

A. B. TOWER.

MACHINE FOR GRINDING PULP FROM WOOD.

No. 311,212.

Patented Jan. 27, 1885.

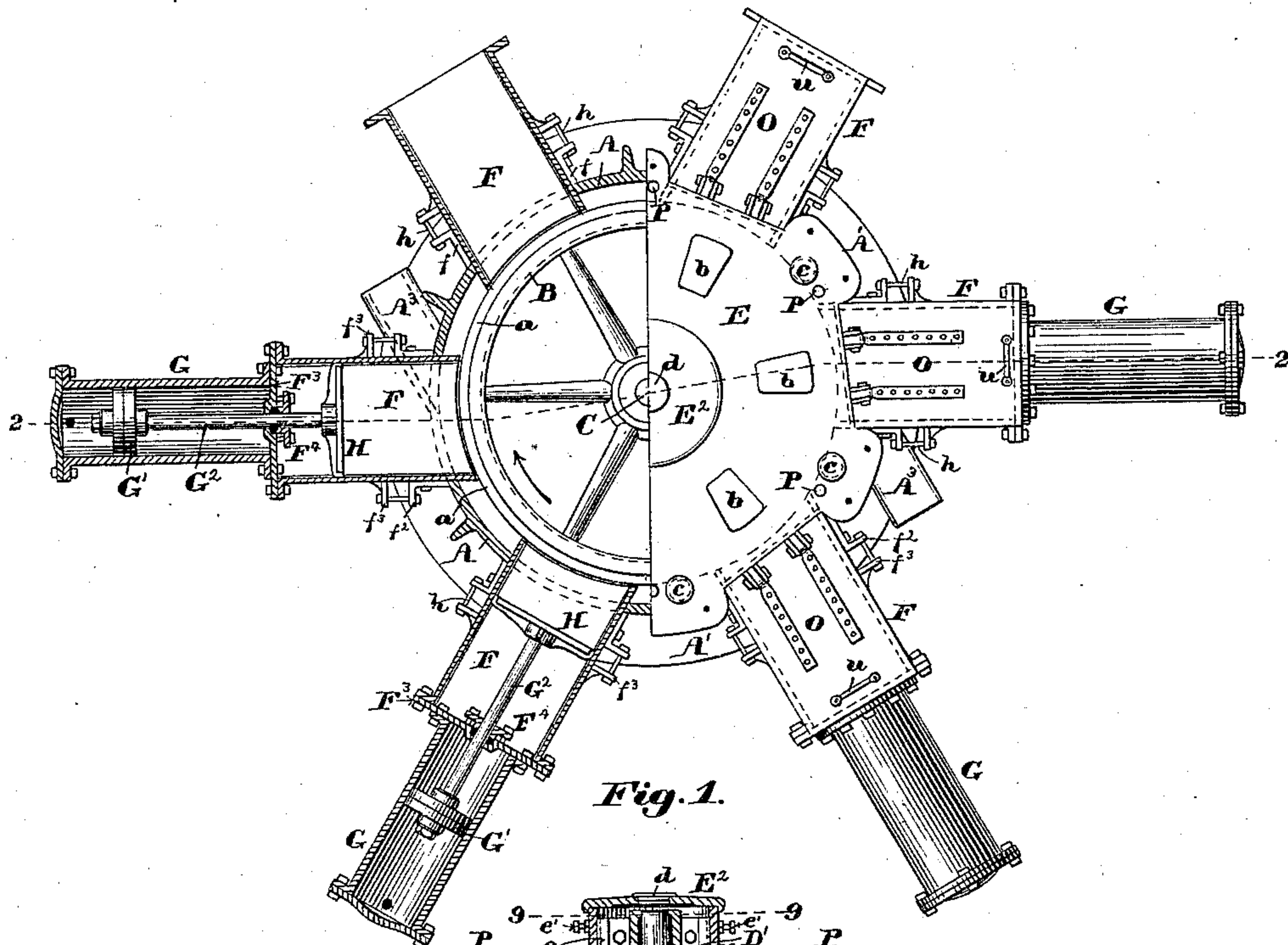


Fig. 1.

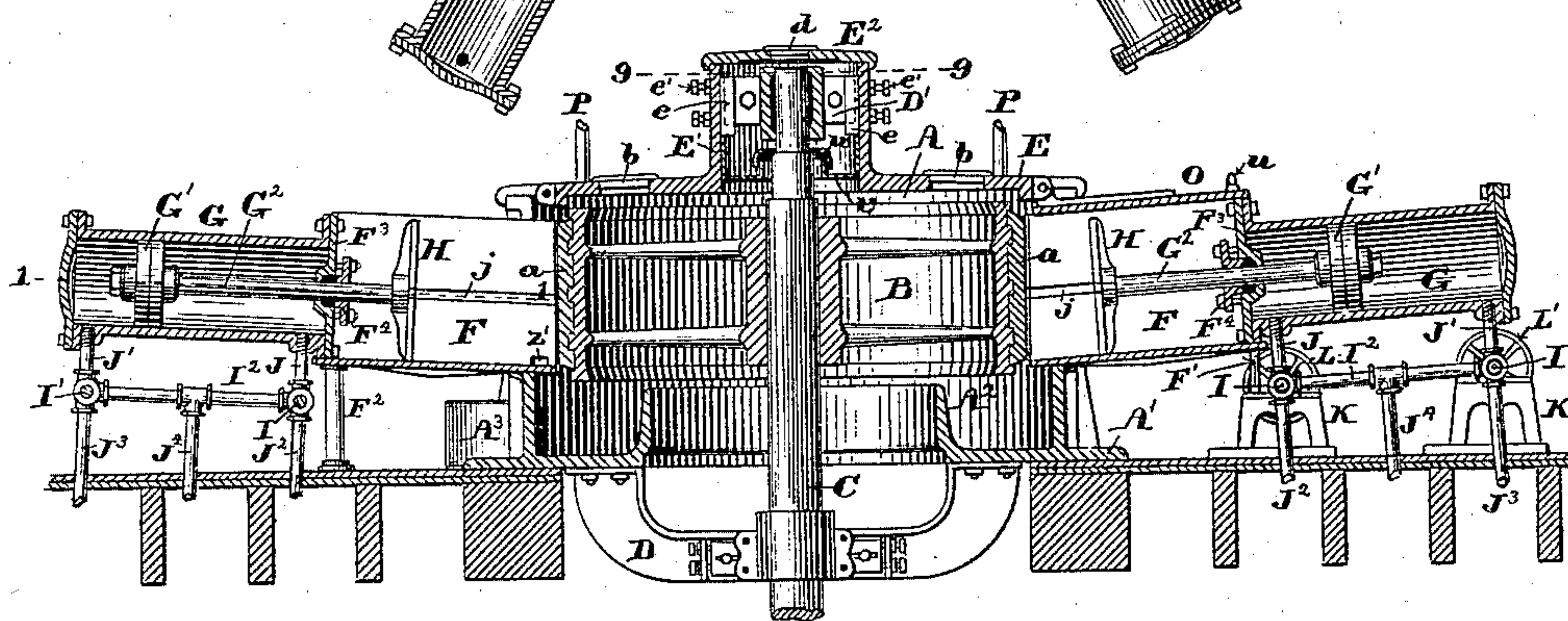


Fig. 2.

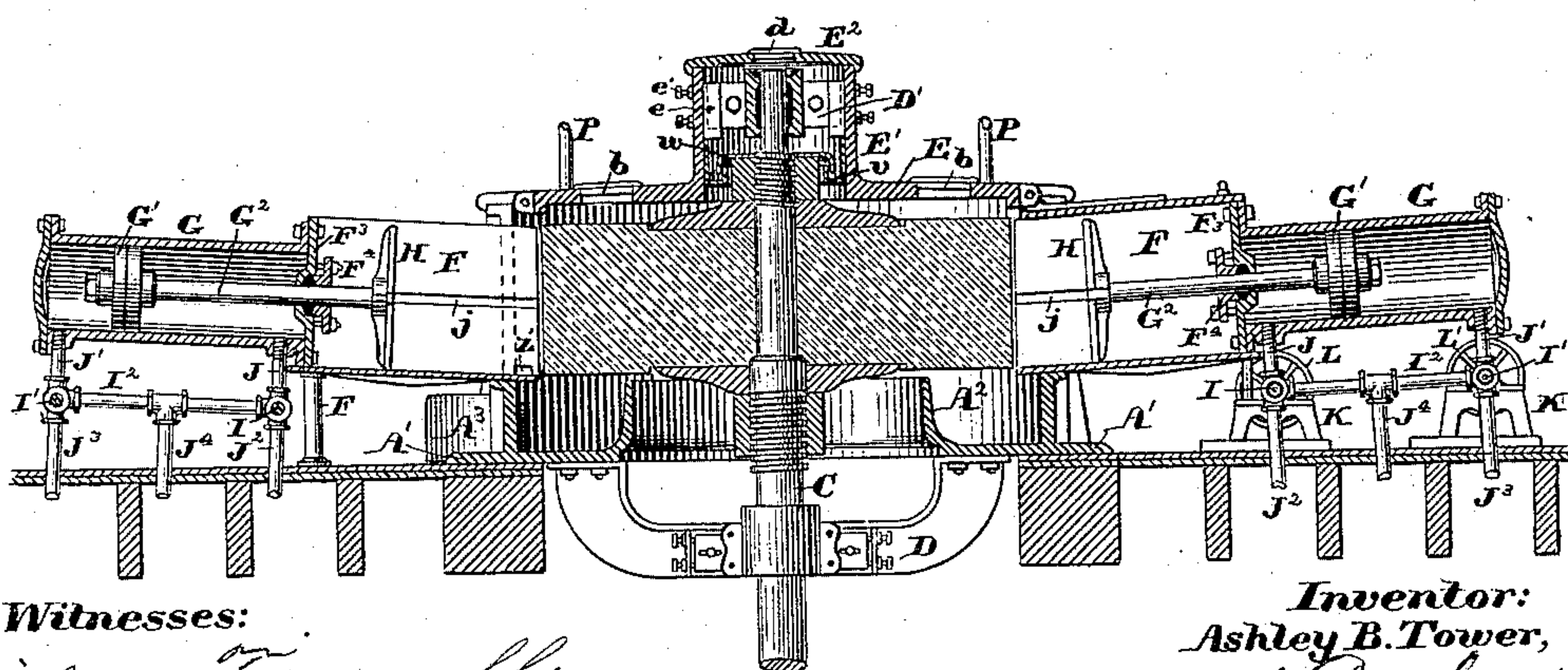


Fig. 3.

Witnesses:

Oliver Twiss
Walter E. Lombard

Inventor:

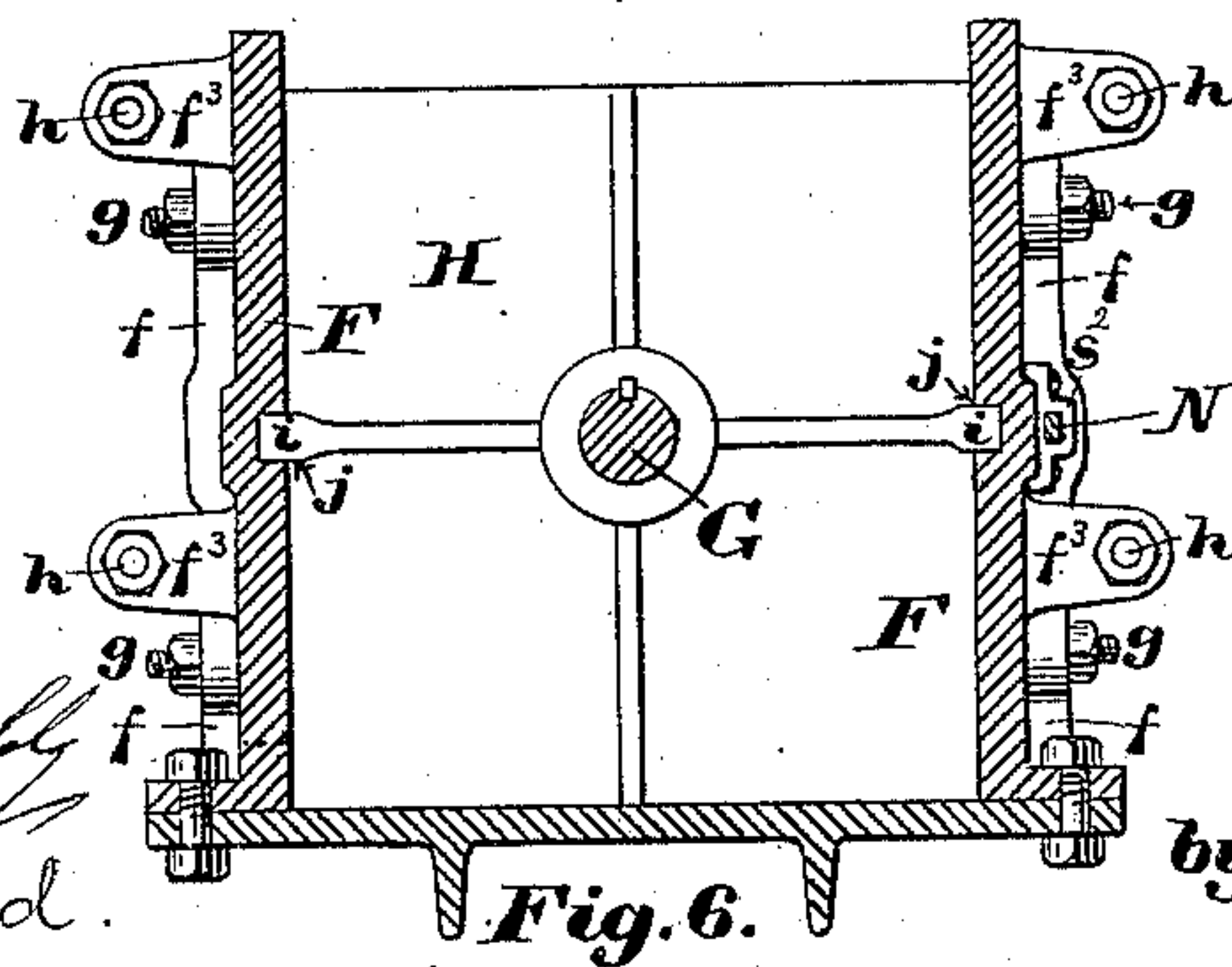
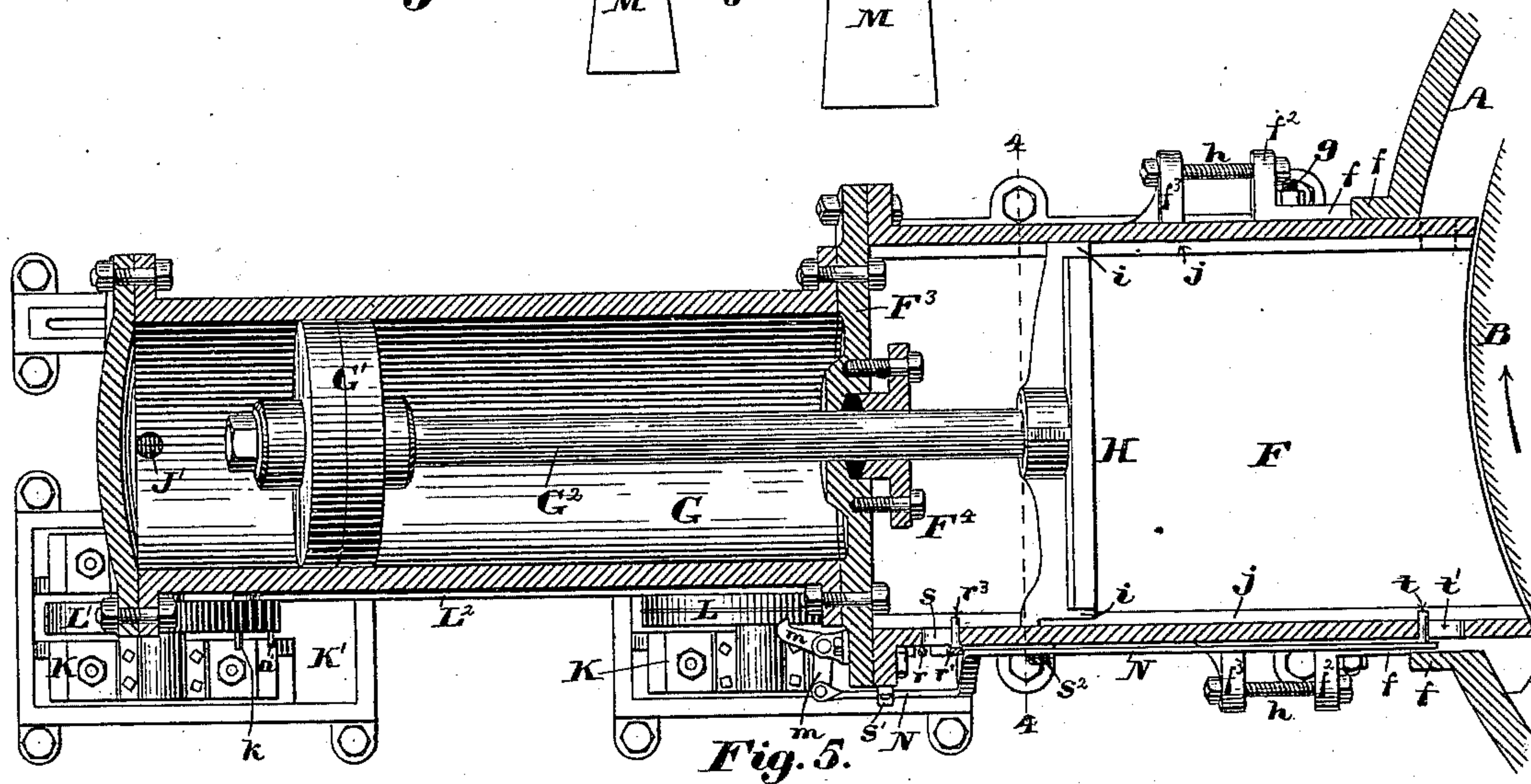
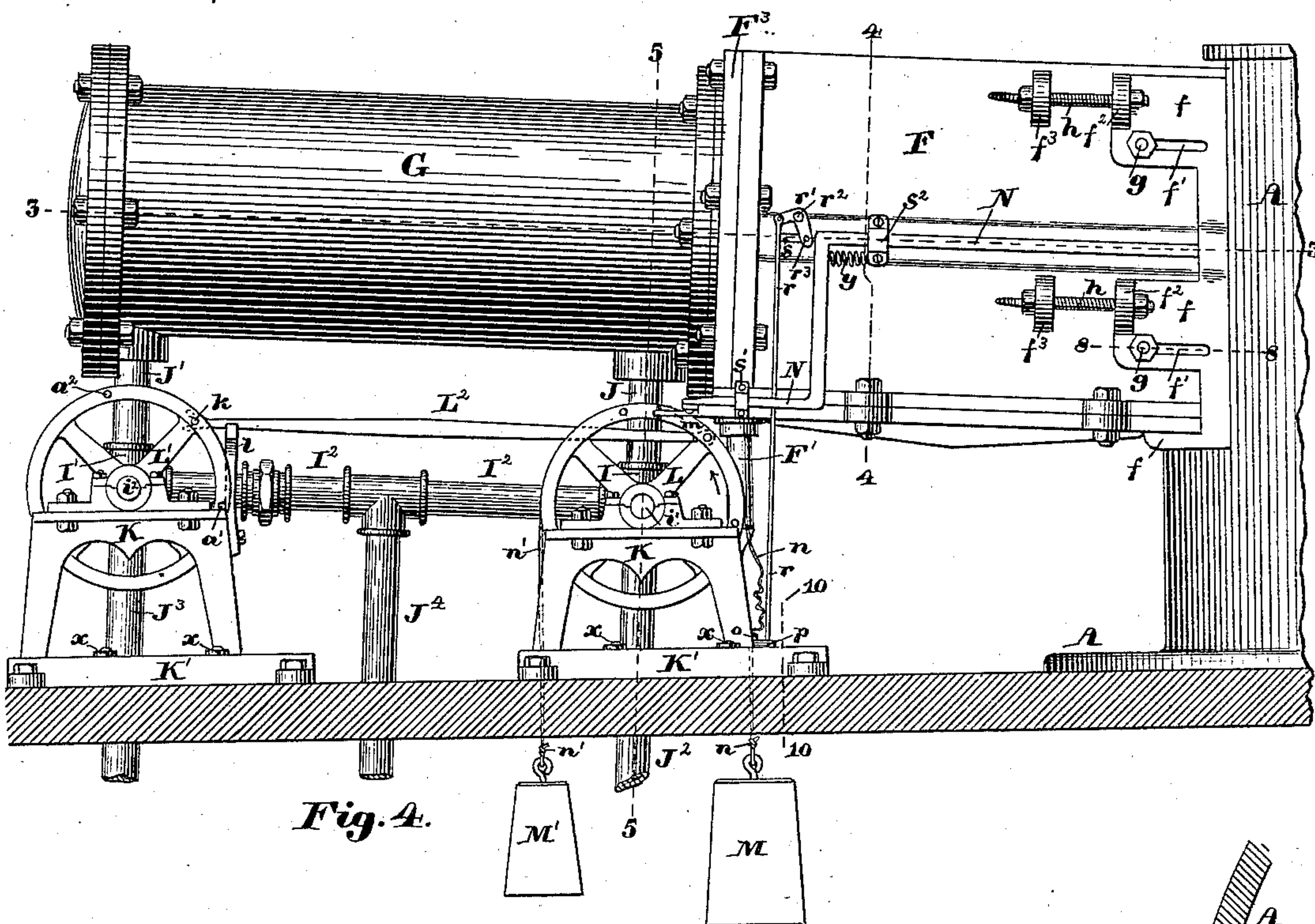
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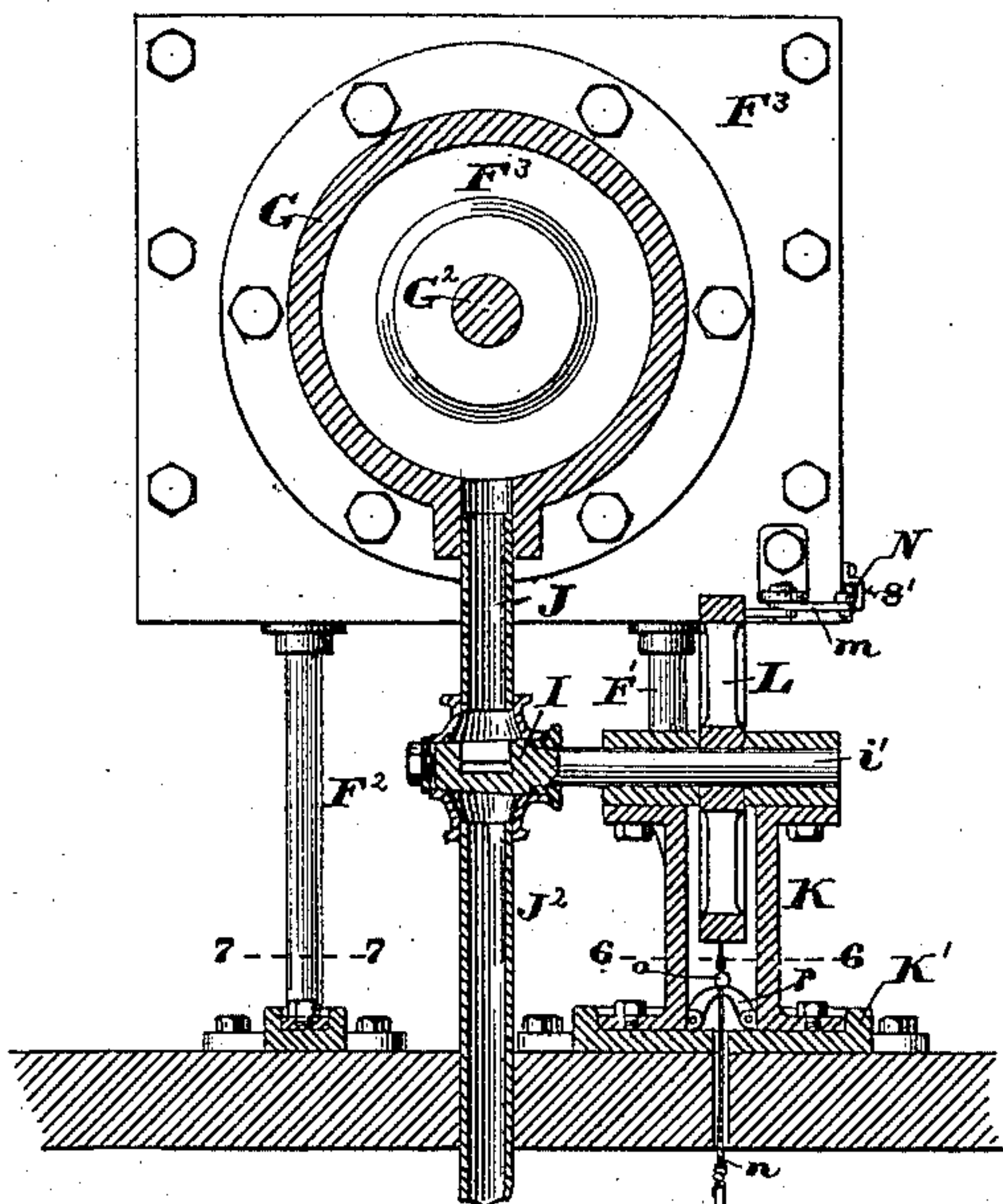
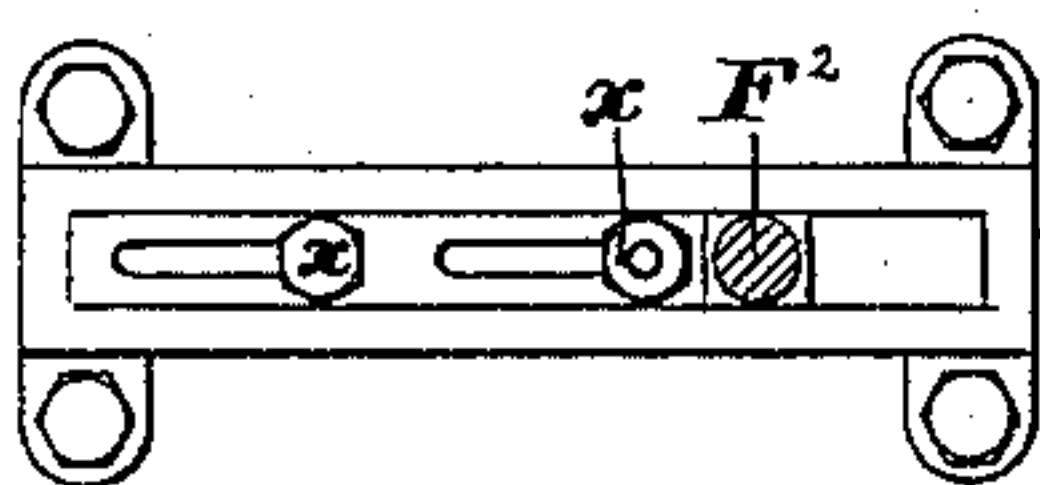
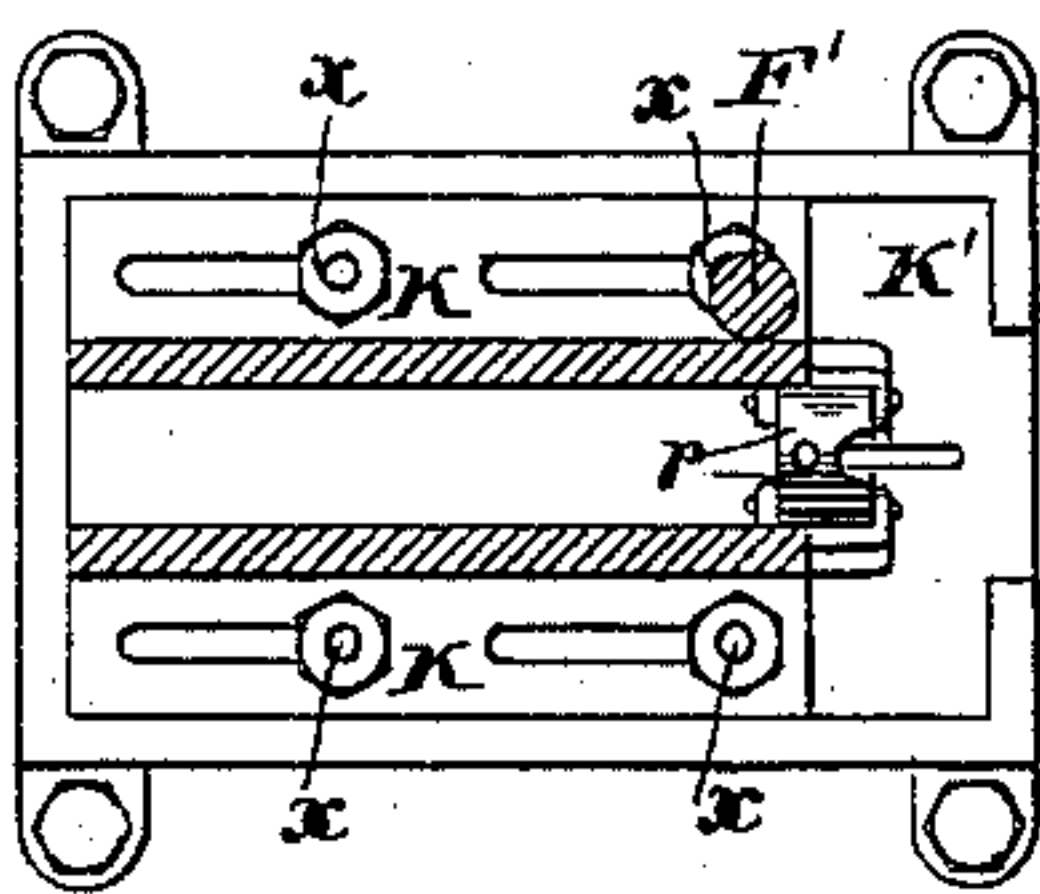
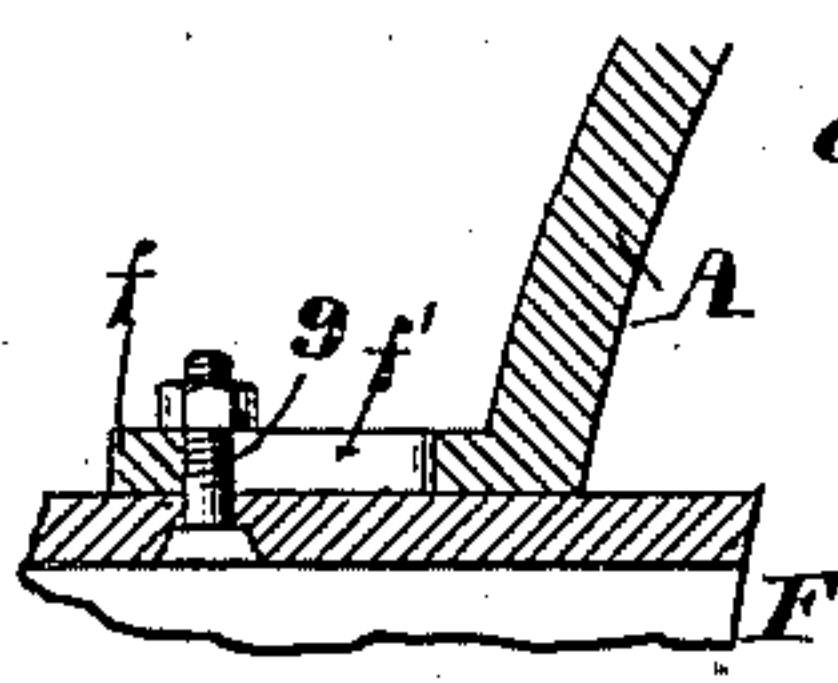
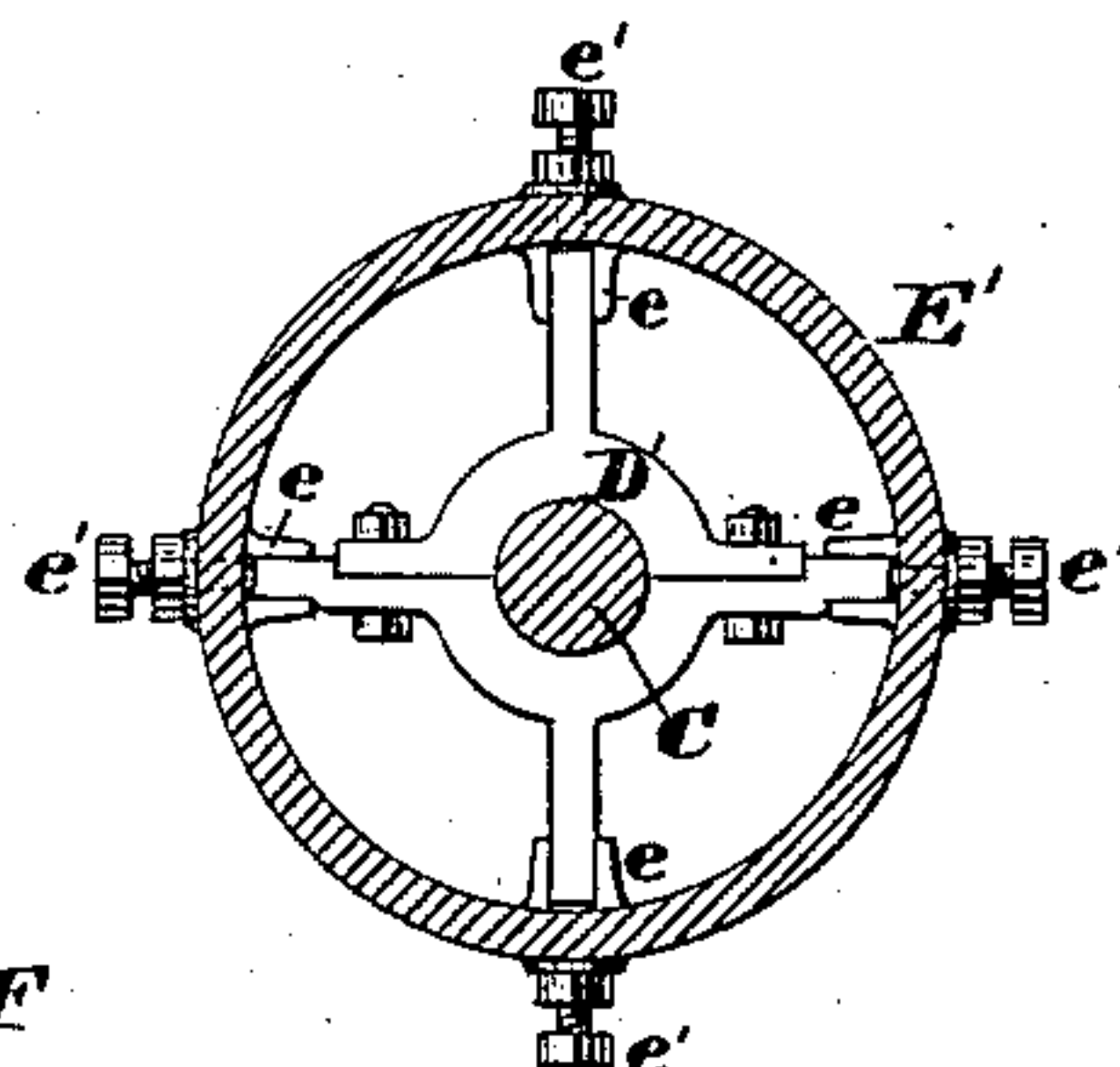
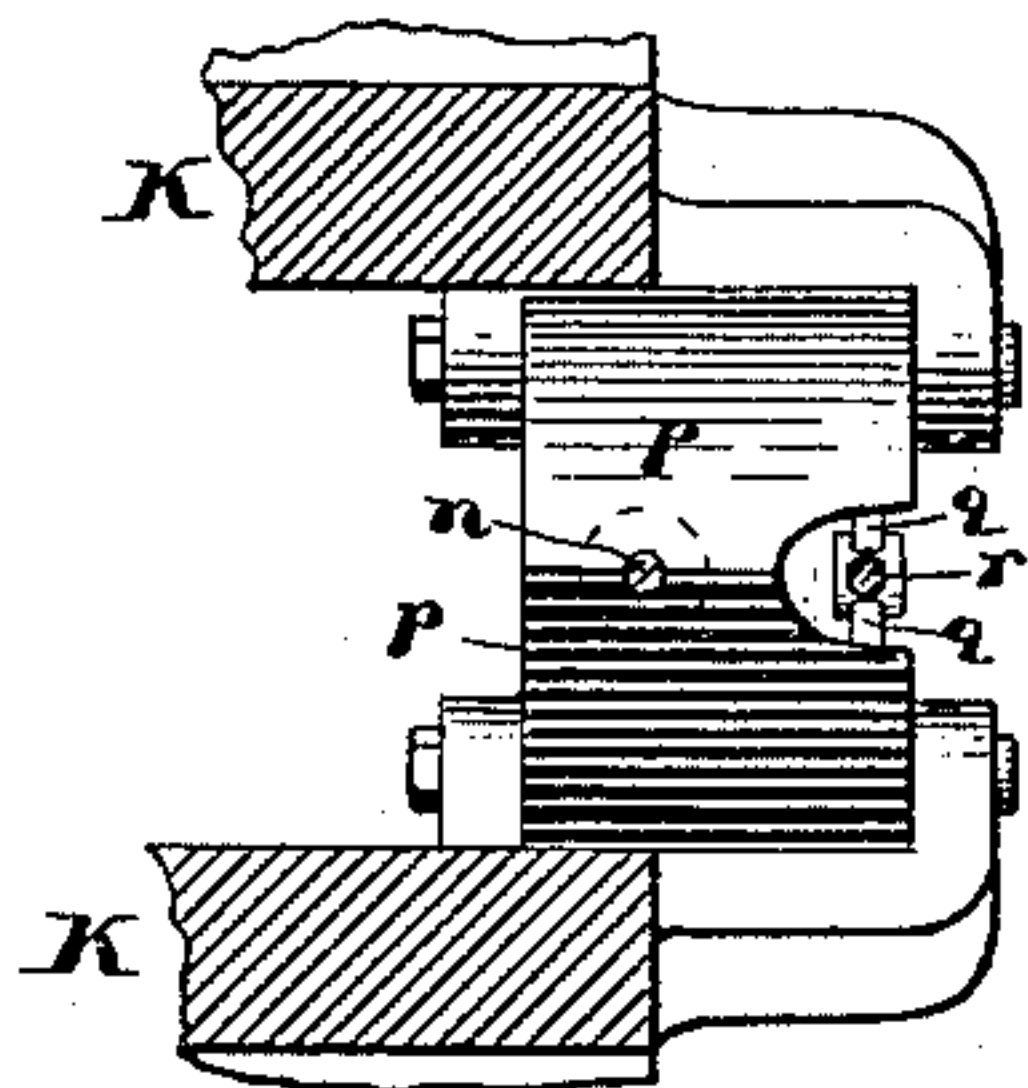
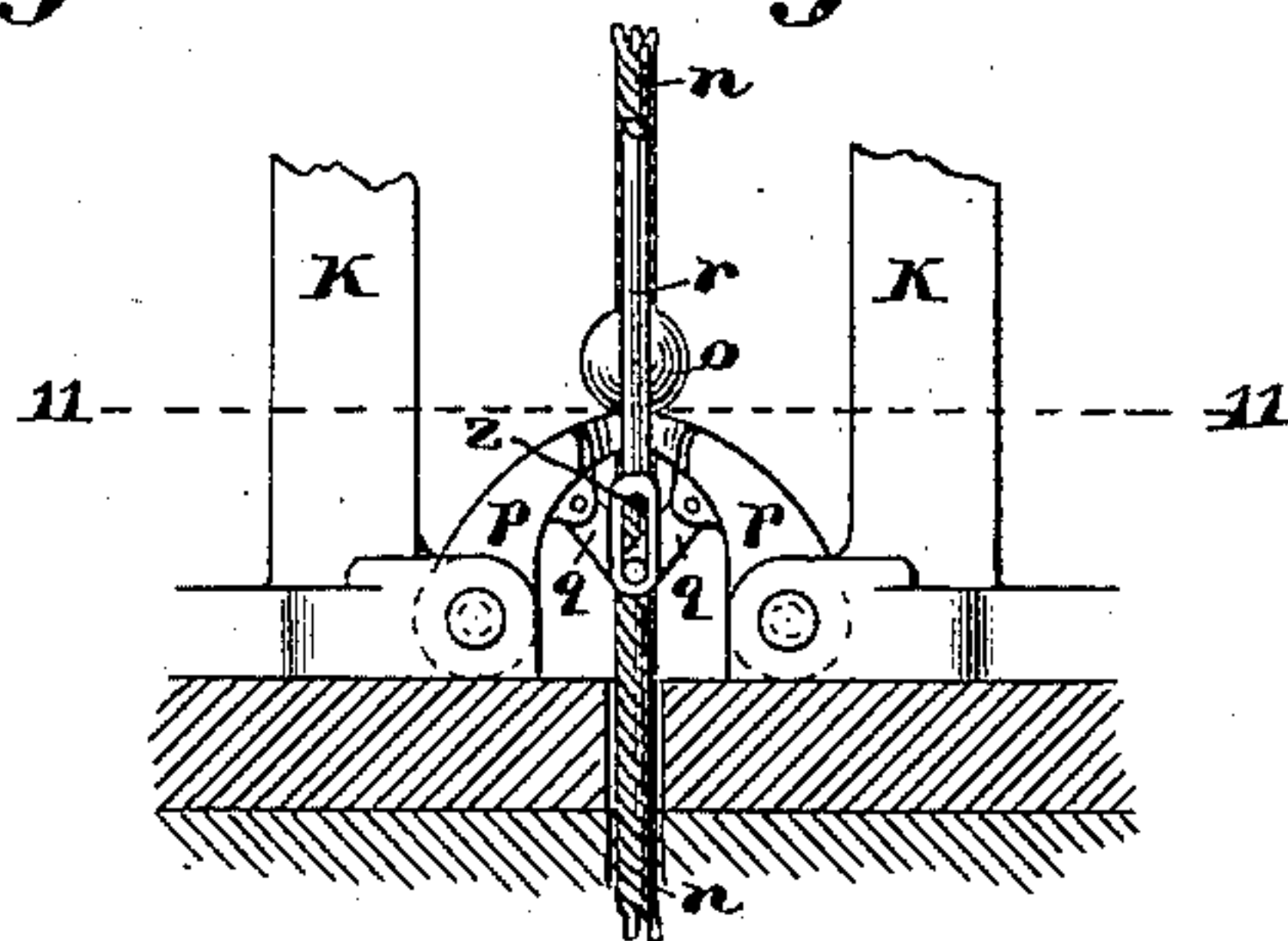
Patented Jan. 27, 1885.



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**Fig. 7.****Fig. 9.****Fig. 8.****Fig. 10.****Fig. 11.****Fig. 13.****Fig. 12.****Witnesses:**

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UNITED STATES PATENT OFFICE.

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MACHINE FOR GRINDING PULP FROM WOOD.

SPECIFICATION forming part of Letters Patent No. 311,212, dated January 27, 1885.

Application filed July 14, 1884. (No model.)

To all whom it may concern:

Be it known that I, ASHLEY B. TOWER, of Holyoke, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Machines for Grinding Pulp from Wood, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to that class of machines for producing wood pulp, in which a series of wood-holding chambers or hoppers are arranged around a common grinding-wheel mounted upon and revolving about a vertical axis; and it consists in certain novel constructions, arrangements, and combinations of devices, which will be readily understood by reference to the description of the drawings, and to the claims to be hereinafter given.

Figure 1 of the drawings is a sectional plan of a machine embodying my invention, the cutting plane of the sectional portion being on line 1 1 on Fig. 2. Fig. 2 is a vertical section on line 2 2 on Fig. 1. Fig. 3 is a similar section showing a modification of the grinding-wheel. Fig. 4 is a side elevation of one of the feed-boxes or hoppers and its operating cylinder, drawn to an enlarged scale. Fig. 5 is a horizontal section on line 3 3 on Fig. 4. Fig. 6 is a vertical transverse section on line 4 4 on Figs. 4 and 5. Fig. 7 is a vertical section on line 5 5 on Fig. 4, looking toward the grinding-wheel. Fig. 8 is a horizontal section on line 6 6 on Fig. 7. Fig. 9 is a similar section on line 7 7 on Fig. 7. Fig. 10 is a partial horizontal section on line 8 8 on Fig. 4. Fig. 11 is a horizontal section on line 9 9 on Fig. 2, enlarged. Fig. 12 is a partial vertical sectional elevation on line 10 10 on Fig. 4, looking toward the outer end of the cylinder, and drawn to a still larger scale; and Fig. 13 is a horizontal section on line 11 11 on Fig. 12.

A is the main cylinder, to receive the grinding-wheel B, which may be an ordinary grindstone, as shown in Fig. 3, or it may be a metallic wheel carrying a band of emery or other suitable abrading material, *a*, as shown in Figs. 1 and 2. The cylinder A is provided at its lower end with the outwardly-projecting flange A', by which it is supported and secured in position, and with the annular trough A² to receive the pulp as it is ground from the wood,

and from which it is discharged through the discharge-pipes A³ A³, opening therefrom tangentially to the periphery of the grinding-wheel, as shown in Figs. 1, 2, and 3. The grinding-wheel B is mounted upon the vertical shaft C, which has its bearings in the yoke D, bolted to the under side of the trough A², and in the spider D', supported in the cylinder E', projecting upward from and forming a part of the cover E, and in a suitable step or thrust bearing, (not shown,) the lever end of said shaft C, with its driving-pulley and step-bearing, being broken away. The cover E is firmly bolted to the upper end of the cylinder A, and has cut through it two series of openings which are closed by the light removable covers *b b* and *c c*, respectively, said openings being intended to facilitate the inspection of the progress of the work. The cylinder E' has secured to its upper end the cover E², in the center of which is an opening designed to facilitate the oiling of the upper bearing of the shaft C, and closed by the light cover *d*. The spider D' rests in recesses formed in the inwardly-projecting lugs *e e*, and is adjustable laterally by means of the set-screws *e' e'*, as shown in Figs. 2, 3, and 11. The cylinder A has cut through its vertical wall a series of rectangular openings to receive the inner ends of the feed-boxes or hoppers F F, which are supported in position with their bottoms inclined toward the cylinder A, so that any pulp which may work outward into said hoppers will readily flow back into the cylinder and fall into the trough A², as shown in Figs. 2, 3, and 4. The inner ends of the hoppers are supported by the wall of the cylinder A, and the outer ends by the columns F' and F², as shown in Figs. 4 and 7. The cylinder A has outwardly-projecting flanges *f*, around three sides of the rectangular openings in which the hoppers are fitted, to which said hoppers are secured by means of the bolts *g*, which pass through holes in the side walls of the hoppers F, and through slots *f'*, formed in the flanges *f*, as shown in Figs. 4 and 10. The hoppers F may be adjusted toward the grinding-wheel as the stone wears away by means of the bolts *h*, which pass through ears *f*² on the flanges *f*, and corresponding ears, *f*³, on the side walls of the hoppers F, as shown in Figs. 4 and 5.

It will be noticed, on reference to Figs. 1 and 5, that the hoppers F are so located relative to the grinding-wheel that radial lines drawn through the axis of said wheel and parallel with the sides of the hoppers will cut through said hoppers near one side wall thereof instead of through their centers, as heretofore practiced, the purpose of which is to prevent slivers of wood being split off at the end where the stone leaves it, by causing the motion of the grinding stone or wheel at that point to be parallel with the grain of the wood, or nearly so. The outer ends of the hoppers F are closed by the heads F^3 , each provided at its center with a stuffing-box, F^4 , and having bolted thereto the cylinder G, provided with the piston G' , secured to one end of the rod G^2 , which passes through the stuffing-box F^4 , and has secured to its other end the piston or follower H, provided upon two opposite sides with the lugs i , which project into the grooves j , formed in the inner faces of the side walls of the hopper F, as shown in Figs. 5 and 6.

I and I' are two three-way valves, located beneath the cylinder G and connected together by the pipe I^2 , and with the interior of the cylinder G by the pipes J and J' , respectively, and provided, respectively, with the discharge-pipes J^2 and J^3 , and with long stems i' and i'^2 , which are mounted in bearings in the stands K K, which in turn are adjustably mounted on the bed-plates K' , as shown in Figs. 4, 7, and 8.

J^4 is the supply-pipe, through which water, steam, or other fluid may be admitted to the pipe I^2 , and thence through the valve I' and pipe J' to the outer end of the cylinder G, or through the valve I and pipe J to the inner end of said cylinder. The valve-stems i' and i'^2 have mounted thereon the wheels L and L' , respectively, as a means of operating said valves. The wheel L has pivoted to its rim, upon one side, one end of the rod L^2 , the other end of which is forked to receive the pin k , set in the rim of the wheel L' in such a manner that the wheel L' may be rotated independently of the rod L^2 , when desired, at which time the rod L^2 is supported by the bracket l , projecting upward from one of the stands K, as shown in Fig. 4. The wheel L has formed in its rim a detent-notch to receive the hook on the end of the elbow-lever m , to lock said wheel in the position shown in Fig. 4. The wheel L has secured to its periphery, at a point near the attachment thereto of the rod L^2 , a chain or wire rope, which depends from opposite sides thereof, as at n and n' , and has attached thereto the weights M and M' , as shown in Fig. 4. The pendent cable n has secured thereon a ball or enlargement, o , by means of which and the two grip-jaws p the weight M is suspended with slack sufficient in said cable between said ball and the attachment of the cable to the wheel to permit said wheel to make a quarter-revolution in the direction indicated by the arrow without affecting the weight M,

the whole weight of the weight M' being suspended from the wheel L by the cable n' , said weight M' being of sufficient capacity to rotate both wheels L and L' and their valves when the locking-latch m is disengaged from the wheel L, and the weight M being of sufficient capacity to rotate the wheel L back to its original position and raise the weight M' when the grip-jaws p are released from engagement with the ball o . The grip-jaws p are pivoted to ears projecting from the stands K K, and are connected together by the toggle-links q , to the central pivot of which is connected the forked lower end of the rod r , the upper end of which is pivoted to one end of the elbow-lever r' , which in turn is pivoted at r^2 to the side of the hopper F, and has set in its other end the pin r^3 , which projects through a slot, s , cut in the side of said hopper, into the groove j in a position to be struck by the lug i of the follower H just before the completion of its outward movement, and cause a movement of the elbow-lever r' about its fulcrum, thereby raising the rod r , which, acting through the toggle-links q , causes the movable ends of the grip-jaws p to separate, and thus release the weight M.

N is a rod or bar mounted in bearings s' and s^2 , secured to the side of the hopper F, and in a groove formed in the inner face of the flange f , and is pivoted at its outer end to the locking-latch m , and has inserted in its inner end the pin t , which projects through a slot, t' , cut in the side of the hopper F, into the groove j in position to be struck by the lug i of the follower H just before the completion of its inward movement, thereby causing an end-wise movement of said bar N, and through it a movement of the locking-latch m about its pivot, which releases the wheel L and permits it to be moved in the direction of the arrow by the descent of the weight M' , it being understood that when this takes place the weight M has been raised up so as to remove its tension from the wheel L by suspending it from the grip-jaws p , as shown in Figs. 4, 7, and 12. The hoppers F F are provided with covers O, hinged to the cover E, and provided with the handle u , for convenience in raising said covers, all as shown in Figs. 1, 2, and 3. The interior of the cylinder E' of the cover E has fitted therein, below the spider-bearing D' , the annular trough v , and the shaft C has secured thereto with an oil-tight joint the inverted cup w , the annular downwardly-projecting lip of which shuts over and incloses the inner upwardly-projecting annular wall of the trough v , as shown in Figs. 2 and 3, the purpose of which is to catch any drippings of oil that may fall from the bearing D' , and effectually prevent said oil from coming in contact with the pulp.

P P are pipes for supplying water to the grinding-wheel from any convenient source of supply.

The operation of my invention is as follows:

The parts being in the positions shown in the drawings, and those portions of the hoppers or feed-boxes between the followers H and the grinding-wheel B being filled with wood, and water or steam having been turned on through the pipes J⁴, it flows through the pipes I², valves I', and the pipes J' to the interior of the cylinders G, outside of the pistons G', thereby forcing said pistons and the wood toward the grinding-wheel, which, having rotary motion imparted thereto in any well-known manner, grinds the wood into pulp, which, with the water admitted to the cylinder A through the pipes P, P, falls into the annular trough A², from which it is discharged through the pipes A³ A³ into any desired receptacle. When either of the followers H has moved forward to within a short distance from the periphery of the grinding-wheel, one of its lugs *i* comes in contact with the pin *t* and moves the bar N toward the grinding-wheel till the locking-notch *m* is released from the detent-notch in the side of the wheel L, when the weight M' descends, and imparts to the wheels L and L', and valves I and I', a movement about their axes equal to a quarter-revolution, thereby causing the supply of water or steam to flow from the pipe J⁴ through the pipe I², valve I, and pipe J to the inner end of the cylinder G, between its piston G' and the head F³, to force the piston G' toward the outer end of the cylinder G, while the water or steam upon the other side of said piston escapes through the pipe J', valve I', and pipe J³. As the follower H nears the extreme of its outward movement one of its lugs *i* comes in contact with the pin *r*³ and moves the elbow-lever *r'* about its pivot, and raises the rod *r*, causing the grip-jaws *p p* to open and release the weight M which, descending, moves the wheel L and the valve I about their axes in a direction the reverse of their previous movement, to open communication through the valve I from the inner end of the cylinder to the discharge-pipe J², the rod L² moving with the wheel L and leaving the wheel L' unaffected by said movement, the outer end of said rod L² being supported by the bracket *l* in such a position that the pin *k* in the wheel L will engage with its fork when it is rotated back to its former position, to admit water or steam to the outer end of the cylinder G, which is done by the operator after the hopper has been again filled with wood. The weight M is then raised up by the operator and suspended from the grip-jaws *p p*, as shown in Figs. 4, 7, and 12, the jaws *p p* opening to permit the upward passage of the ball *o*, the central pin in the toggle-links *q q* moving upward in the slot *z* in the lever end of the rod *r*. As the grinding-wheel wears away the several hoppers, with the cylinders G, together with the pipes, valves, and valve-operating mechanism are moved inward, by first slackening the nuts on the bolts *x x* in the feet of the stands K K and the column F², and the nuts on the bolts

g, and screwing up the nuts on the bolts *h*, as before described. The locking-latch *m* is forced into engagement with the detent-notch in the rim of the wheel L by the spring *y*, acting upon the bar N to move it outward. A notch, *z'*, is cut in the lower edge of that side of the hopper toward which the grinding-wheel revolves, and near its inner end, so as to be within the inner circumference of the cylinder A, the object of which is to facilitate the discharge into the trough A² of any pulp or liquid which may work its way into the hopper among the pieces of wood contained therein. The motions of the wheels L and L' in either direction are limited by suitable stops, represented in the drawings by the pins *a'* and *a''*, which alternately come in contact with the stand K, as shown in Figs. 4 and 5.

Another advantage of having the bottoms of the hoppers F inclined to the plane of revolution of the grinding-wheel is to enable the wood to be packed in the hopper on end, and at the same time grind obliquely to the grain of the wood, thereby preventing the drawing out of long fibers without properly disintegrating them.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In combination with a grinding-wheel arranged to be revolved about a vertical axis, one or more feed-boxes or hoppers, arranged with their bottoms inclined to the plane of revolution of said wheel, substantially as described.

2. In combination with a grinding-wheel arranged to revolve about a vertical axis, one or more feed-boxes or hoppers arranged with their center lines (as viewed in plan) at one side of but parallel with radial lines drawn through the center of said wheel, substantially as and for the purposes described.

3. The cylinder A, provided with the annular trough A² and one or more discharge-nozzles, A³, opening therefrom in a direction tangent, or nearly so, to said trough, substantially as and for the purposes described.

4. The combination of the cylinder A, having cut through its vertical wall one or more rectangular openings, one or more hoppers, F, fitted to said openings, the bolts *g*, the slots *f'*, and the bolts *h*, and ears *f*² and *f*³, all arranged and adapted to operate substantially as and for the purposes described.

5. The combination, with the cylinder A and grinding-wheel B, of the hopper F, the cylinder G, the piston G', and follower H, mounted upon a common piston-rod, the pipes I², J, J', J², J³, and J⁴ for conveying water or other fluid to the cylinder G, and the three-way valves I and I', for controlling the flow of said water or steam, substantially as described.

6. The combination of the hopper F, the follower H, the cylinder G, the three-way valve I, the wheel L, mounted upon the stem of said valve, the weight M, connected to the wheel L by the cable *n*, the ball or enlarge-

ment *o* on said cable, the grip-jaws *p p*, arranged to support the weight *M* independent of the wheel *L*, the links *q q*, the rod *r*, the elbow-lever *r'*, and the pin *r³*, all arranged
5 and adapted to operate substantially as described.

7. The combination of the hopper *F*, the follower *H*, the cylinder *G*, the piston *G'* and rod *G²*, the three-way valve *I*, the wheel *L*,
10 mounted upon the stem of said valve, and provided with a detent-notch in its rim, the weight *M'*, suspended from the periphery of said wheel, the locking latch-lever *m*, the bar *N*, and the pin *t*, all arranged and adapted to operate
15 substantially as and for the purposes described.

8. The combination of the hopper *F*, the cylinder *G*, the piston *G'*, the rod *G²*, the follower *H*, the three-way valves *I* and *I'*, the
20 wheels *L* and *L'*, mounted upon the stems of said valves, the rod *L²* for connecting said wheels, the differential weights *M* and *M'*, connected to the wheel *L* by suitable flexible connections, the grip-jaws *p p* for supporting the
25 weight *M* independently of the wheel *L*, the links *q q*, rod *r*, elbow-lever *r'*, the pin *r³*, the bar *N*, provided with the pin *t*, the spring *y*, and the locking latch-lever *m*, arranged to engage with a detent-notch in the wheel *L*, all
30 constructed and adapted to operate, substantially as and for the purposes described.

9. In combination with a grinding-wheel arranged to revolve about a vertical axis, and a bearing for its shaft above said wheel, the
35 bearing-inclosing cylinder *E'*, the annular trough *v*, fitted to said cylinder, and the inverted cup *w*, attached to the shaft of said wheel, substantially as described, for the purpose specified.

40 10. The combination of the grinding-wheel *B*, the shaft *C*, the cylinder *A*, the cover *E*, provided with the cylinder *E'*, having the inwardly-projecting bearing-lugs *e e*, the spider-bearing *D'*, and the set-screws *e' e'*, all arranged
45 and adapted to operate substantially as described.

11. The combination of the hopper *F*, provided with the longitudinal grooves *j j*, and the slots *s* and *t'*, the follower *H*, provided with the lugs *i i*, the bar *N*, provided with the pin
50 *t*, the locking-latch *m*, the wheel *L*, provided with a detent-notch to receive said latch, the elbow-lever *r'*, provided with the pin *r³*, the rod *r*, provided with the slot *z* in its lower end, the links *q q*, the grip-jaws *p p*, the weight
55 *M*, connected to the wheel *L* by the cable *n*, and the ball or enlargement *o* on said cable, all arranged and adapted to operate substantially as described.

12. In combination, with the cylinder *A* and
60 the grinding-wheel *B*, the hopper *F*, arranged to project through the wall of the cylinder *A* into its interior, and provided with the discharge-orifice *z'*, substantially as described.

13. In a machine for grinding wood pulp,
65 the combination of a grinding-wheel mounted upon and adapted to revolve about a vertical axis, a suitable casing inclosing said wheel, one or more feed boxes or hoppers fitted to rectangular openings in the vertical wall of said
70 casing, a cylinder extending outward from each of said hoppers, and containing a piston connected with a follower in said hopper, pipes for conveying water or other fluid to and from said cylinder, valves for controlling the flow
75 of said fluid, and devices for operating said valves by the movements of the wood-feeding follower, when all of these parts are adjustable horizontally, or nearly so, toward the axis of the grinding-wheel, substantially as
80 described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 10th day of July, A. D. 1884.

ASHLEY B. TOWER.

Witnesses:

N. C. LOMBARD,
WALTER E. LOMBARD.