

(No Model.)

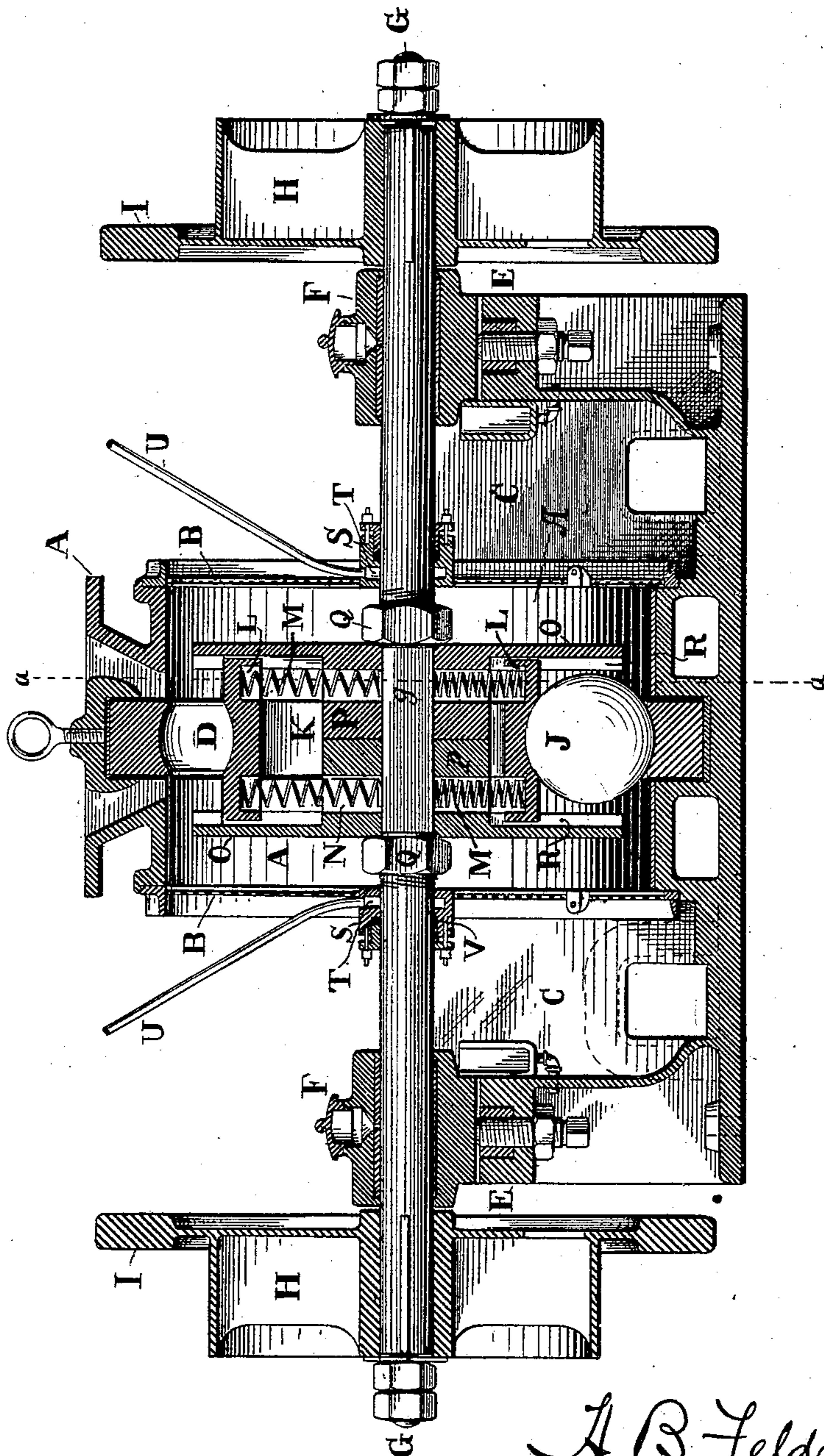
3 Sheets--Sheet 1.

H. B. FELDMANN.  
PULVERIZING MACHINE.

No. 275,031.

Patented Apr. 3, 1883.

Fig. 1.



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(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

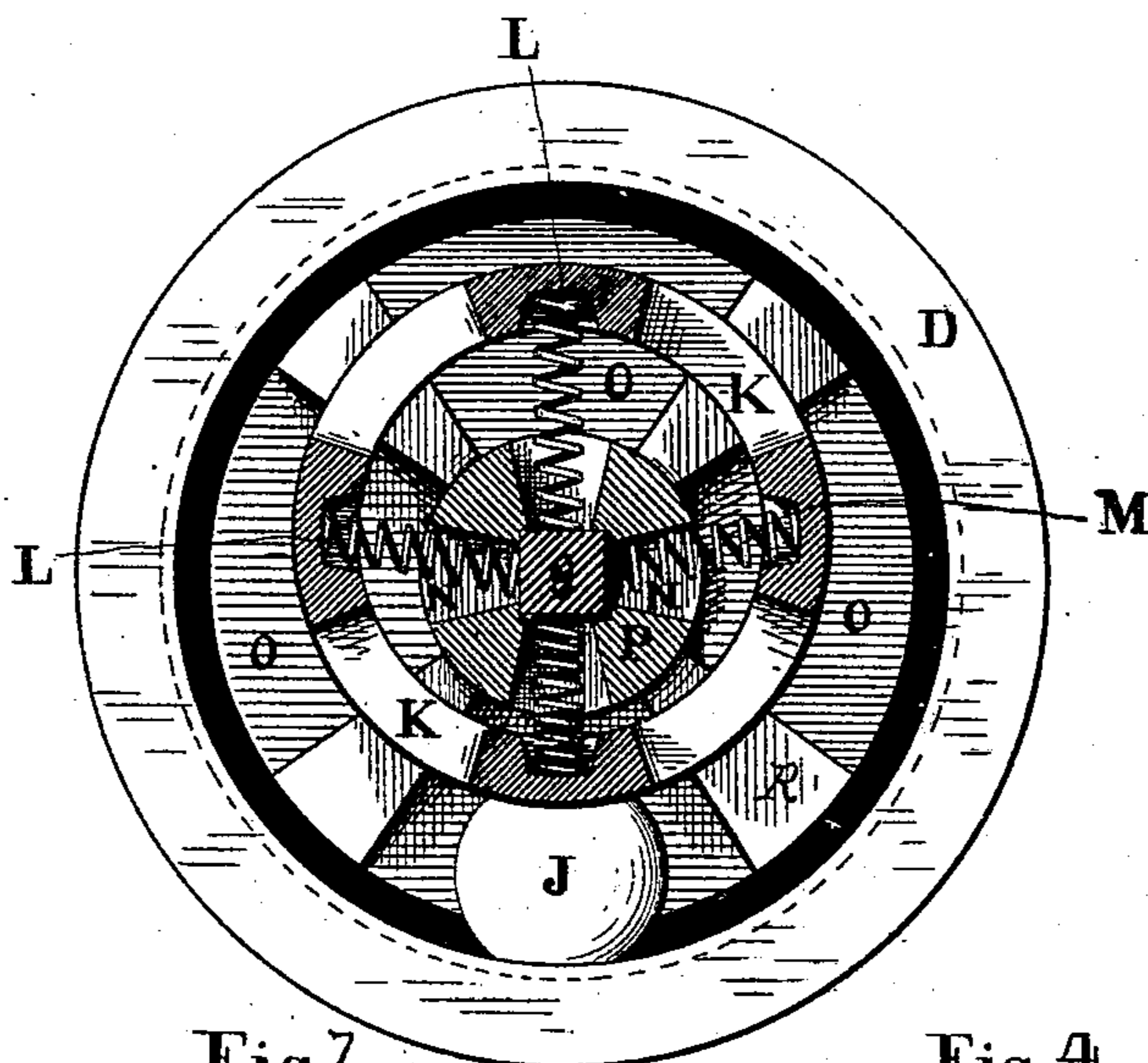


Fig. 3.

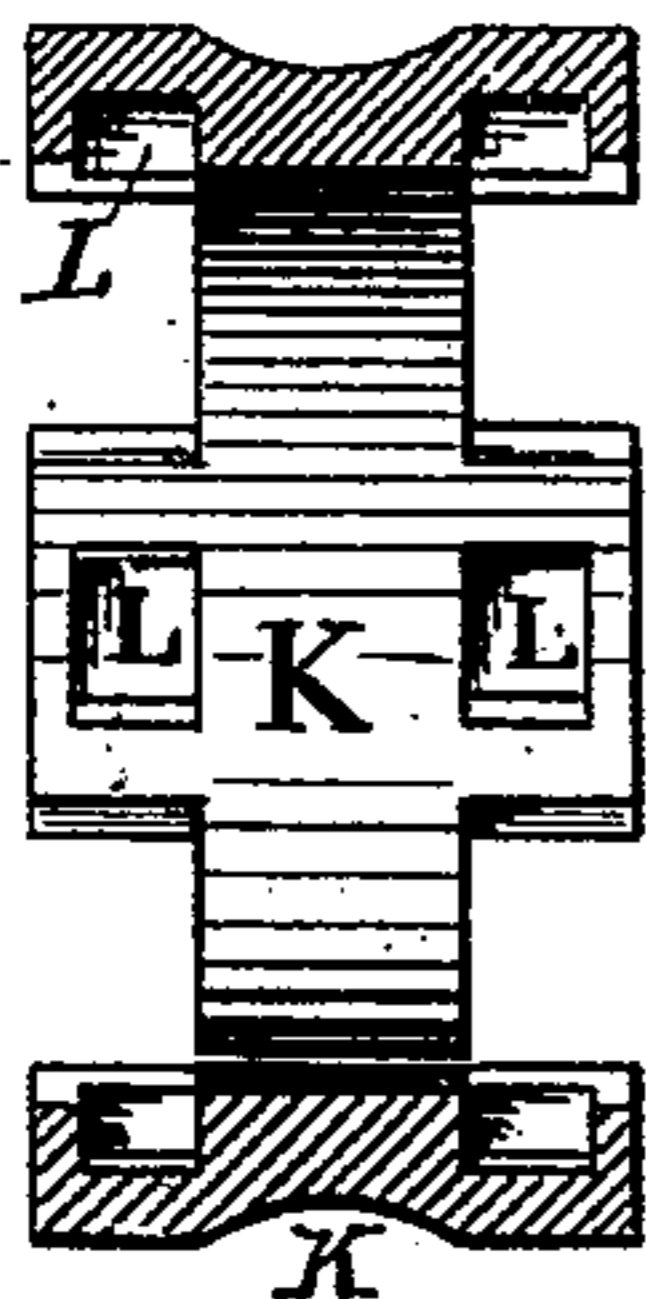


Fig. 7.

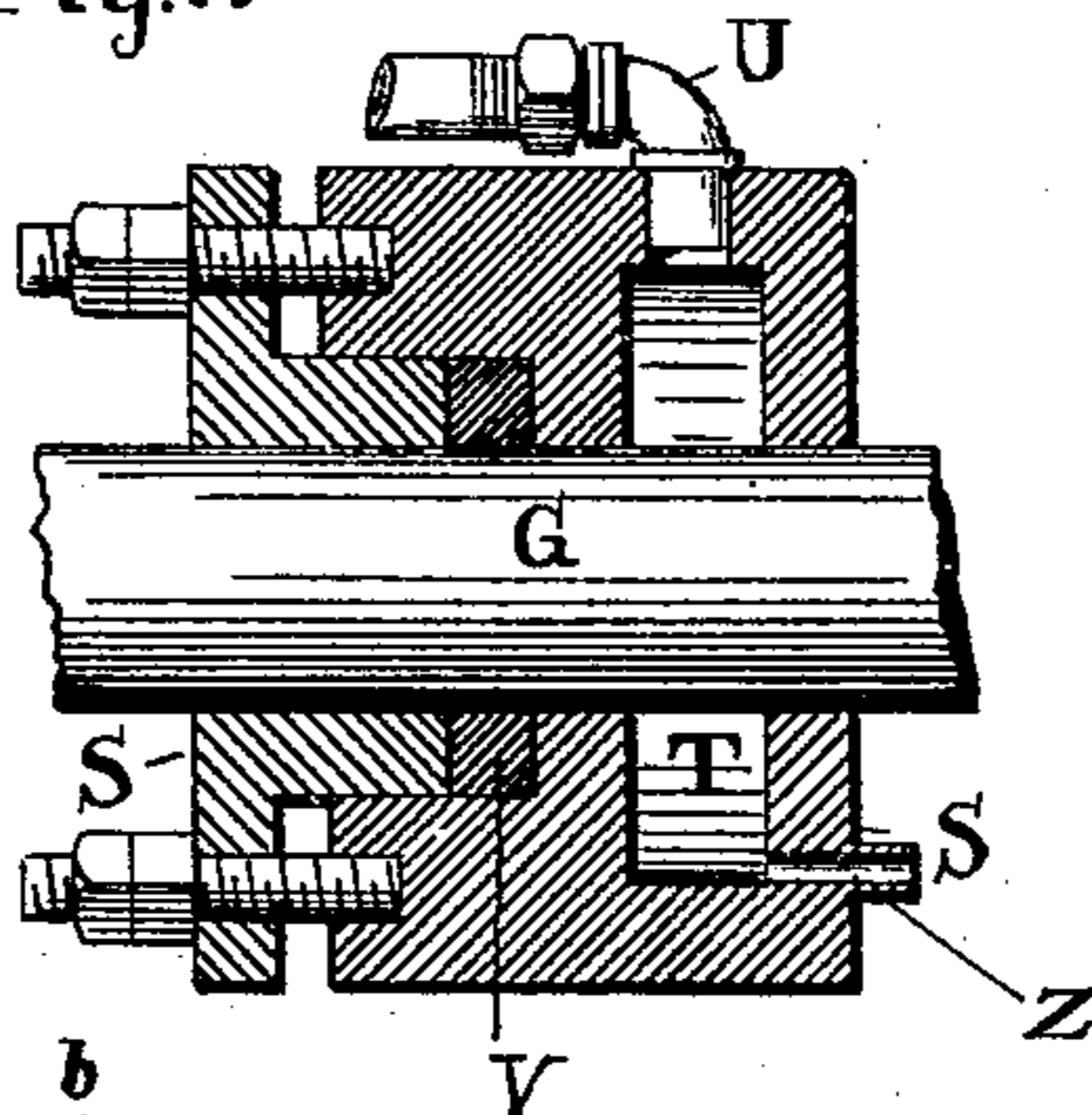


Fig. 4.

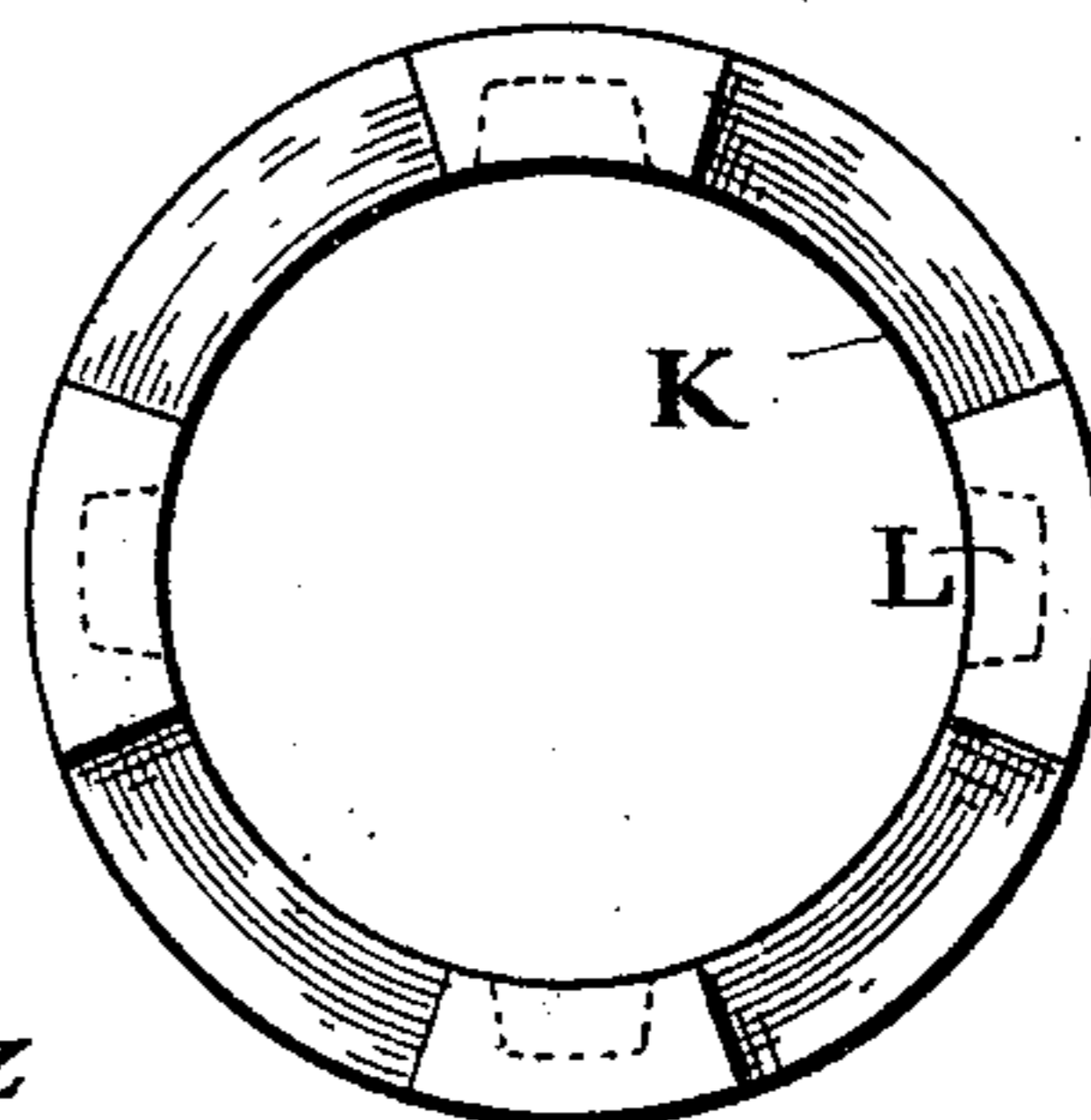


Fig. 5.

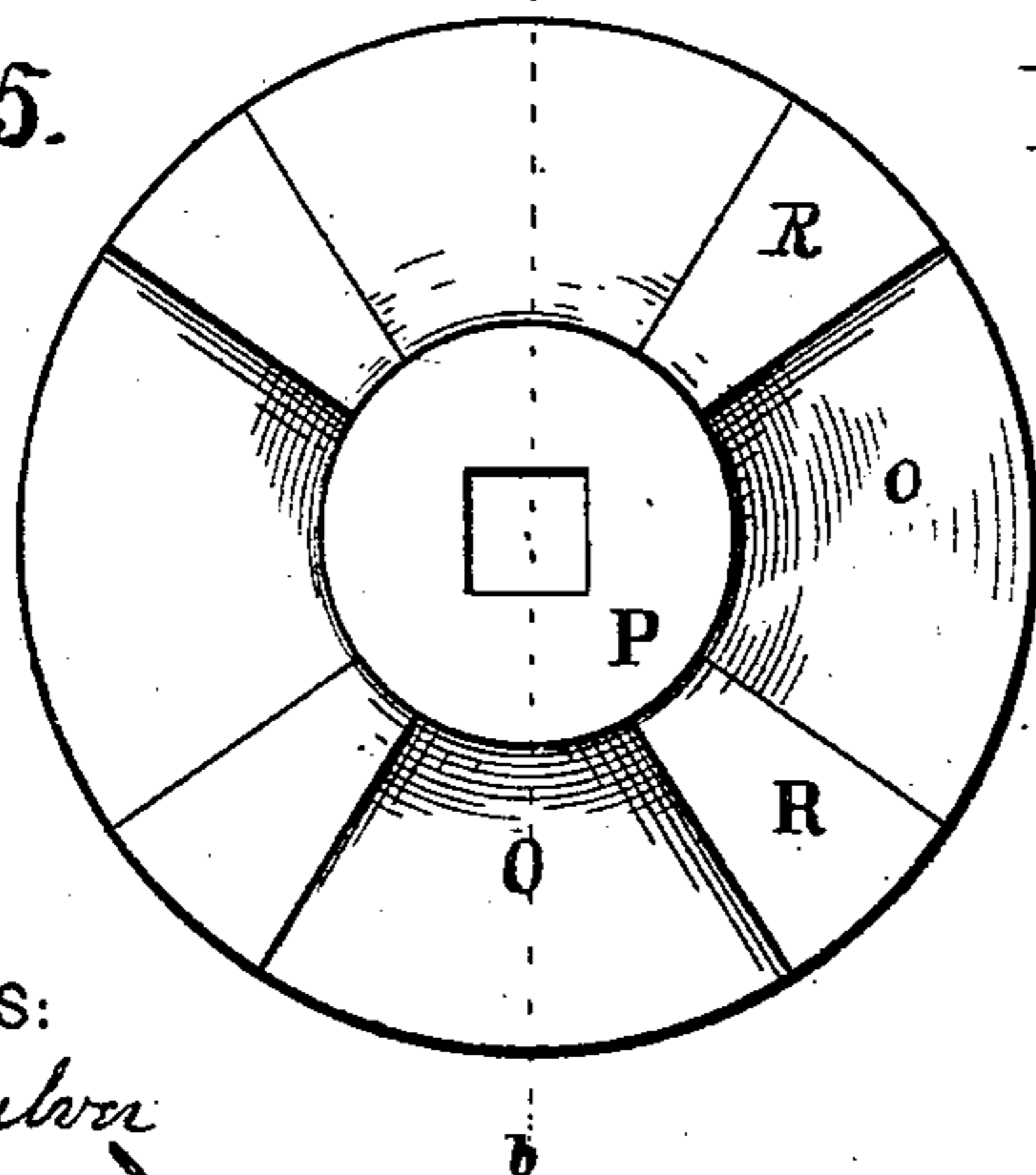
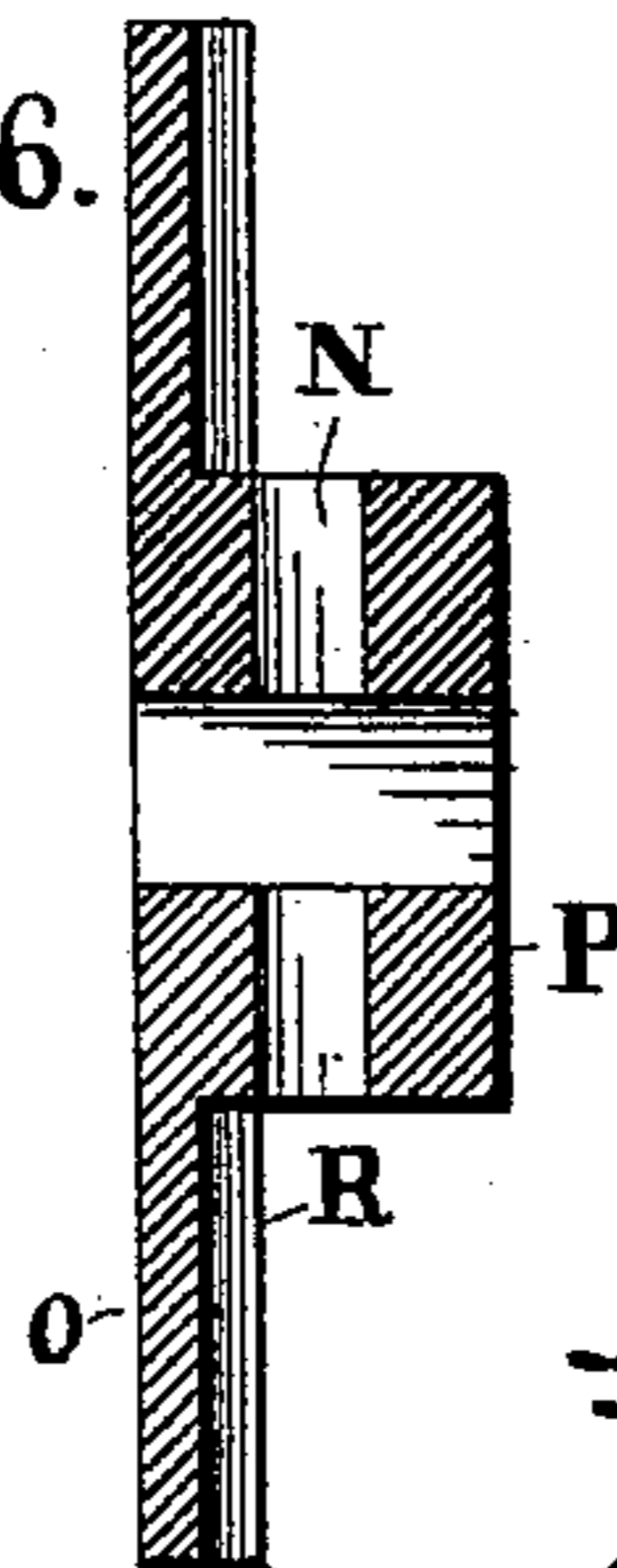


Fig. 6.



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3 Sheets—Sheet 3.

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Fig. 8.

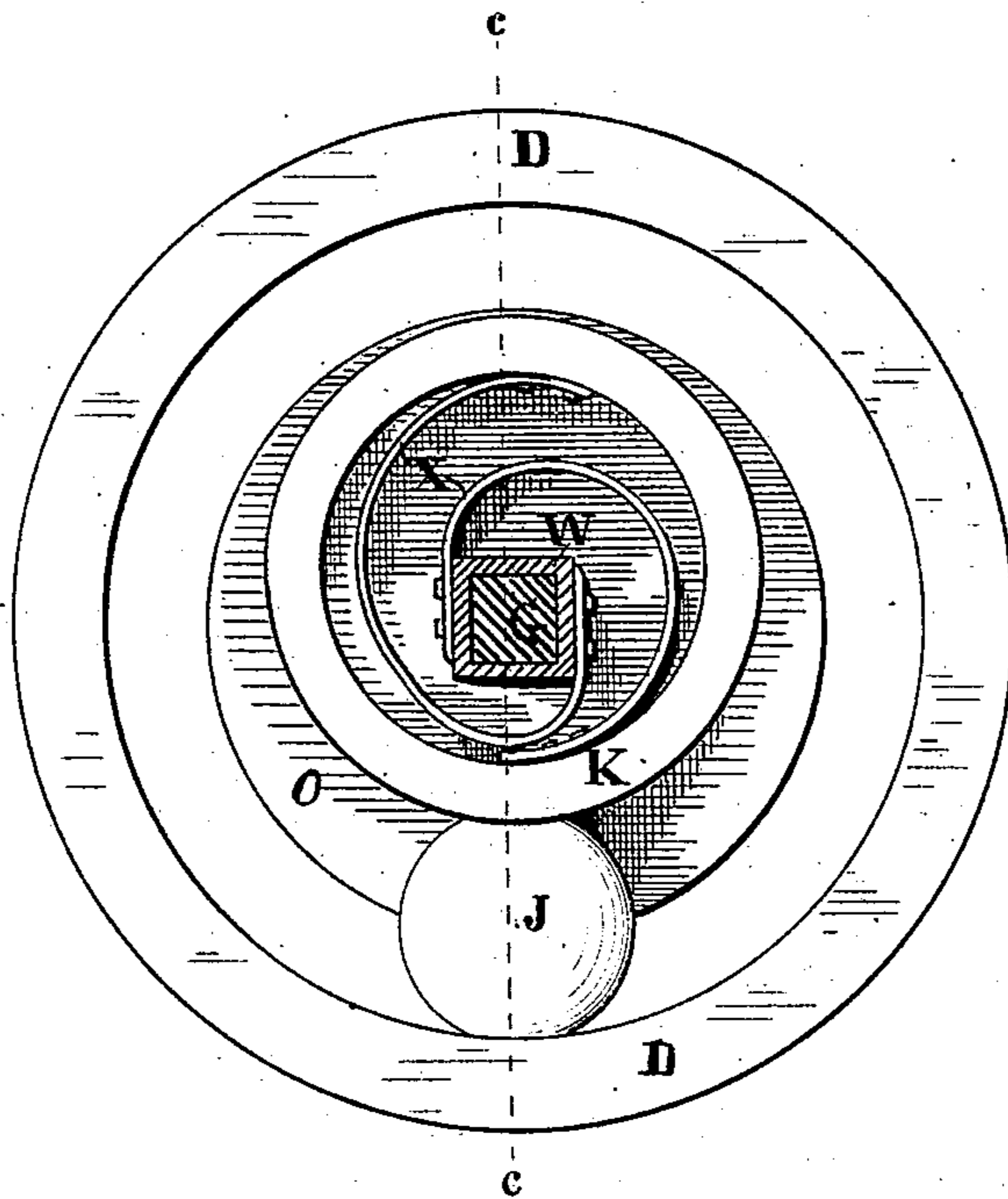
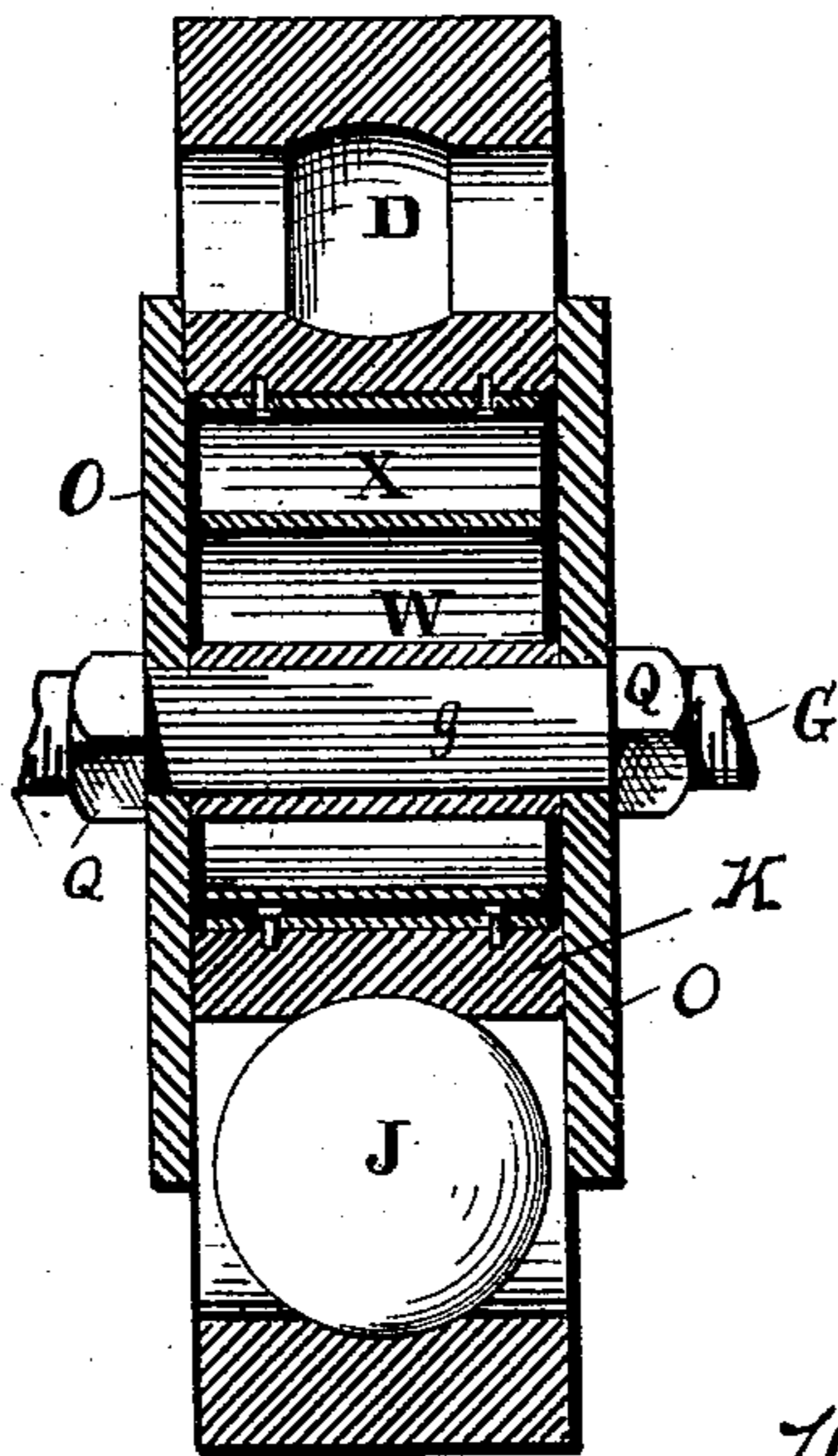


Fig. 9.



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# UNITED STATES PATENT OFFICE.

HERMANN B. FELDMANN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF  
ONE-HALF TO STEPHEN P. M. TASKER, OF SAME PLACE.

## PULVERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 275,031, dated April 3, 1883.

Application filed December 19, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, HERMANN BERNHARD FELDMANN, of the city and county of Philadelphia, in the State of Pennsylvania, have invented a new and useful Pulverizing-Machine, of which the following is a specification.

My invention relates to a class of pulverizing-machines in which the pulverizing instrumentality is an independent ball or crushing-sphere inclosed within a casing, and by any suitable means caused not only to revolve around the casing, but also to rotate about its own axis.

In machines of the above class it is usual to provide a ball-track within the casing, upon which the ball is forced to travel, and between which and the surfaces of the ball the pulverizing action takes place. This track may either be applied as a separate member or be formed as an integral portion of the casing. Heretofore two distinct means of imparting motion to the ball have been resorted to—viz., first, by the application, in connection with a central shaft concentrically journaled in the casing, of a radial arm projected from said shaft and rotated by it, which impinges against the rear of the ball, and so occasions its revolution—a method enabling, if desired, the use of several balls, but defective, in that no pressure is exerted to hold the ball or balls down upon the track other than that due to centrifugal movement; and, second, by the application to a shaft concentrically journaled in the casing of a pair of vertically-erected disks provided with peripheral beveled bearing-surfaces, and arranged face to face at some distance on either side of the center of said shaft, the said disks being capable of rocking movements, but being caused to bear or press upon the ball in their effort to assume, a vertical position, which the size of the ball tends to prevent, crowd it against the casing with greater or less force, according to the rapidity of the revolution, and by the friction of the contact carry it with them around the casing and communicate to it both a centrifugal motion and an axial rotation—a method better than that first described, but necessitating the employment of but a single ball.

My invention comprehends the construction

of a pulverizing-machine in which one or two independent balls or crushing-spheres can be employed, and in which the ball or balls is or are permitted to move to and from the ball-track, as in passing over material of varying size, without being at any time free from the influences which occasion their compound motion.

A preferred form of a convenient embodiment of my invention is hereinafter described and claimed, the proportions represented being those adopted when but one ball, as represented and described, is employed.

In the accompanying drawings, in which similar letters of reference in the several figures indicate corresponding parts, Figure 1 is a central vertical longitudinal sectional elevation of a machine conveniently embodying my improvements. Fig. 2 is a vertical side sectional elevation through the casing, the ball-actuating annulus, one of the disk-hubs, and the shaft, taken on the dotted line *a a* of Fig. 1. Fig. 3 is a vertical central front sectional elevation of the ball-actuating annulus. Fig. 4 is a side elevation of the same. Fig. 5 is an inside front elevation of one of the annulus-operating disks. Fig. 6 is a vertical central side sectional elevation of the same, taken on the line *b b* of Fig. 5. Fig. 7 is a longitudinal central vertical sectional elevation through one of the stuffing-boxes. Fig. 8 is a side elevational detail of a modified construction and arrangement of the disks and of the springs supporting the ball-actuating annulus. Fig. 9 is a vertical sectional elevation of the same, taken on the line *c c* of Fig. 8.

Before proceeding to a detailed description of the several instrumentalities which go to compose my invention, it is proper to premise that any preferred form of casing other than that represented may be employed, and that any hopper or feeding contrivance may be used in connection therewith.

In the drawings I have represented a casing of a character invented by Stephen P. M. Tasker, of Philadelphia, and patented to him in and by Letters Patent No. 265,713, dated October 10, 1882, and have also represented it as applied in connection with a receiver (within which said casing is erected) of a character

invented by Mr. Tasker and embraced in an application for Letters Patent filed by him in the United States Patent Office upon the 23d day of November, 1882.

5 In the drawings, A represents the casing proper, it being a cylindriform receptacle, the sides of which are inclosed by screens B, and which is provided with an independent circumferential ball-track, D.

10 C represents the receiver, centrally within which the casing is erected; and E are the pedestals forming a part of or connected with said receiver, and carrying the bearings F for the central driving-shaft, G.

15 H are pulleys, and I balance-wheels applied for the actuation of the shaft.

The above devices are convenient; but I do not restrict myself to them only in connection with the devices constituting my invention, as 20 other devices of a kindred character, but of mechanically different construction, can be, with perhaps equal profit, substituted in their stead.

J is a crushing sphere or ball upon the ball-track. One only, as stated, is represented in 25 the drawings and herein described; but two may be employed.

K is what I term a "ball-actuating annulus," Figs. 1, 2, 3, and 4, the same being a ring of 30 metal, preferably chilled iron, the exterior face of the periphery of which is conformed to the arc of the crushing-sphere, and which is placed about the shaft, so as to register in place within the ball-track. The annulus is 35 provided with a series of laterally-projecting pockets, L, designed to receive the outer extremities of spiral springs M, the inner extremities of which pass through radial slots N in the hubs of annulus-operating disks O and 40 abut against the shaft, as hereinafter more fully explained.

O are what I term "annulus-operating disks," Figs. 1, 2, 5, and 6, the same being metallic 45 plates of a diameter less than that of the interior of the casing, and each provided with hubs P, conformed to a squared central portion, *g*, of the shaft, so as to be adapted to rotate in fixed connection therewith. The hubs 50 project from one face only of the disks, and the disks are oppositely placed upon the shaft, so as to cause the hubs to abut, being fixedly retained together and upon the shaft by means of disk-nuts Q, threaded on the shaft. The 55 inner opposite faces of the disks, preferably down to the hubs, are provided with raised radial webs R, which project between the pockets upon the sides of the annulus, and in the revolution of the disks impinge against said 60 pockets and occasion the revolution of the annulus. It will now be understood that upon the revolution of the shaft the disks revolve, and with them the annulus, as stated. The space between the radial webs upon the disks is such as to permit of the free movement of 65 the pockets, and consequently of a motion of the annulus to and from the shaft in any direction. The annulus is in equilibrium upon

its springs, eight of which are in the drawings represented as supporting it; and it will be readily seen that while the annulus is free 70 to rotate with the shaft and disks it is also capable of movement to and from the shaft in any direction under the influence of any force which presses upon it and tends to compress such of its supporting-springs as resist the 75 pressure. The ball is made of sufficient size not to fit between the annulus and the ball-track when the annulus is concentric with the track, but is of such size as when in place upon the ball-track to occasion the placing of 80 the annulus eccentrically with respect to the ball-track. When the ball is in place the annulus, as will be readily understood by reference to the drawings, and especially to Figs. 1 and 2, being forced into an eccentric posi- 85 tion with respect to the shaft and ball-track under the influence of its springs, will be constantly pressing upon the ball with greater or less force, according to the strength of the springs and the rapidity of the revolution, in 90 its endeavor to reassume its concentric position.

S are stuffing-boxes erected in the screens at the sides of the casing, and designed to prevent the egress of pulverized material from 95 out the casing except through the mesh of the screens. These boxes are each provided with a water-chamber, T, into each of which a supply-tube, U, connected with a constant source of water-supply, opens. They are also pro- 100 vided with an outlet or discharge tube, Z, through which the water can escape. The stuffing-boxes are thus kept constantly wet, with the result that any gritty particles hap- 105 pening to enter them are suspended in the water and prevented from entering that portion of the stuffing-boxes in which the packing material V is placed.

Having thus described a preferred form of apparatus conveniently embodying my inven- 110 tion, the operation will be very readily understood. One ball being supposed in place upon the track, and motion being supposed imparted to the shaft, the disks rotate with the shaft and occasion the rotation of the annulus, in the 115 manner already described. The energy of the compressed springs, developed by their constant tendency to expand, acts outwardly against the annulus and occasions a constant pressure of the annulus against the ball, what- 120 ever may be the position of the ball with respect to the ball-track and casing, and thereby, also, as the annulus rotates, occasions not only the revolution of the ball around the track, but also its axial rotation. By this means, as 125 will be obvious, a continuous pressure is exerted upon the ball whatever be its position, which pressure, while constant in fact, is yielding in degree, so as to enable the lifting of the ball over substances which it cannot at first 130 crush, and so permit, if I may use the term, the varying eccentricity of the annulus, the latter, however, as explained, never being concentric when the ball is in place.

That construction which enables the constant pressure, yet varying eccentricity, of the annulus when the ball is in place, and which yet insures its concentricity and equipoise when the ball is not in place, being vital to the invention, it will be obvious to any mechanic that other devices than spiral springs may be employed to such result. Thus, for instance, in Figs. 8 and 9 I have represented a modified construction in which coiled band-springs are substituted in the stead of the spiral springs. In place of band-springs, however, rubber cylinders or kindred devices can be substituted.

The gist of the invention, so far as the annulus is concerned, resides in the provision of any suitable means whereby the annulus can be cushioned, so to speak, in any direction with respect to the shaft, and be in such manner held in suspension that upon pressure being exerted upon it in any direction it can be forced from such direction in toward the shaft, but upon the relief of such pressure will resume its normal position of concentricity therewith.

A reference to Figs. 8 and 9 will show that in the structure therein represented the disks are modified to be simply circular plates of metal fitted to the squared center of the shaft, but made without either hubs or radial webs, and that about the squared center of the shaft and between the disks is placed a sleeve, W, conformed to the shaft, to which are rigidly connected the inner extremities of band-springs X, the outer extremities of which are rigidly connected to the interior face of the annulus, which latter is made without pockets. Two band-springs are represented in the drawings; but less or more than two may be employed, the annulus being in suspension upon said springs. The device is ordinarily employed with but a single ball, and is operative to the best advantage in such arrangement. The advantages incident to this construction are those incident to both the former constructions hereinbefore recited, while there is the additional advantage of simplicity and cheapness of manufacture.

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

1. In a pulverizing-machine, the following instrumentalities in combination: first, an inclosing-casing provided with a ball-track; second, an independent ball or crushing-sphere; third, a ring or ball-actuating annulus registering within the ball-track, and bearing against its convex surface or exterior periphery upon the ball; fourth, suitable mechanism for causing the annulus to impart to the ball not only a motion of revolution around the casing and an axial rotation, but also a constant pressure against the track; and, fifth, means for imparting rotation to said annulus.

2. In a pulverizing-machine, the following instrumentalities in combination: first, an inclosing-casing provided with a ball-track; second, an independent ball or crushing-sphere; third, a ball-actuating annulus; fourth, disks between which the annulus is placed, and which impart motion to it; fifth, springs connected with the annulus so as to cause the latter to resist compression exerted from without inwardly upon it in any direction; and, sixth, devices for imparting rotation to the disks.

3. In a pulverizing-machine, the combination of a casing, a crushing sphere or ball, a shaft journaled in the casing, two disks upon the shaft, provided with devices for engaging with the annulus, a ball-actuating annulus, and springs interposed between the annulus and the central shaft.

4. In a pulverizing-machine, the combination of two disks provided with radial projecting webs, an annulus provided with pockets or lugs against which the webs of the disks engage, and springs or cushioning devices interposed between the interior of the annulus and the shaft, substantially as set forth.

In testimony whereof I have hereunto signed my name this 16th day of December, A. D. 1882.

HERMANN BERNHARD FELDMANN.

In presence of—

J. BONSALL TAYLOR,  
WALTER S. GIBSON.