

No. 780,894.

PATENTED JAN. 24, 1905.

H. LUNDQVIST.
ROTARY ENGINE.

APPLICATION FILED DEC. 29, 1903.

3 SHEETS—SHEET 1.

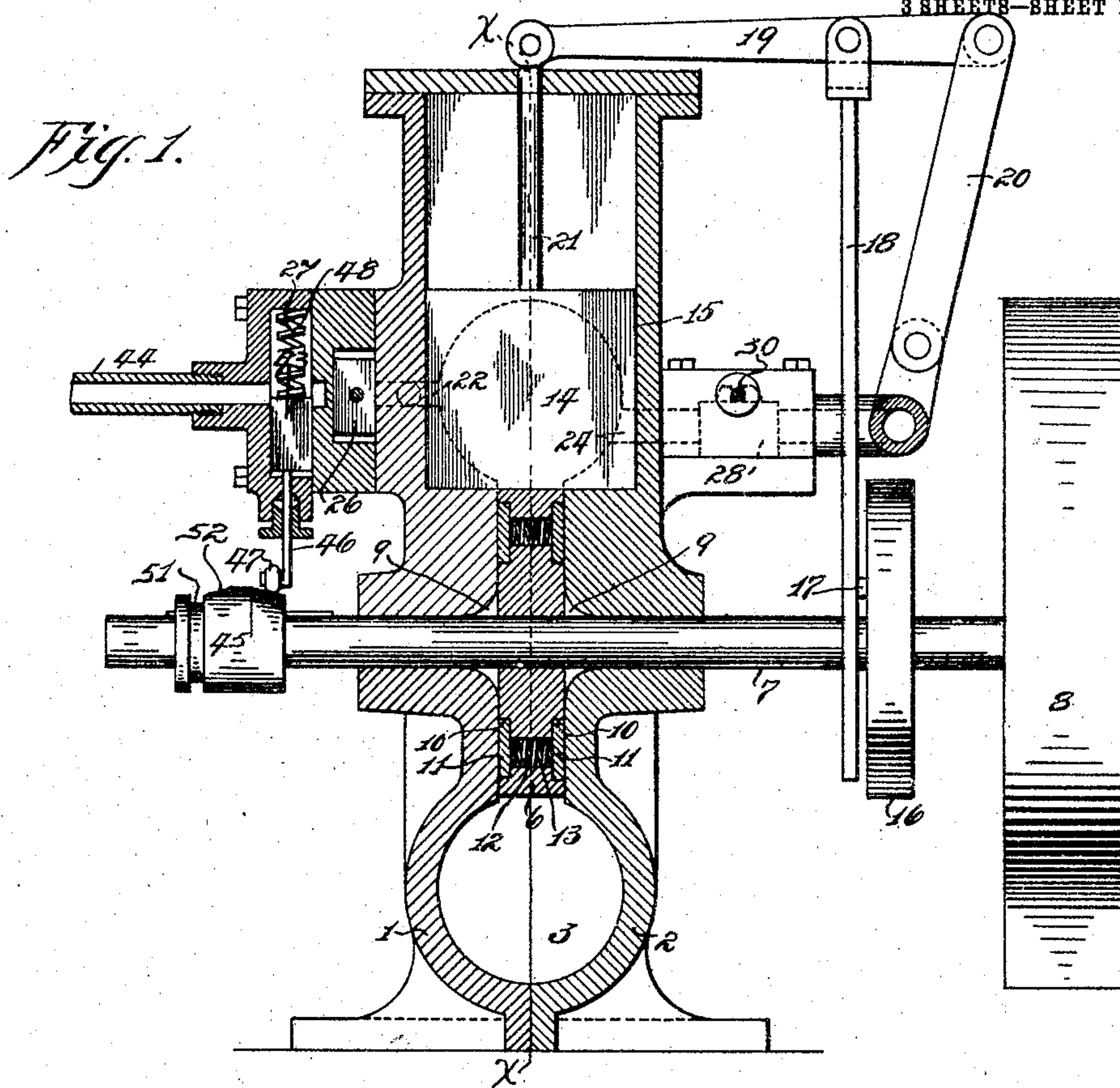


Fig. 2.

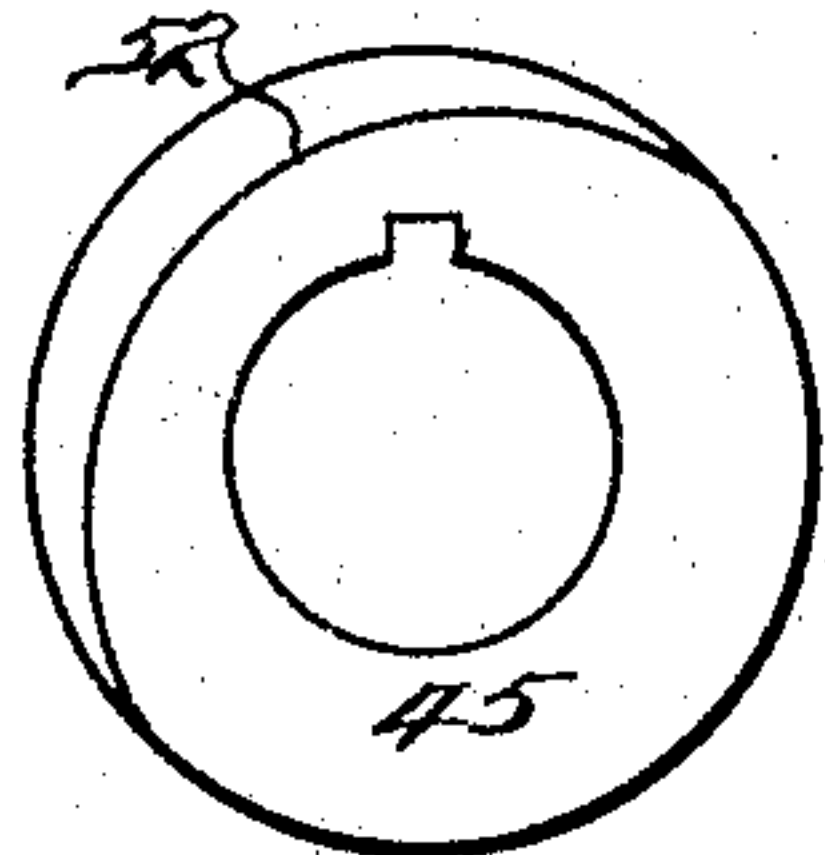


Fig. 4.

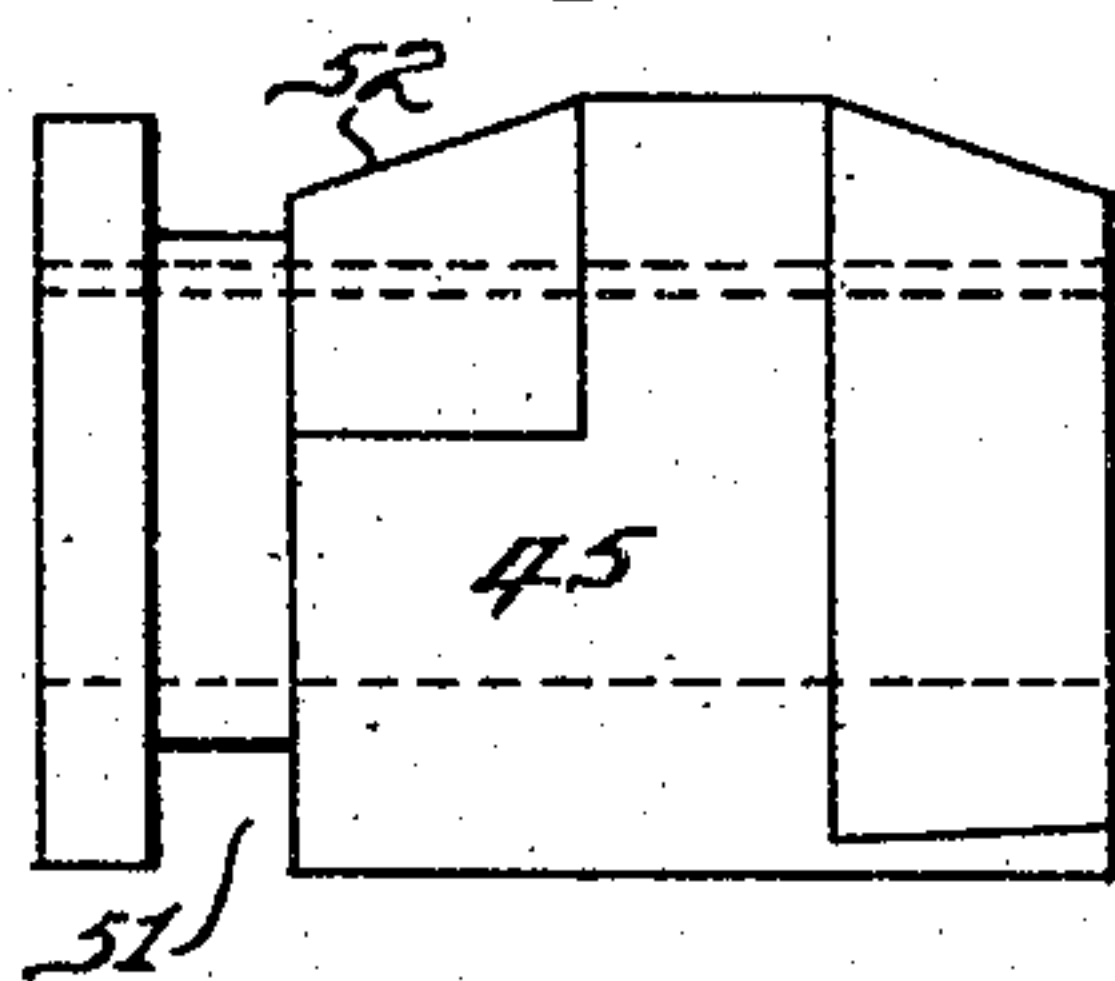
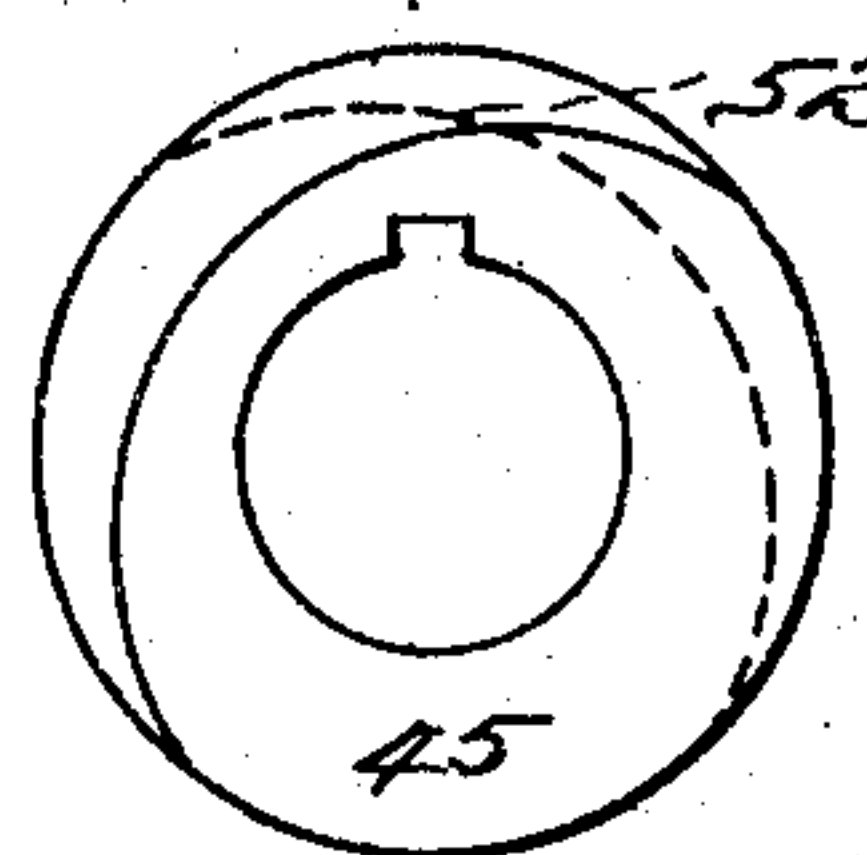


Fig. 3.



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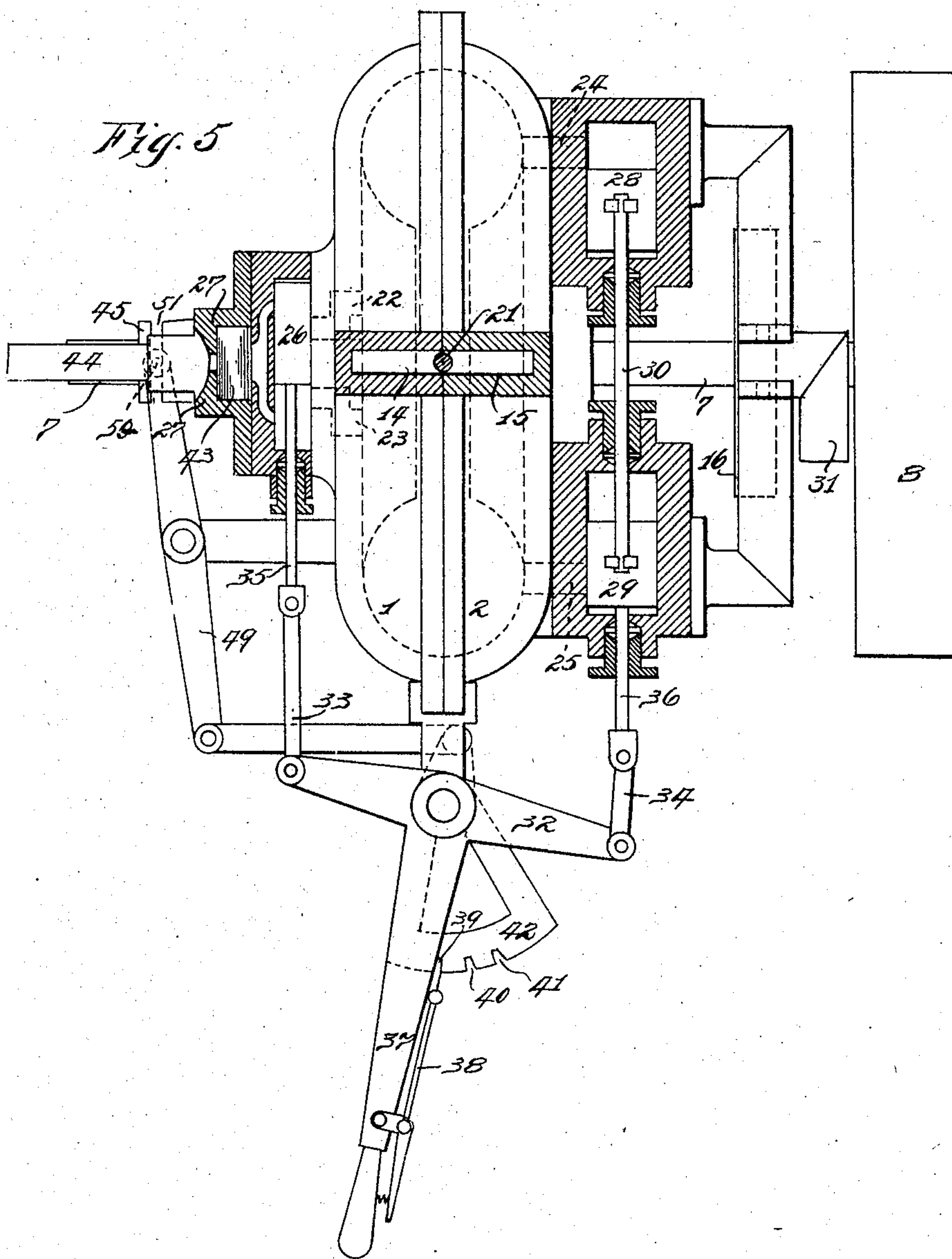
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3 SHEETS—SHEET 3.

Fig. 6.

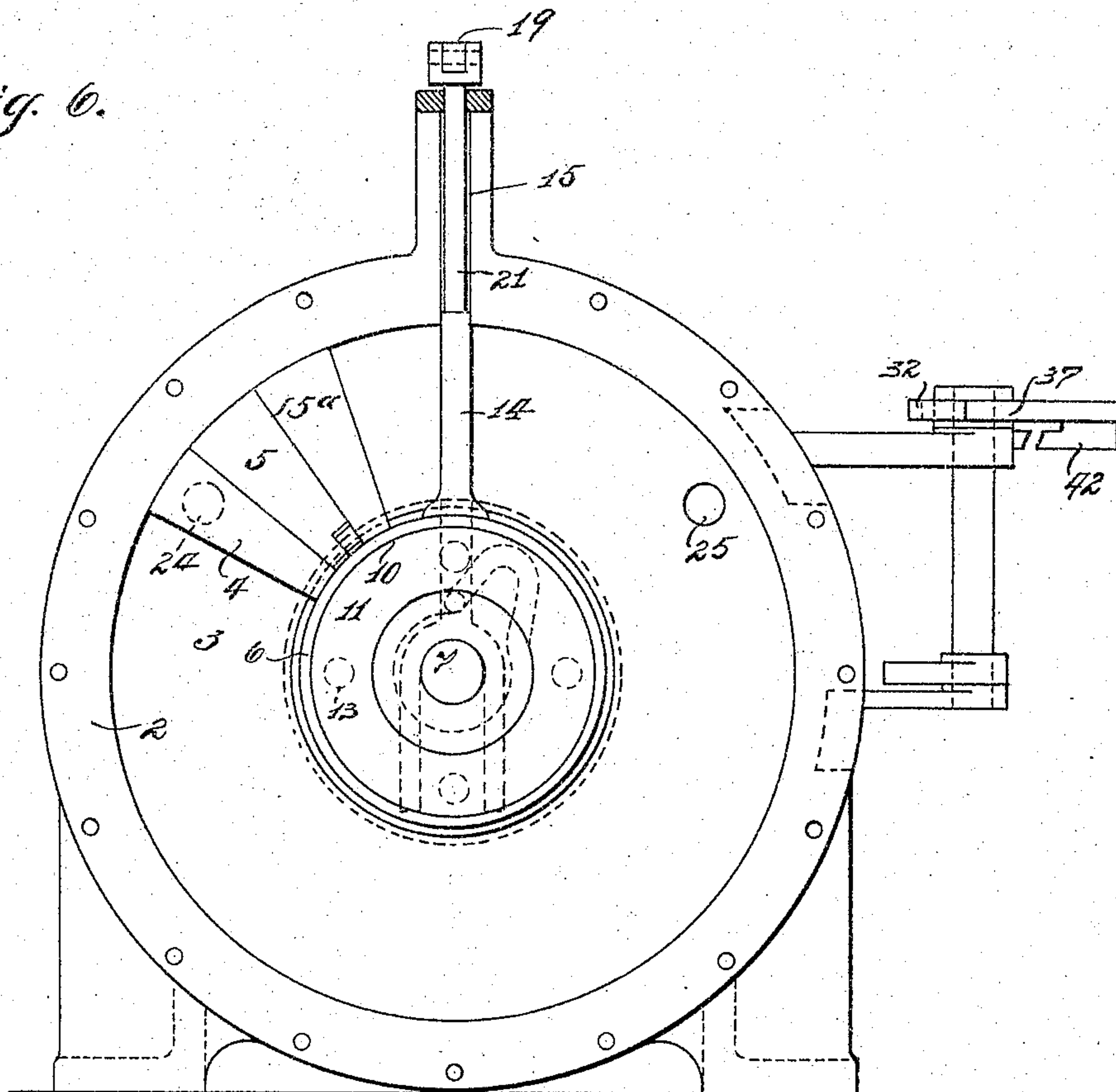
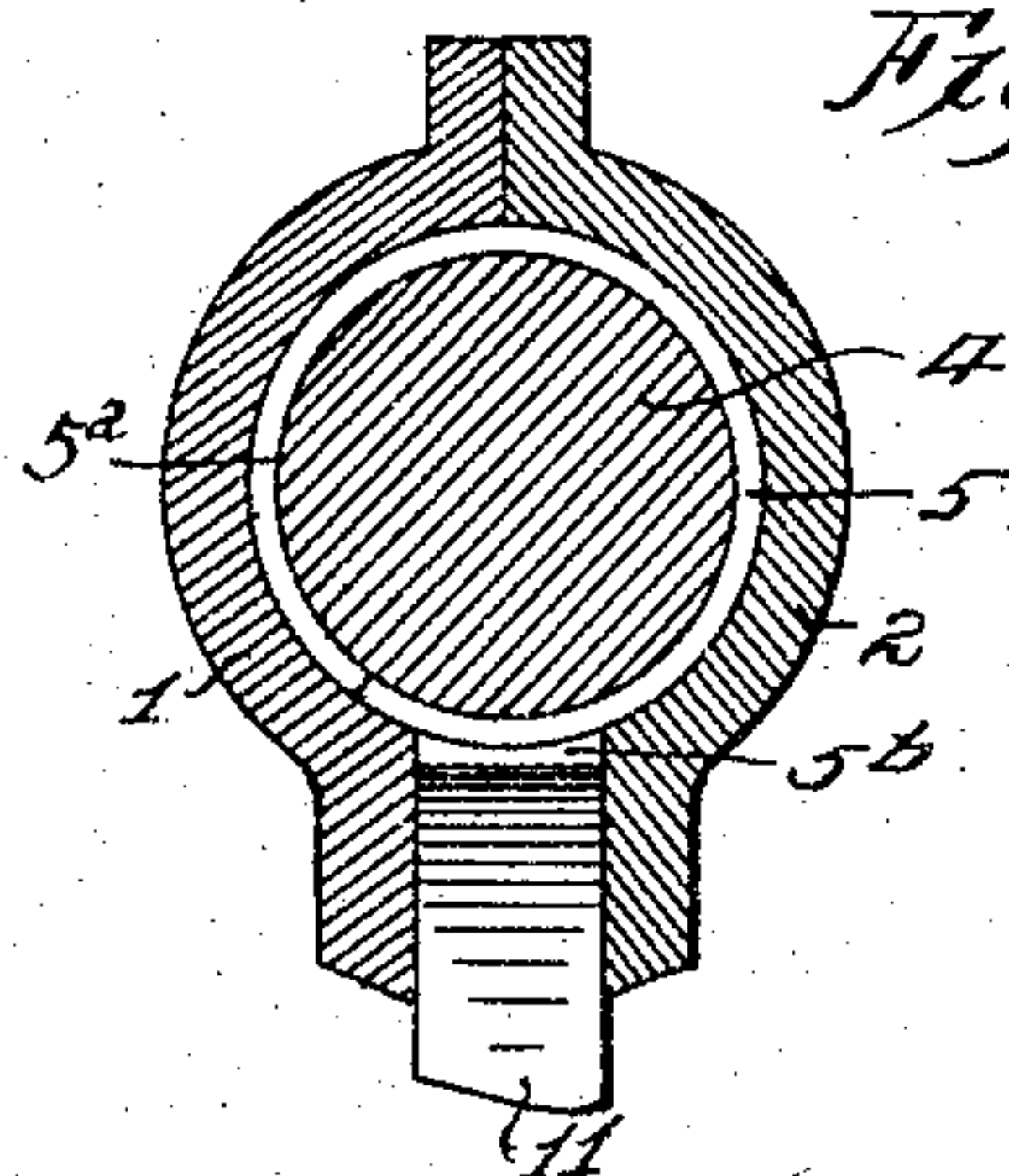


Fig. 7.



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UNITED STATES PATENT OFFICE.

HILDING LUNDQVIST, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO
GEORGE WILLIAM CURTIS, OF BAYONNE, NEW JERSEY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 780,894, dated January 24, 1905.

Application filed December 29, 1903. Serial No. 187,080.

To all whom it may concern:

Be it known that I, HILDING LUNDQVIST, a citizen of the United States, residing in the city of New York and State of New York, have invented a certain new and useful Improved Rotary Engine, of which the following is a specification.

This invention relates to engines of the rotary class, and particularly to those in which a piston is mounted in an annular chamber which is provided with a shutter which is adapted to open to permit the piston to pass.

The object of my invention is to improve the form of the piston and chamber, to improve the mounting of the piston, to provide improved packing means, to improve the operation of the shutter, to effect economy in the use of steam or other motive power, and to enable the engine to run in either direction at will. Other objects will hereinafter appear.

In the accompanying drawings, Figure 1 is a median sectional view of one form of engine made in accordance with my improvements. Figs. 2 and 3 are end views, and Fig. 4 a side view, of an adjustable cut-off cam mounted upon the engine-shaft. Fig. 5 is a plan of the engine. Fig. 6 is a sectional elevation taken at about the line *x x* of Fig. 1. Fig. 7 is a detail of the piston, illustrating a packing-ring thereon.

Throughout the views like parts are identified by like signs.

The engine-casing is made in two sections 1 and 2, each section being formed with one-half of an annular chamber 3, in which fits a piston 4, provided with a ring-packing 5. By making the chamber round or circular in cross-section, as seen at Fig. 1, the piston may be made circular in contour, permitting the use of a ring-packing, which is very effective to prevent leakage of steam. The piston is carried by a disk 6, which is fixed upon a central shaft 7, carrying a fly-wheel 8. In the casing oil-spaces are left at 9 at each side of the disk 6 and adjoining the shaft-opening. Said disk 6 is provided in its opposite sides with annular grooves 10, in which are fitted packing-rings 11, which are pressed away from each other and against the contiguous walls of the

casing by means of a series of compression-springs 12, which fit in perforations 13, formed through the disk at said grooves. It will thus be seen that both the piston and its carrying-disk are effectively packed against leakage of steam. The piston-packing 5 is in the form of a ring inserted or sprung into a peripheral groove 5^a, which joins a recess 5^b, formed at the junction of piston and disk.

A sliding shutter 14, adapted to close the annular chamber 3 to form a cylinder-head, is mounted in a guideway 15 and caused to open and close at the proper time by mechanism driven by the main shaft 7 and comprising a grooved cam 16, fixed upon the shaft, a pin or roller 17 engaging said cam, a rod 18 whereon said pin or roller is secured, a lever 19, pivoted to the upper end of said rod and fulcrumed upon a link 20, and a rod 21, connecting the end of said lever to said sliding shutter.

For enabling the direction of movement of the piston and engine to be reversed I provide admission-ports 22 and 23, one upon each side of the shutter 14, and exhaust-ports 24 and 25, also disposed one upon each side of the shutter, but preferably upon the annular chamber from the admission-ports. For the admission-ports I provide a valve or valve member 26, which when in position to close one port leaves the other port open to the steam-chest 27. For the exhaust-ports I provide a valve member preferably comprising two valves 28 and 29, rigidly connected by a rod 30, so that the valves move together, and it will be observed that the valves 28 and 29 are so related that when either exhaust-port is closed the other is open to the exhaust 31. The admission and exhaust valves are connected by means of a cross-lever 32, links 33 and 34 connecting the latter to valve-stems 35 and 36, respectively. It will be seen that by opening an admission-port upon either side of the shutter 14 the exhaust-port upon that side of the shutter is closed, while upon the other side of said shutter the admission-port is closed and the exhaust-port is opened. Thus by a simple movement of the lever the direction of the engine motion is reversed. I

preferably provide the lever with a handle 37 and the latter with a latch 38, adapted to engage either one of three notches 39, 40, and 41, formed in a segment 42 for retaining the lever in either forward or backward or middle position. It will be understood that the pressure of steam holds the valves tightly to their seats.

In the steam-chest 27 I provide a cut-off valve 43, adapted to close communication between the admission-pipe 44 and the piston-chamber. This valve is lifted automatically to effect the cut-off once in each revolution of the engine by means of a cam 45 splined upon the shaft, said valve being provided with a stem 46, having a roll 47, which rides upon said cam. A spring 48 may be provided for holding the roll down upon the cam. To regulate this valve, I skew the cam 45 and provide means for moving it along the shaft, the movement of the valve being diminished when the cam is moved to the right at Fig. 1 and increased when the cam is moved in the opposite direction, according to the position occupied by the roll on the inclined face of the cam. The cam may be adjusted along the shaft by a lever 49, and suitable means may be provided for securing the same. The lever is provided with a member 50, engaging a peripheral groove 51, provided upon the cam.

When the engine is running in the opposite direction, the timing of the cut-off cam needs to be changed, owing to the relation between the shutter movement and the piston movement, and I accordingly provide upon the cam member a second cam 52, skewed oppositely from the cam 45, but similar thereto, except that it is set or formed to operate at a different point in the revolution, as will be understood from Figs. 2, 3, and 4.

To oil the piston-carrying disk, as well as

the piston and other parts, it is only necessary to supply oil to the openings 9, which immediately surround the shaft, and the centrifugal force developed by the operation of the engine distributes the oil outwardly, lubricating the disk, the annular chamber, &c.

Having thus described my invention, I claim—

1. In a rotary engine, the combination of an annular chamber, a round piston therein, a rectangular shutter mounted to slide across said chamber, a shaft connected to said piston, levers operated by said shaft for sliding said shutter, admission-ports and exhaust-ports upon opposite sides of the shutter, and connected valves for said ports, operating substantially as described.

2. In a rotary engine, the combination of a casing having an annular chamber therein, a round piston in said chamber, a disk upon which the piston is mounted, a yielding packing for said disk, and a packing-ring fitted in a groove around the periphery of the piston and seated in a recess between the disk and the piston.

3. In a rotary engine, the combination of a casing having an annular chamber of circular cross-section, a round piston in said chamber, a disk which carries said piston, said disk having yielding packing, a main shaft passing through the disk and casing, a shutter, a cut-off valve, and a compound exhaust-port valve, said shutter and cut-off valve being automatically actuated by means of the main shaft and intermediate connections, substantially as described.

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