

No. 816,933.

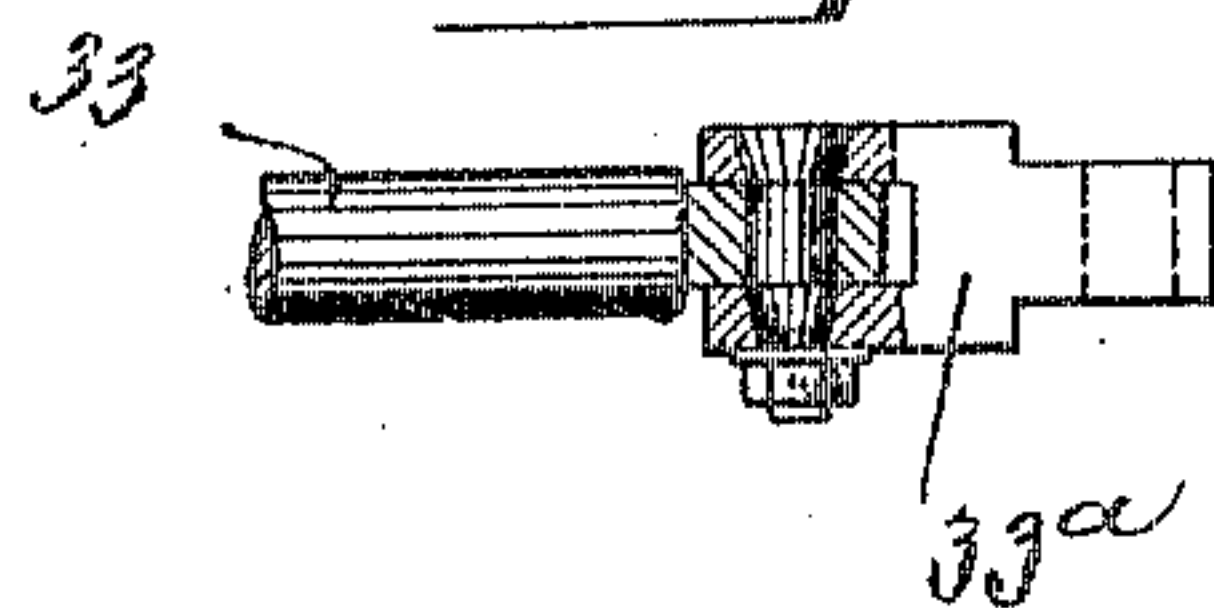
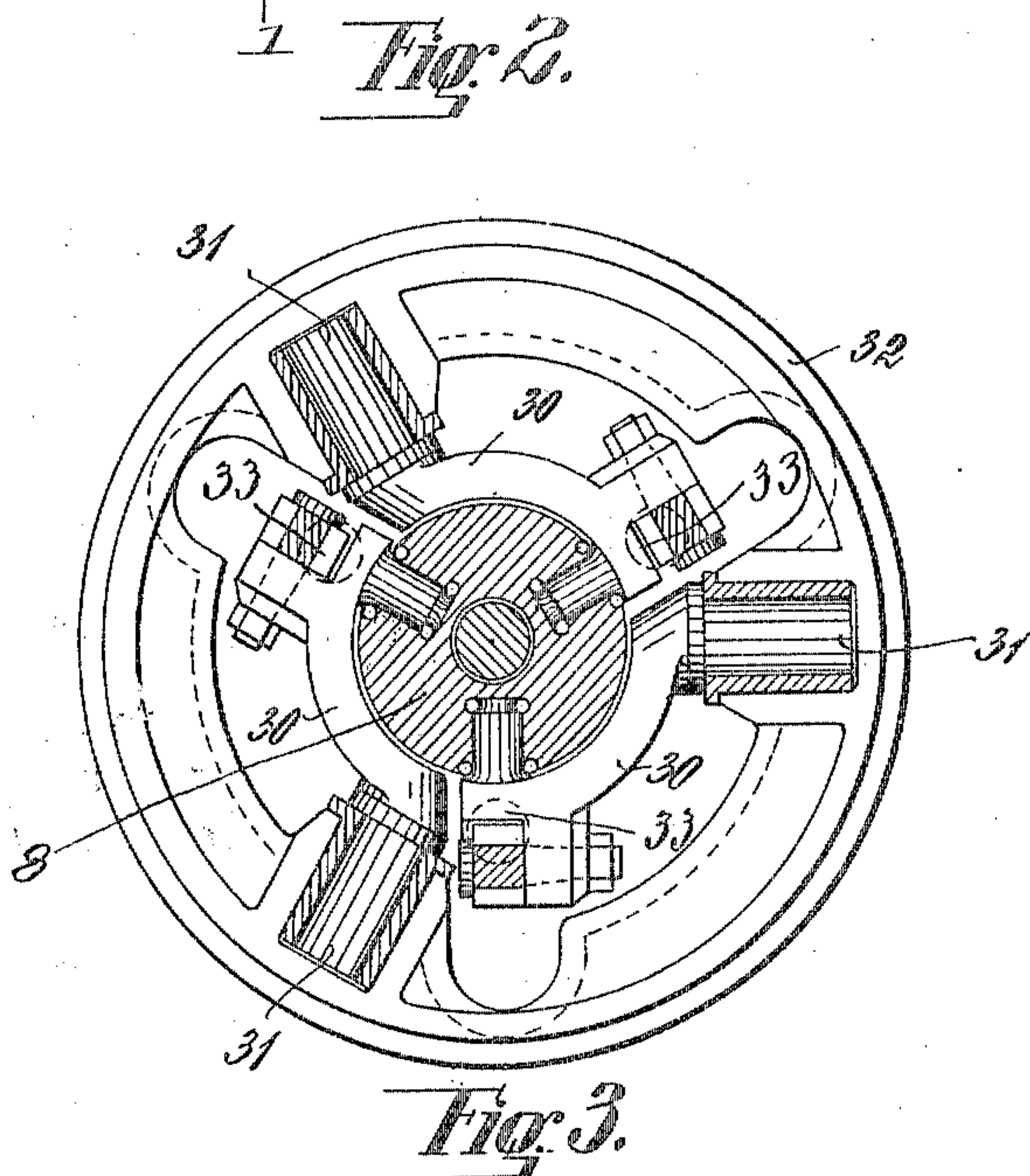
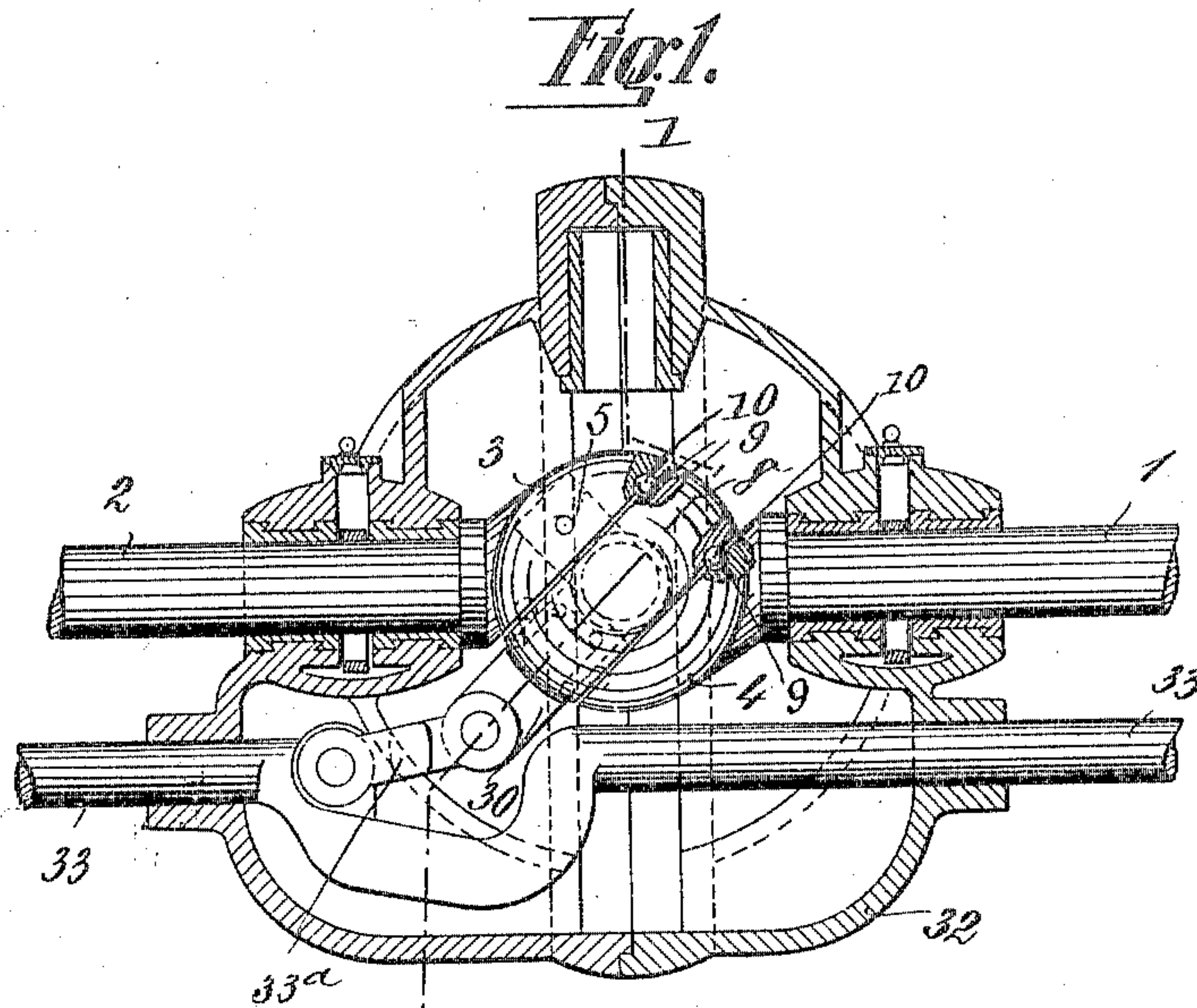
PATENTED APR. 3, 1906

L. NEUMANN.

MECHANISM FOR CONVERTING ROTARY MOTION INTO RECIPROCATORY  
MOTION.

APPLICATION FILED APR. 8, 1904.

3 SHEETS—SHEET 1



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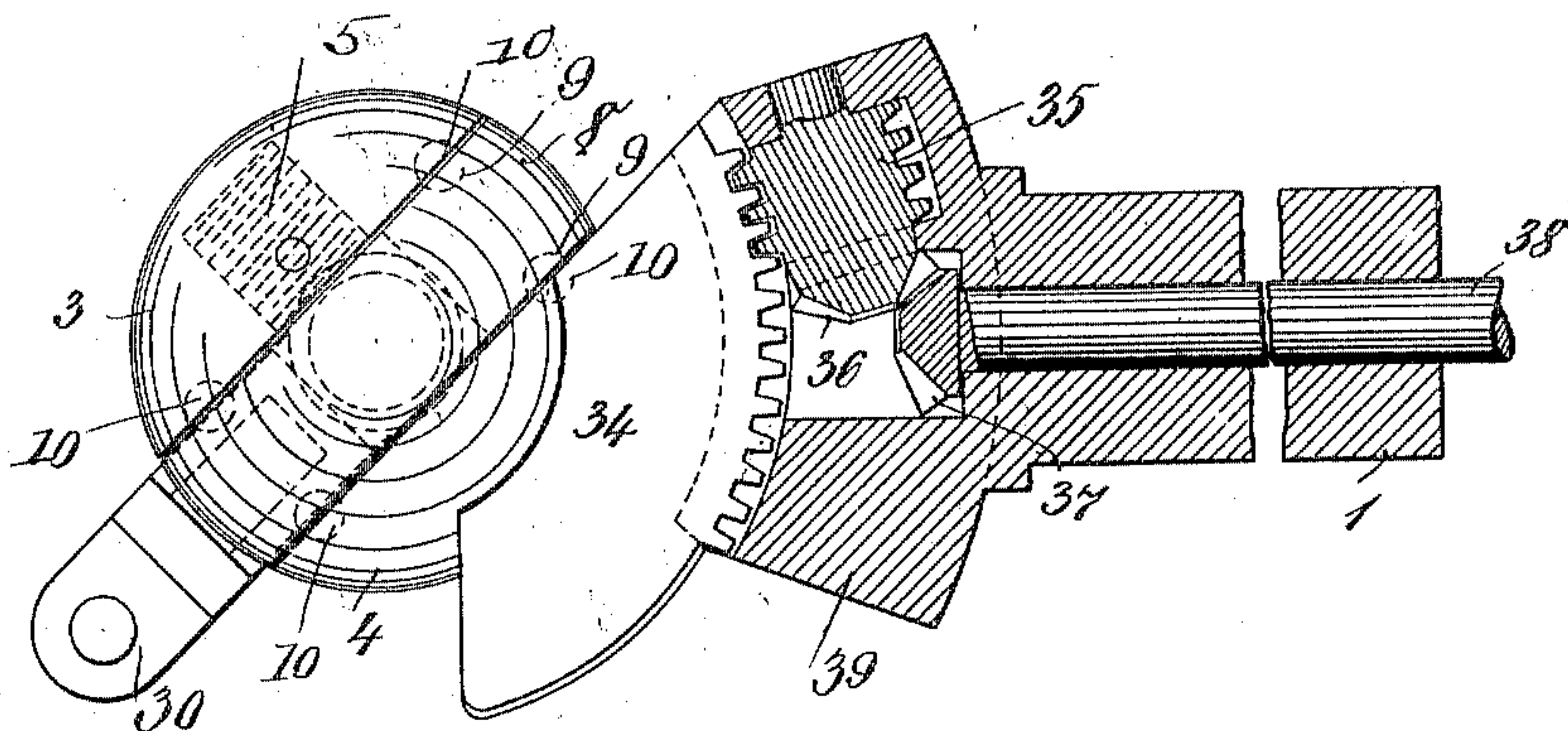
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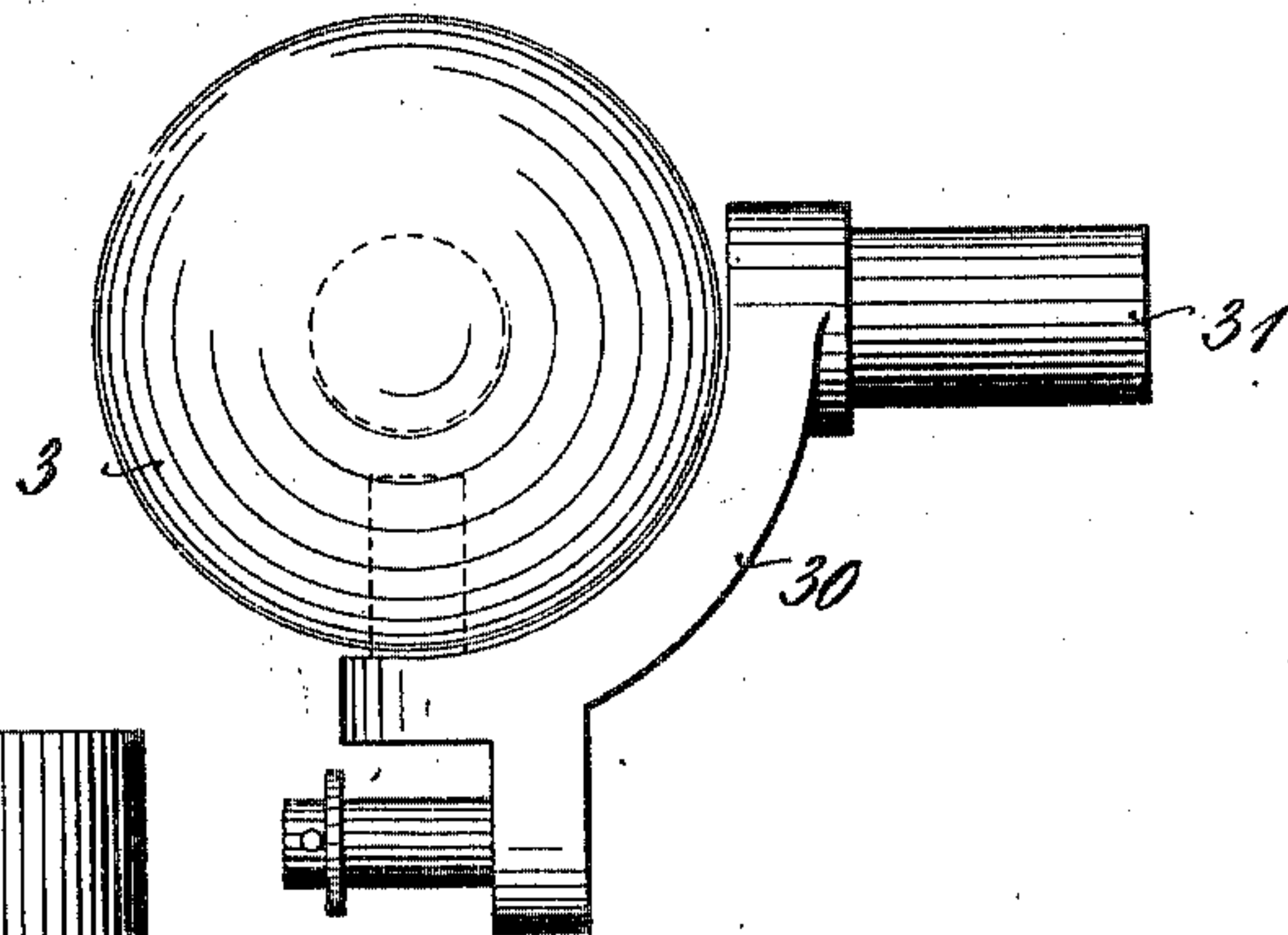
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3 SHEETS—SHEET 2.

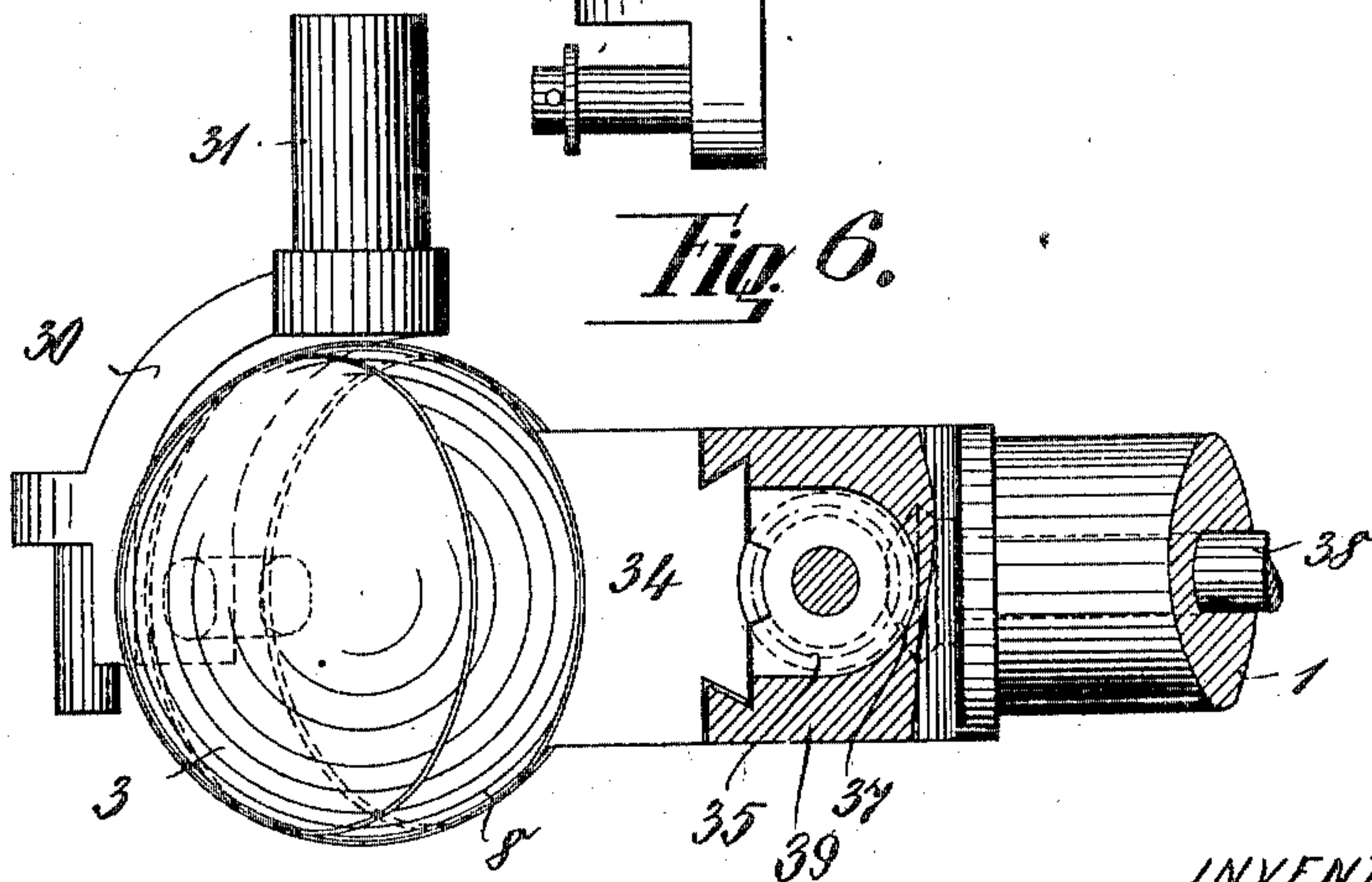
*Fig. 4.*



*Fig. 5.*



*Fig. 6.*



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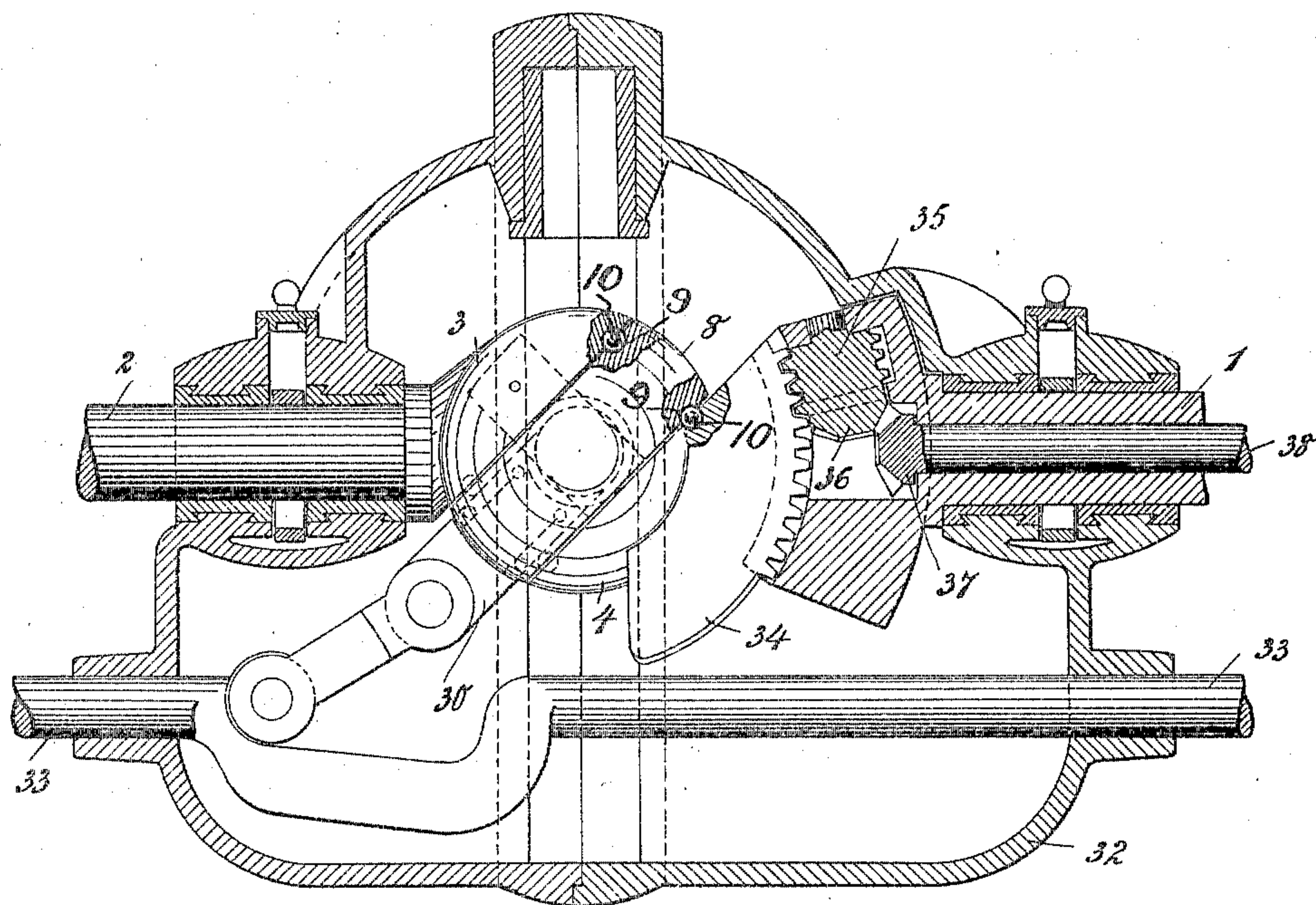
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*Fig. 7*



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# UNITED STATES PATENT OFFICE.

LUDWIG NEUMANN, OF GLEIWITZ, GERMANY.

MECHANISM FOR CONVERTING ROTARY MOTION INTO RECIPROCATORY MOTION.

No. 816,933.

Specification of Letters Patent.

Patented April 3, 1906.

Application filed April 8, 1904. Serial No. 202,161.

*To all whom it may concern.*

Be it known that LUDWIG NEUMANN, a subject of the King of Prussia, German Emperor, residing at Gleiwitz, in the Kingdom of Prussia and German Empire, have invented new and useful Improvements in Mechanism for Converting Rotatory Motion into Reciprocating Motion, of which the following is a specification.

The present invention relates to improvements in that kind of mechanism for converting motion in which a reciprocating ring is mounted between two inclined rotary disks; and the object of the invention is to adapt such mechanism for a greater variety of purposes, and quite particularly to enable it to be used for converting reciprocating into a rotary motion, which was not heretofore possible. Such mechanism comprises two curved or angular disks or the like arranged parallel to each other, but inclined with regard to their axes of rotation and between which an annular part or ring is guided in such a manner that during the rotary movement of the disks the said annular part is revolved and also caused to oscillate in the longitudinal direction of the axis. Mechanism of this kind is applicable to a great many purposes in the art—as, for instance, for operating the slide-valves of steam-engines and of air, gas, and petrol motors as well as the pistons of pumps and for many other purposes.

Figure 1 is a longitudinal sectional view of the improvement. Fig. 2 is a transverse sectional view of the same on the line 1 1. Fig. 3 is a detail view of the rod and link. Fig. 4 is a side elevation, partly in section, of another form of the improvement. Fig. 5 is an end view. Fig. 6 is a plan view, partly in section, of the same; and Fig. 7 is a longitudinal sectional view of the improvement embodying the modification shown in Figs. 4, 5, and 6.

Referring to Figs. 1, 2, and 3, disks 3 and 4 are fixed to opposite ends of two shafts 2 and 1, arranged in alinement with each other. The said disks are parallel to each other and at angles of approximately forty-five degrees to the shafts 1 2. Through the centers of these disks passes a bolt 5, so that the shafts 1 and 2 are rigidly connected to each other and the disks 3 and 4 are held at a certain distance apart. Between the disks 3 4 is arranged a ring 8, the thickness of which corresponds approximately to the distance between the disks 3 and 4. Each lateral

surface of this ring 8 is provided with an annular groove 9, which coincides with a similar groove in the respective disk 3 or 4 and forms a race for the balls 10. By this arrangement jamming and friction is avoided and it is rendered possible to considerably increase the stroke of the mechanism. By means of one or more cranks 30 the annular part 8 is guided. Said cranks are arranged in a plane at right angles to the revolving shafts 1 and 2 and are fixed to shafts or gudgeons 31, which revolve in suitable bearings in the bipartite box 32. To the shafts or gudgeons 31 levers can be fixed outside the box. The to-and-fro movement of the cranks 30 produced during the revolution of the shafts 1 2 is transmitted to rods 33 by means of a connecting-link 33<sup>a</sup>. (See Figs. 1 and 3.) Said rods 33 can operate or be operated by pistons or the like. In the latter case the reciprocating motion of the rods 33 is converted into the rotary motion of the shafts 1 and 2.

In order to increase or reduce the stroke of the oscillating part during the working of the mechanism or to stop the said stroke entirely, the arrangement shown in Figs. 4, 5, and 6 can be used. In this case the disk 4, which is inclined at an angle of approximately forty-five degrees, is connected to the toothed segment 34, which is provided with a dovetail guide in the part 39. A worm 35 is in gear with the toothed segment 34, the said worm being integral with the bevel-wheel 36. With this bevel-wheel another bevel-wheel 37 is in gear, the latter being fixed to a shaft 38, which is rotatable within the shaft 1. If the shaft 38 is rotated, the angle of inclination of the disk 4 with regard to the shaft 1 is altered. When this angle amounts to ninety degrees, no oscillation takes place; but the rotation of the shaft 1 can still continue. With this arrangement the mechanism can also be used for controlling-gear—for instance, in place of link motion in locomotives. If the toothed segment were made of sufficient length, the mechanism could also be used with advantage for the controlling-gear of engines which must be capable of reversing without stopping.

It is obvious that a fly-wheel can be fixed to the driving-shaft in order to overcome the dead-points, if the guiding-points are diametrically opposite each other or if only one guiding-point is provided on the ring 8. If, however, there are several guiding-points on



the circumference of the ring and these are at angles of ninety degrees or one hundred and twenty degrees to each other, no dead-points will exist, so that a fly-wheel is not  
5 necessary. The same also applies to the arrangement in which cranks are used.

What I claim, and desire to secure by Letters Patent, is—

10 1. Mechanism for converting motion, comprising in combination two disks mounted at an angle to their axes of rotation and parallel to each other, means connecting said disks with each other at the middle, an oscillating  
15 ring mounted between said disks, balls arranged between each side of said ring and each of said disks, cranks pivoted at one end to said oscillating ring, and a fixed frame to which the other ends of said cranks are pivoted, substantially as set forth.

20 2. Mechanism for converting motion, comprising in combination two disks mounted at an angle to their axes of rotation and parallel to each other, means connecting said disks with each other at the middle, an oscillating  
25 ring mounted between said disks, balls arranged between each side of said ring and each of said disks, cranks pivoted at one end to said oscillating ring, a frame to which the other ends of said cranks are pivoted, and  
30 means to alter the inclination of said disks, substantially as set forth.

3. Mechanism for converting motion, com-

prising in combination two disks mounted at an angle to their axes of rotation and parallel to each other, means connecting said disks  
35 with each other at the middle, an oscillating ring mounted between said disks, balls arranged between each side of said ring and each of said disks, cranks pivoted to a fixed support and to said oscillating ring, a toothed  
40 segment connected to one of said disks, a worm meshing with said toothed segment and means to turn said worm, substantially as set forth.

4. Mechanism for converting motion, com- 45  
prising in combination two disks mounted at an angle to their axes of rotation and parallel to each other, means connecting said disks with each other at the middle, an oscillating  
ring mounted between said disks, balls ar- 50  
ranged between each side of said ring and each of said disks, cranks pivoted at one end to said oscillating ring, a frame to which the other ends of said cranks are pivoted, a link  
connected to the end of said crank pivoted to 55  
said ring, and a rod pivoted to the opposite end of said link, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LUDWIG NEUMANN.

Witnesses:

HERMANN TEIDEL,  
W. PETSCH.