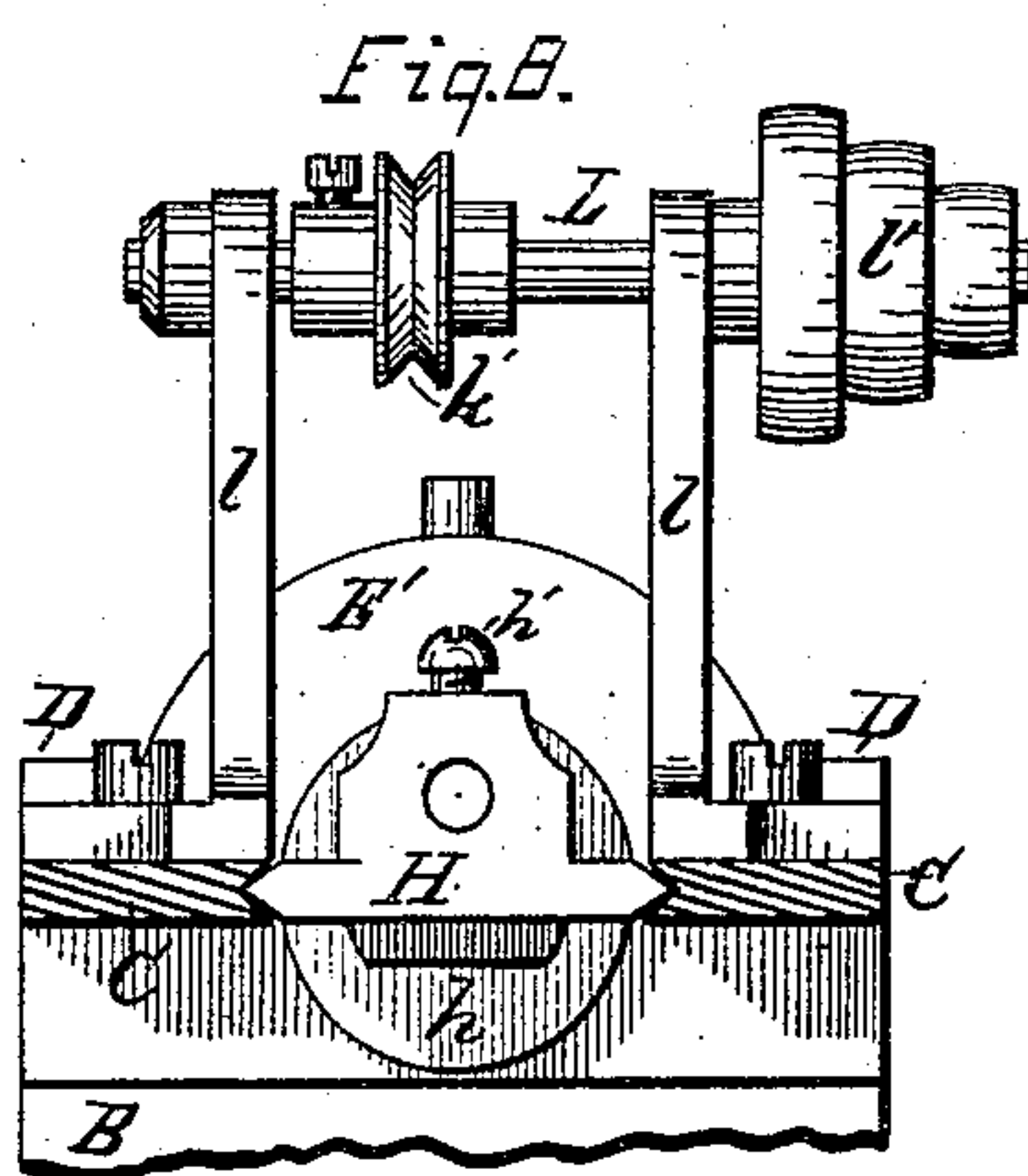
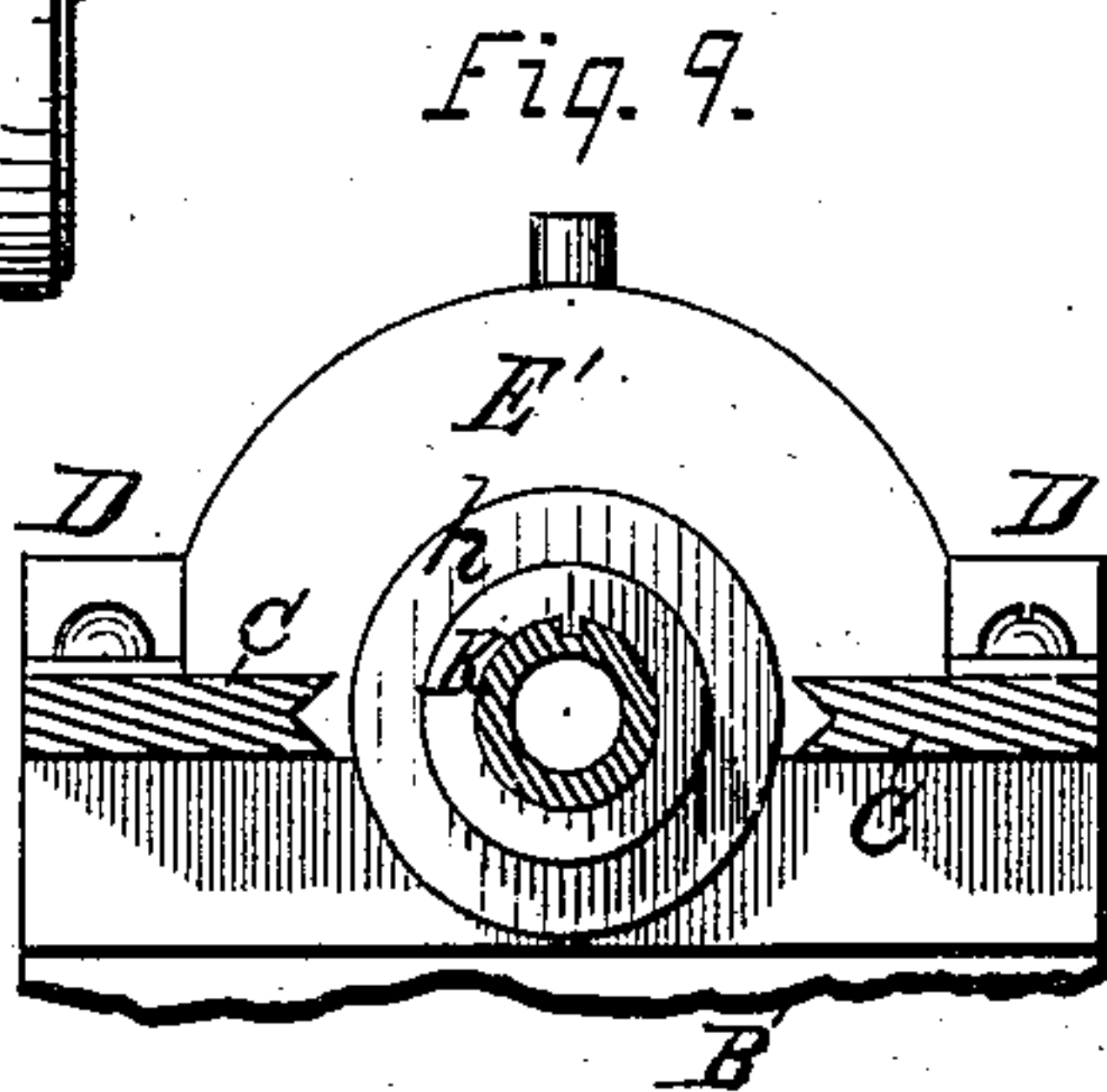
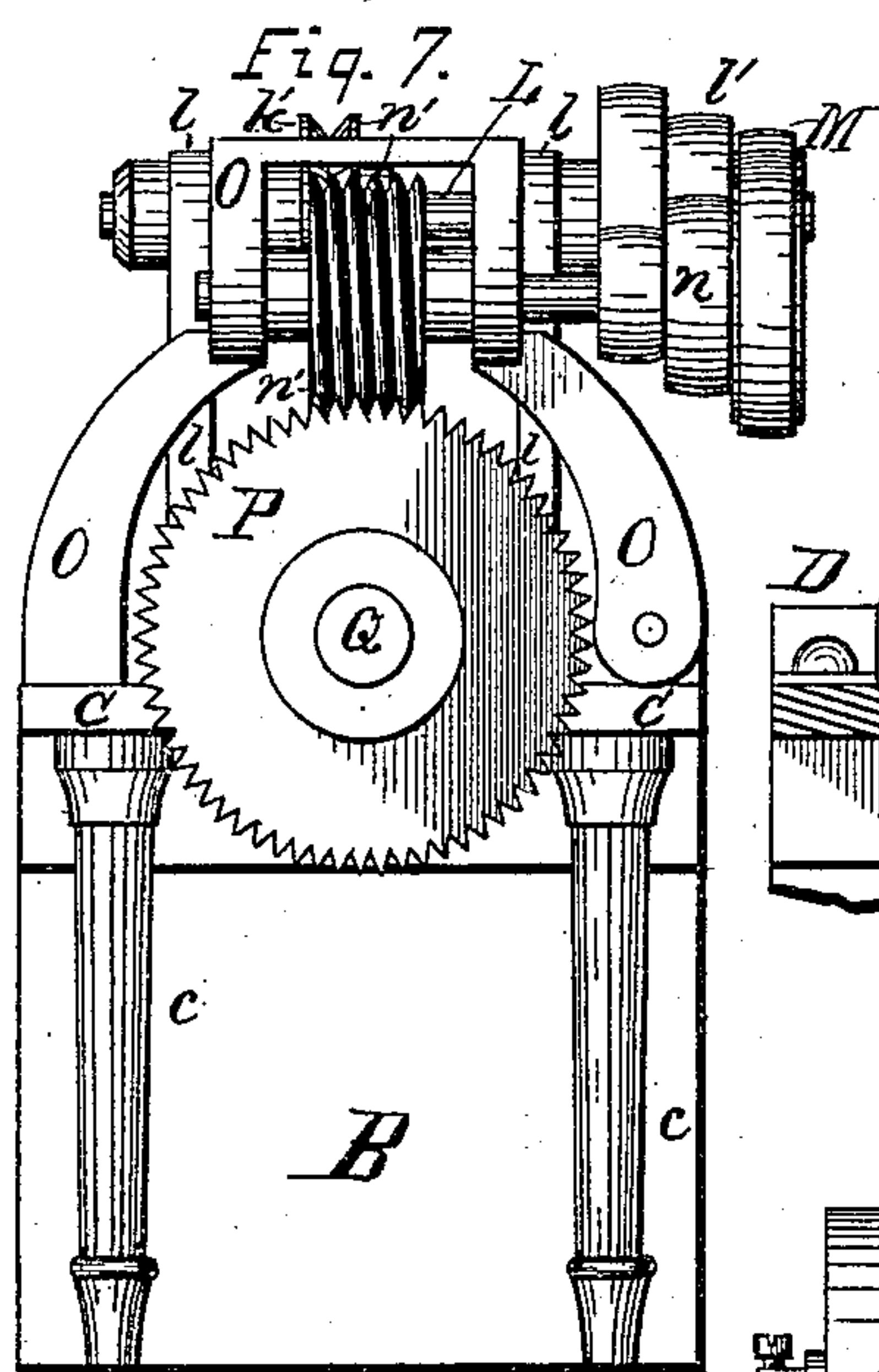
(No Model.)

2 Sheets—Sheet 2.

E. M. BALL.

Machine for Manufacturing Paper Pulp from Wood.
No. 241,277.

Patented May 10, 1881.



Witnesses:
W. H. Gilman
Geo. B. Finkler

Inventor:
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Wm. H. Lange.
Attorneys.

UNITED STATES PATENT OFFICE.

EDWARD M. BALL, OF COATICOOKE, QUEBEC, CANADA, ASSIGNOR OF ONE-HALF TO CHARLES C. COLBY AND EDWIN R. JOHNSON, BOTH OF STANSTEAD, QUEBEC, CANADA.

MACHINE FOR MANUFACTURING PAPER-PULP FROM WOOD.

SPECIFICATION forming part of Letters Patent No. 241,277, dated May 10, 1881.

Application filed March 26, 1881. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. BALL, a citizen of Canada, residing at Coaticooke, in the county of Stanstead and Province of Quebec, have invented certain new and useful Improvements in Machines for Manufacturing Paper-Pulp from Wood; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in machines for manufacturing paper-pulp from wood, the object of which is to reduce logs, sticks, or pieces of wood into pulp by means of oppositely-revolving grinders, substantially as hereinafter fully described, and set forth in the claims.

In the annexed drawings, Figure 1, Sheet 1, is a side elevation of a machine containing my invention. Fig. 2 is a plan view thereof. Fig. 3 is a longitudinal vertical section. Fig. 4 is a rear view of my improved grinder. Fig. 5 is a front elevation. Fig. 6 is a transverse vertical section thereof on line *x x*, Fig. 2. Fig. 7, Sheet 2, is an end elevation of the feeding mechanism. Fig. 8 is a sectional view on line *y y*, Fig. 2. Fig. 9 is a similar view on line *z z*, Fig. 2. Fig. 10 is a rear elevation of the head or chamber in rear of the revolving grinders. Fig. 11 is a detail side elevation of same. Fig. 12 is a detail view of the concaved grinder with its hollow shaft, and Fig. 13 is a modification of same, showing the shaft to be solid. Fig. 14 is a detail of the pulleys *K*, *h*, and *J*, showing the pin *j* projecting into the groove of the pulley *J*. Corresponding parts in the several figures are indicated by like letters of reference.

Referring to the drawings, *A* marks a base, having a tank, *B*, secured thereto. One end of a frame, *C*, is attached to one of the ends of the tank, and the other end is supported on legs *c*, which rest on the base *A*.

Running the length of the tank *B*, above its sides, are two guide-plates, *D*, the ends of which are firmly fastened to the tank and frame *C*, as shown.

E marks a cylindrical chamber, having slides

e, which work between the tank and the guide-plates, to permit of said chamber sliding back and forth in the tank. The front portion of the chamber is open, and its back has an orifice with a hub extending therefrom forward, forming a bearing for, and through which passes, a hollow shaft, *f*, of a grinder, *F*, said shaft having a second bearing in a bracket, *f'*, secured to the tank, and receives a pulley, *f*². The chamber *E* is further provided with an orifice, *e'*, to permit water to be fed to the interior thereof.

Surrounding the hollow shaft of the grinder, and between the meeting surfaces of said grinder and hub of chamber, is a washer, *s*, to lessen the wear of the grinder and hub at that point.

Made in one piece with the hollow shaft *f*, or firmly secured to the forward or inner end thereof, is the grinder *F*, which is preferably made in the shape of a hollow truncated cone, surrounded by a cylindrical shell which meets the periphery of the base of the cone, by which a space is formed by the walls of said cone and shell and closed at one end. An opening, *G*, leads from the grinding-surface of the cone into the space between the walls of said cone and shell. A second opening, *G'*, leads from the grinding-surface to the exterior of the shell, said opening prevented from having communication with the space between the cone and shell by walls surrounding the orifice and meeting the shell.

The space between the walls of the cone and its surrounding shell, together with the space in the chamber *E*, forms a water-chamber, the purpose of which, together with the peculiar construction of the grinder *F* and chamber *E*, will be presently set forth.

A second chamber, *E'*, carrying a second grinder, *F'*, facing the opposite grinder with its hollow shaft, slides in the ways at the opposite end of the tank, all constructed in like manner to those hereinbefore described. The hollow shaft of the grinder *F'*, after passing through the chamber *E'*, receives a pulley, *h*, loosely keyed thereto to permit said shaft to have a longitudinal motion through the pulley, and then is held to a cross-head, *H*, by means of a set-screw, *h'*, passing through the bearing which receives the end of the shaft and into an annular groove in said shaft.

A collar, *I*, may be secured to the shaft by a

set-screw to abut against an annulus, *i*, secured to the chamber *E'*, to prevent, more or less, the escape of water from said chamber at that point.

5 Firmly attached to the inner face of the pulley *h* is a smaller grooved pulley, *J*, in the groove of which projects a pin, *j*, secured to the frame *C*, to prevent lateral movement of the pulley *h*. On the opposite side of the pulley
10 *h* is fastened a second grooved pulley, *K*, which receives a belt, *k*, passing over a grooved pulley, *k'*, keyed to a shaft, *L*, journaled in up-rights *l* secured to the frame *C*. The shaft *L* is above and at right angles to the shaft of the
15 grinder.

Keyed to one end of the shaft *L* is a cone of pulleys, *l'*, which receives a belt, *M*, engaging with a second cone of pulleys, *n*, keyed to the shaft *N* journaled in the frame *O*, one end of
20 which is hinged to the frame *C* and the other end merely rests thereon. A worm, *n'*, is keyed to the shaft *N* and meshes with a worm-gear wheel, *P*, the hub of which is journaled in and passes through the cross-piece *c'* of the frame *C* and
25 receives a collar, *p*, to prevent lateral play of said gear. The hub of the worm-gear wheel is interiorly screw-threaded, and receives a screw-threaded shaft, *Q*, whose inner end has a bearing in and is held to the sliding cross-plate *H*
30 by a set-screw, as shown in Fig. 3. The cross-plate slides in grooves or ways in the side pieces of the frame *C*, and, as stated hereinbefore, the hollow shaft of the grinder and the screw-threaded shaft is held thereto. The face
35 of the grinders are coated with emery, corundum, or other suitable substance.

The operation of my invention is as follows: A log, stick, or piece of wood having been placed between the two grinders and upheld
40 thereby, motion is communicated from a suitable motor to the revolving grinder *F* by means of its shaft and pulley and a belt, also to the opposite grinder, but in such manner that it will revolve in an opposite direction to that of
45 the grinder *F*, when the screw-threaded shaft *Q* will have a rectilinear forward motion through the operation of the pulley *K*, belt *M*, cone-pulleys *l'n*, worm *n'*, and worm-gear wheel *P*, and in turn the grinder *F'* will be gradu-
50 ally fed to the opposite grinder, by which the log of wood, with the exception of the small portion remaining in the grinders and the center or heart in the hollow shafts, will be reduced to pulp.

55 A pulley may be placed on the end of the hub of the worm-gear wheel to receive a loose belt, which may run over a pulley on the driving-shaft, so that upon raising the hinged frame to take the worm out of gear with the
60 worm-gear wheel and tightening said belt, the grinder *F'* will be drawn back to the end of the tank through the operation of the gear-wheel, screw-threaded shaft, and sliding cross-head, and the remaining portion of the log re-
65 moved from the grinders and their hollow shafts and a second log be placed in said grind-

ers. Pressure being applied to the ends of the log and the grinders revolving in opposite directions, the log will, substantially, be prevented from revolving by the opposition of
70 forces. If deemed necessary, however, means for holding the log may be provided. The same results will be accomplished with less mechanism where one grinder is fed to the
75 other, as where the grinders are fed to each other; and though a feeding mechanism for one grinder only is shown, I do not wish to be understood as limiting myself to feeding mechanism for one grinder only.

While grinding, water is fed, under pressure, 80 to the chambers *E E'* through the orifices *e'*, filling the space caused by the hollow portions of said chambers and grinders, as shown in Fig. 3, which passes to the grinding-surface of the grinders through the orifice *G*, and, to-
85 gether with the ground pulp, is discharged from the orifice *G'* into the tank. By the construction of parts, water unmixed with pulp is continually fed to the grinding-surfaces.

Beneficial results can be obtained by dispensing with the water-chambers and running the grinders in water. 90

I do not limit myself to the exact construction of the grinders or the chambers, nor to the feeding mechanism shown, since the former can be modified or changed in many particulars and the latter entirely substituted by other forms of feeding mechanism now in use without departing from the spirit of my invention. 95 100

Fig. 13 of the drawings shows a grinder provided with a solid shaft, which may be substituted for the grinder having the hollow shaft, if advisable.

I am aware of the patents granted to H. Dodge, January 25, 1870, No. 99,071, and January 10, 1872, No. 122,581; also, original patent No. 106,710, granted to H. B. Much, August 23, 1870, and reissued May 28, 1878, Nos. 8,256, 8,257, and 8,258, and make no claim to the invention described or claimed therein. 105 110

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine for manufacturing paper-pulp from wood, the combination of two oppositely-revolving grinders, with mechanism for feeding said grinders together, as and for the purpose set forth. 115

2. In a machine for manufacturing paper-pulp from wood, the combination, with two oppositely-revolving grinders provided with mechanism for feeding said grinders together, of means for supplying water to the grinding-surfaces of said grinders, as and for the purpose set forth. 120 125

3. In a machine for manufacturing paper-pulp from wood, the combination, with two oppositely-revolving grinders facing each other, of means for feeding one of said grinders to the other, as and for the purpose set forth. 130

4. In a machine for manufacturing paper-

pulp from wood, the combination, with two oppositely-revolving grinders facing each other, and provided with mechanism for feeding one of the grinders to the other, of means for supplying water to the grinding-surfaces of said grinders, as and for the purpose set forth.

5. In a machine for manufacturing paper-pulp from wood, the combination, with two oppositely-revolving hollow grinders facing each other, and provided with mechanism for feeding one grinder to the other, of means for supplying water to the grinding-surfaces of said grinders, as and for the purpose set forth.

6. In a machine for manufacturing paper-pulp from wood, the combination, with two oppositely-revolving grinders facing each other, having concaved grinding-surfaces to hold and grind the ends of a log, stick, or piece of wood, and provided with mechanism for feeding one grinder to the other as the wood is ground, of means for supplying water to the grinding-surfaces of said grinders.

7. In a machine for manufacturing paper-pulp from wood, the combination, with two oppositely-revolving grinders facing each other, provided with means for supplying water to the grinding-surfaces thereof, and constructed in such manner as to discharge the water and pulp at the periphery of the grinders, of mechanism for feeding one grinder to the other, as and for the purpose set forth.

8. In a machine for manufacturing paper-pulp from wood, the combination, with a revolving grinder having a concaved grinding-surface, a cylindrical shell surrounding the same and joining the periphery of the grinding-surface to form a space between the walls of said concaved and cylindrical portions, and having an orifice extending from the grinding-surface to said space, of a head or chamber meeting the said grinder to form a water-chamber, as and for the purpose set forth.

9. In a machine for manufacturing paper-pulp from wood, the combination of the revolving grinder and the head or chamber, as shown and described, and for the purpose set forth.

10. In a machine for manufacturing paper-pulp from wood, the combination, with the revolving grinders and heads or chambers, as shown, of mechanism for feeding one grinder with its head or chamber to the other grinder, as and for the purpose set forth.

11. In a machine for manufacturing paper-pulp from wood, the combination, with the oppositely-revolving grinders and the heads or chambers, the latter sliding in ways in a suitable tank, of mechanism for feeding one grinder with its head or chamber to the other, and mechanism for feeding water to said heads or chambers, as and for the purpose set forth.

12. In a machine for manufacturing paper-pulp from wood, the combination of two oppositely-revolving hollow grinders, provided each with a hollow shaft joining the smaller end of said hollow grinder, with mechanism for feeding said grinders together, as and for the purpose set forth.

13. In a machine for manufacturing paper-pulp from wood, the combination of two oppositely-revolving hollow conical grinders, provided each with a hollow shaft meeting the smaller end of said grinders, and having mechanism for feeding said grinders, together with means for supplying water to the grinding-surfaces of said grinders, as and for the purpose set forth.

14. In a machine for manufacturing paper-pulp from wood, the combination, with two oppositely-revolving hollow or concaved grinders, provided each with a hollow shaft meeting the smaller open end of said grinders, and having mechanism for feeding one grinder to the other, of means for supplying water to the grinding-surfaces of said grinders, as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD MOSES BALL.

Witnesses:

JNO. FRASER,
DANIEL MULLINS.