R. C. LEEDHAM.

ROTARY ENGINE.

APPLICATION FILED JAN. 6, 1910.

962,850.

Patented June 28, 1910.

4 SHEETS—SHEET 1.

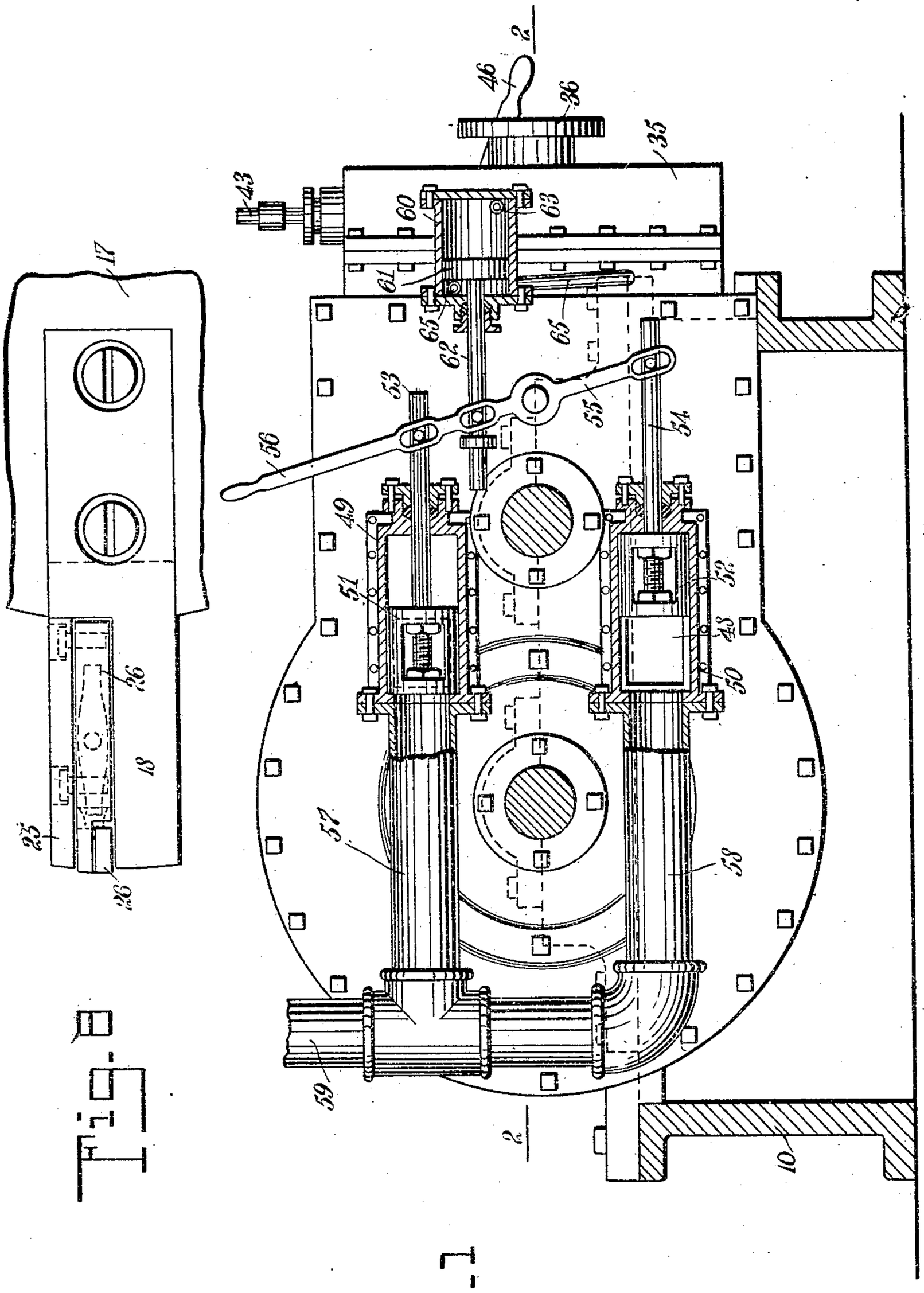

Fig. 1.

WITNESSES

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4 SHEETS—SHEET 2.

Fig. 2

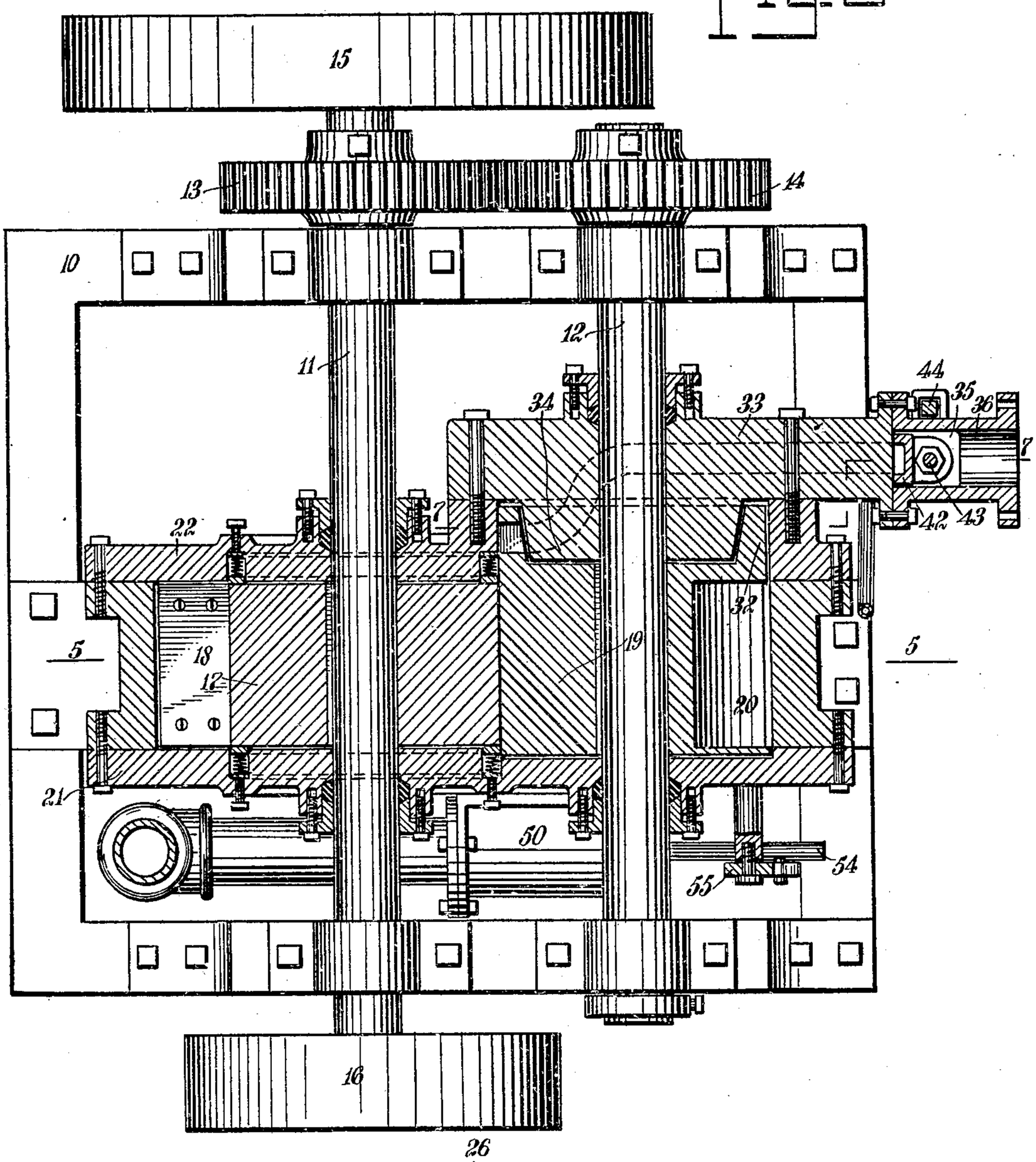
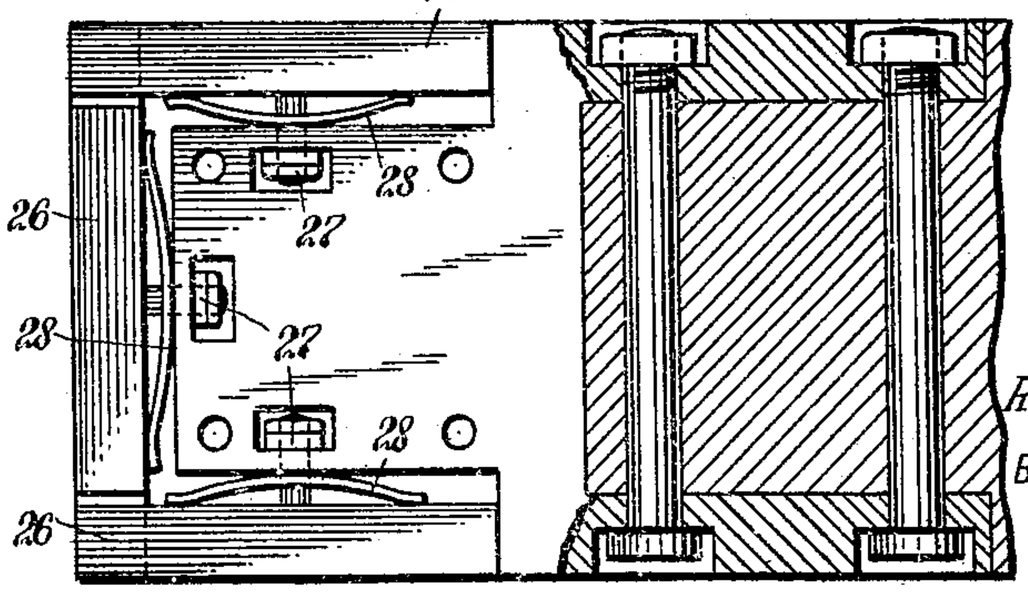


Fig. 3



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4 SHEETS—SHEET 3.

Fig. 4

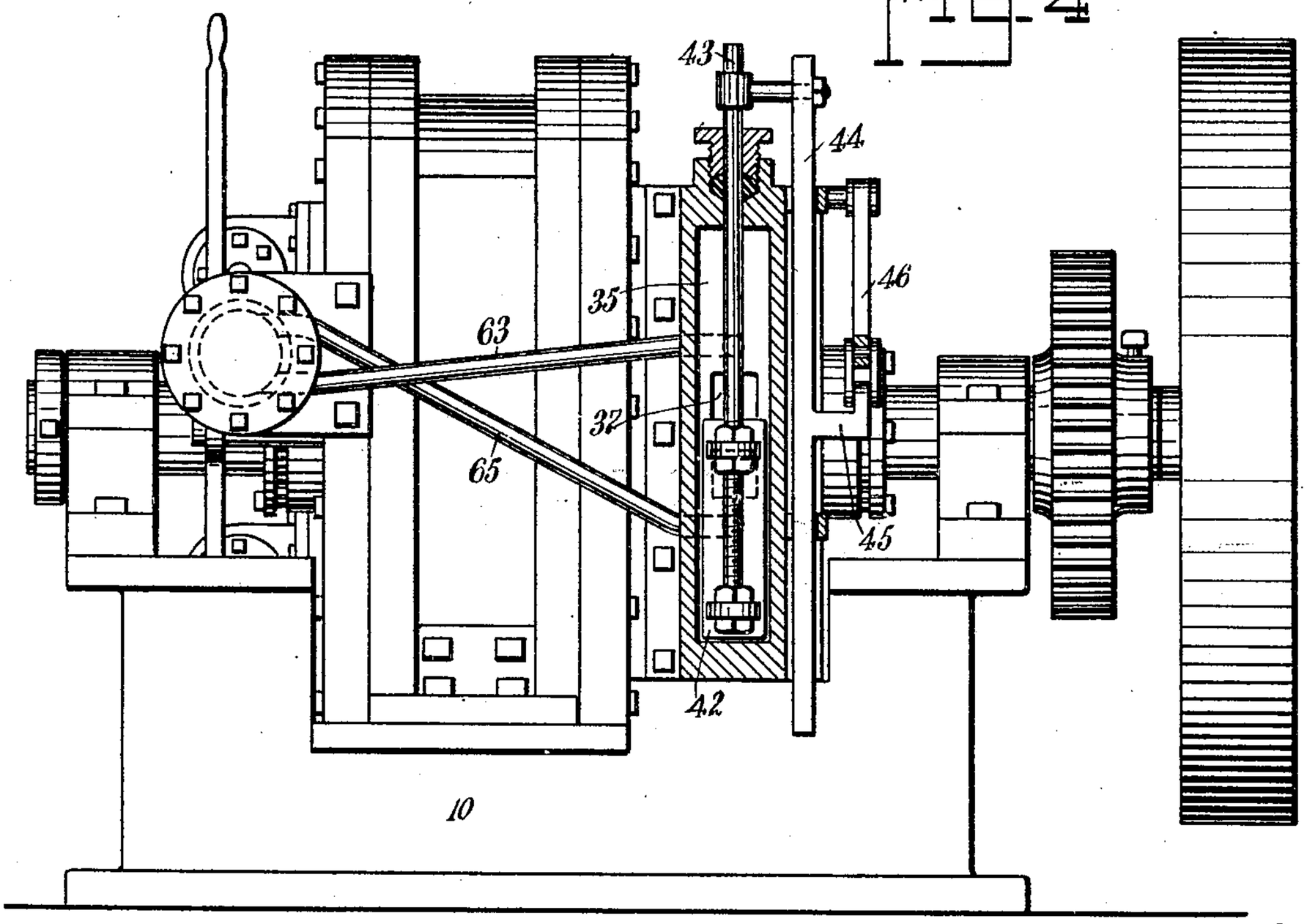
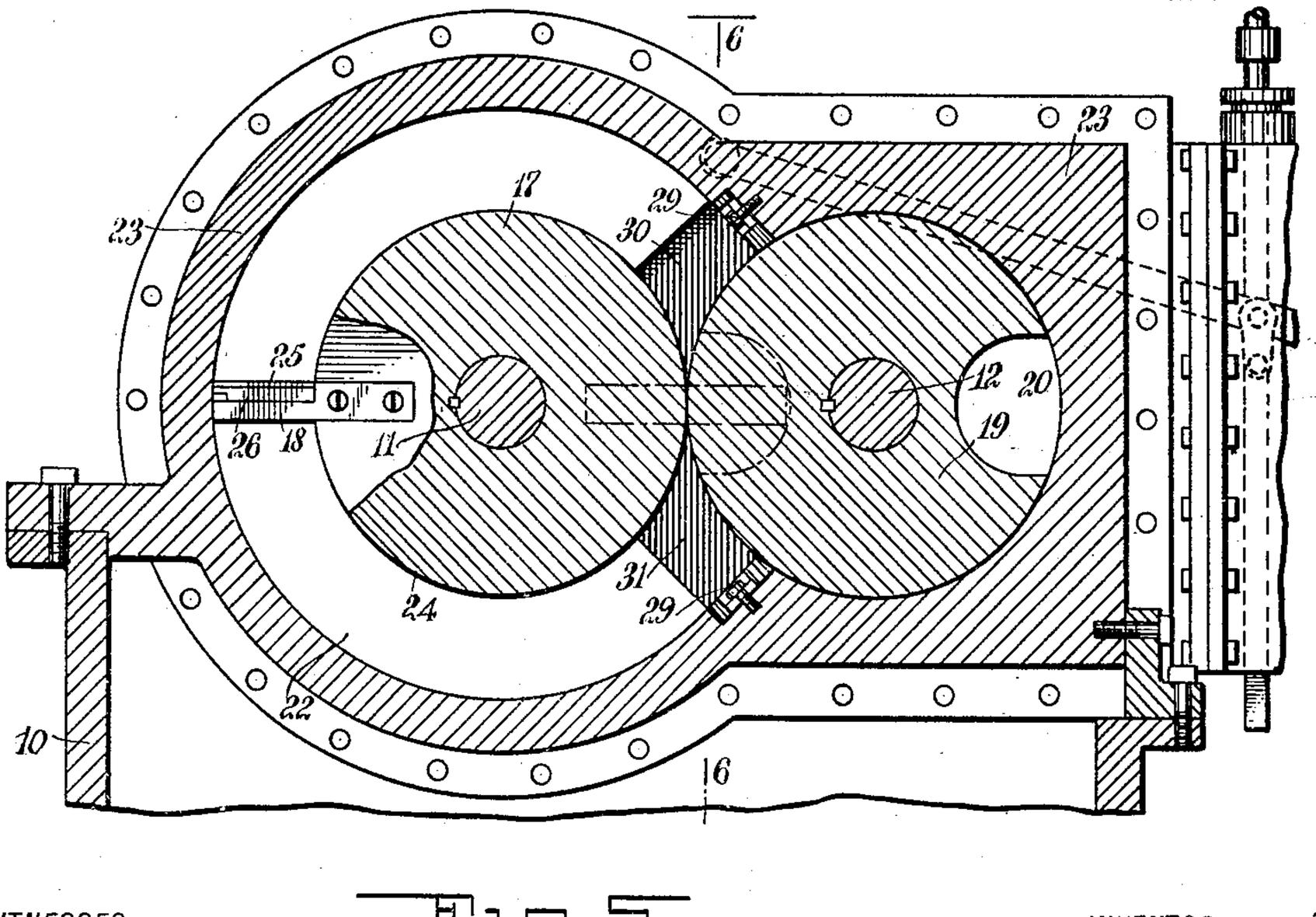


Fig. 5



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4 SHEETS—SHEET 4.

Fig. 6

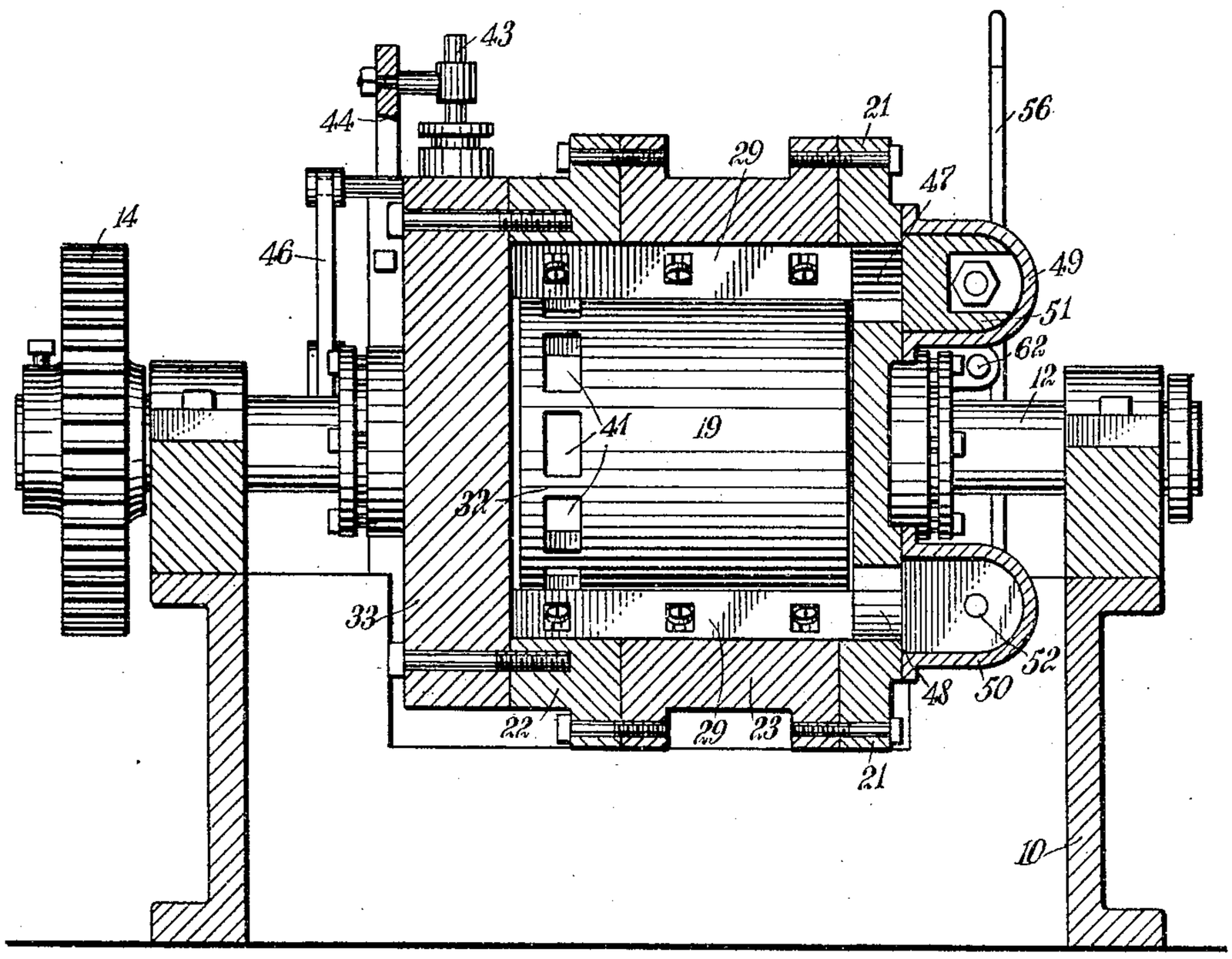
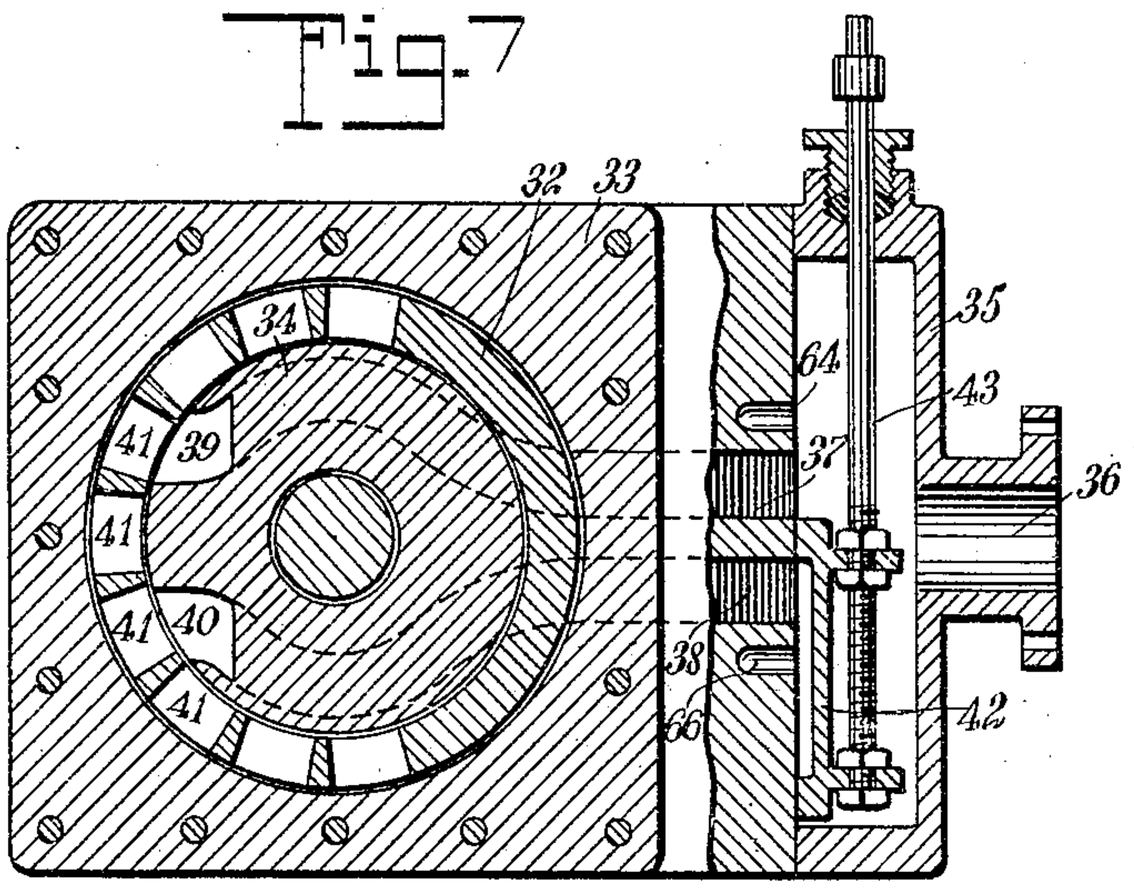


Fig. 7



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UNITED STATES PATENT OFFICE.

RUSSEL CLINTON LEEDHAM, OF TRINIDAD, COLORADO.

ROTARY ENGINE.

962,850. Specification of Letters Patent. **Patented June 28, 1910.**

Application filed January 6, 1910. Serial No. 536,639.

To all whom it may concern:

Be it known that I, RUSSEL CLINTON LEEDHAM, a citizen of the United States, and a resident of Trinidad, in the county of Las Animas and State of Colorado, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in rotary engines of that type in which the rotor carries an outwardly-extending piston movable through an annular chamber, and in which the back flow of motive fluid is cut off by a rotary abutment recessed to permit the passage of the piston.

One important object of my invention is to utilize the rotary abutment as the means for more effectively controlling the supply of motive fluid to the working chamber.

A further object of my invention is to automatically control the escape of exhaust motive fluid from the engine as the supply control valve is operated to reverse the engine.

Other objects and advantages will be set forth hereinafter, and the particular features of my invention will be pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is an end view of the exhaust side of my improved engine, a portion of the exhaust conduit being broken away to show the exhaust valves; Fig. 2 is a central horizontal section on the line 2—2 of Fig. 1; Fig. 3 is a portion of a radial section through the rotor, showing the packings upon the piston; Fig. 4 is a side elevation of my improved engine, the inlet valve casing being shown in section. Fig. 5 is a vertical transverse section on the line 5—5 of Fig. 2; Fig. 6 is a vertical section substantially on the line 6—6 of Fig. 5; Fig. 7 is a transverse section on the line 7—7 of Fig. 2; and Fig. 8 is an enlarged edge view of the piston and a portion of the rotor.

My improved engine is adapted for the use of steam, compressed air, water or any other fluid which may be supplied under pressure, but the specific form of engine illustrated is especially adapted for use with steam or compressed air. The engine includes a bed or base 10, having bearings or journal boxes for two parallel shafts 11 and 12. The two shafts are provided with intermeshing gears 13 and 14, so as to rotate simultaneously in opposite directions, and one of the shafts, preferably the shaft 11, is provided with a fly wheel 15 and a belt pulley 16. Upon the shaft 11, intermediate its ends, there is mounted a rotor 17, substantially cylindrical in form and presenting an outwardly-extending piston 18. Upon the shaft 12 there is provided a rotary member 19, adapted to serve not only as a rotary pump but also as an automatic cut-off for the motive fluid. These two rotary members 17 and 19 are of substantially the same diameter and are in rolling contact, so that motive fluid cannot readily pass therebetween. The rotary member 19 is provided with a recess 20, in one side thereof, of a depth substantially equal to the height of the piston 18, so that when during the rotation of the two members, the piston 18 approaches the line of tangency between the two rotary members, it will enter said recess and pass to the opposite side of the line of tangency.

Surrounding the two rotary members is a casing which serves to confine and control the motive fluid during the operation of the latter upon the piston. This casing may be formed of two end walls 21 and 22, spaced apart to receive the two rotary motors therebetween and having stuffing boxes preventing the escape of motive fluid along the two shafts. The two end walls or end plates 21 and 22 are connected together by an outer or peripheral wall 23, which is disposed closely adjacent the major portion of the peripheral wall of the rotary member 19, but is spaced from the rotor 17, so as to leave a chamber 24 of a height equal to the height of the piston 18 and of a width substantially equal to the length of said piston and the length of said rotor. The piston in moving through the arcuate chamber 24, completely subdivides the latter into separate compartments, so that motive fluid cannot pass from one side of the piston to the other. For insuring a tight fit between the outer edges of the piston and the walls of the arcuate chamber, the piston may be provided with resiliently mounted packing strips. Preferably, the piston has a removable face plate 25, and marginal grooves between the edge of the face plate and the edge of the body of the piston. Within these grooves are mounted packing strips 26, limited in their outer

movement by bolts 27, and normally pressed outwardly into engagement with the walls by springs 28. The passage of motive fluid into the thin curved space between the periphery of the rotary member 19 and its casing, may be prevented by adjustable packing strips 29, as shown particularly in Figs. 5 and 6.

One of the end walls of the arcuate chamber, for instance, the wall 22, is provided with two ports 30 and 31, adjacent the line of tangency of the two rotary members and upon opposite sides thereof. These ports are adapted to serve as inlet ports, and the motive fluid may be supplied to either port, so as to control the direction of rotation of the rotor. The rotary member 19 is provided with an annular flange 32, the outer or peripheral wall of which constitutes an extension of the annular wall of said rotary member. The end wall 22 has an opening therein into which said flange extends and a separate flange 33 covers this opening and has a boss or hub 34 extending into the space within the annular flange. Upon the outer end of this plate is a steam chest 35, having an inlet port 36, to which the main supply for the steam or other motive fluid is connected. From the interior of the steam chest, two passages 37 and 38 extend inwardly to the diametrically opposite side of the projection or hub 34 and terminate at ports 39 and 40 delivering against the inner surface of the flange. The outer surface of the flange along a portion of its length, is exposed to the two ports 30 and 31, and said flange is provided with a plurality of ports or passages 41 therethrough. The motive fluid may pass from the steam chest through the passage 37 to the port 39, and thence through one of the passages 41 to the port 30 and into the working chamber, or the motive fluid may flow through the passage 38 to the port or passages 41, to the port 31 in the working chamber at the opposite side of the piston in the port 30. Thus, the piston may be moved in either direction dependent upon which of the passages 37 or 38 the motive fluid enters.

Within the steam chest 35 is a sliding valve 42, which may uncover either of the passages 37 or 38 to control the flow of motive fluid or may cover both of said passages to prevent the flow. This valve may be operated in any suitable manner, but, as illustrated, it is connected to a valve stem 43 entering through a stuffing box in one end of the steam chest. Outside of the steam chest, a slide 44 may be connected to the valve stem, and a bracket 45 on this slide may be connected to a pivoted lever 46, by means of which the valve may be readily operated. The ports 41 may be disposed about the entire periphery of the flange 32, if desired, but preferably they extend only along approximately one-half of the flange, and along the half which is diametrically opposite to the recess 20. Thus, when the piston 18 is within said recess and passing from one side of the line of tangency to the other side, the flange 32 will cover both of the ports 39 and 40, and prevent any motive fluid from entering the motive fluid chamber.

With the motive fluid entering either of the ports 30 or 31, the piston will be moved away from that port toward the other port. Instead of conducting the gas back through the other passage to the steam chest, I preferably exhaust it directly out through the end wall 21 of the chamber, and thus avoid the resistance to the escape of the motive fluid. The wall 21 has two ports 47 and 48, directly opposite to the two ports 30 and 31. Two valve casings 49 and 50 cover these two ports, and within the two valve casings are slide valves 51 and 52. The two valves have their valve stems 53 and 54 both connected to a lever 55, which is pivoted between the two valve stems, so that the opening of one valve will insure the simultaneous closing of the other valve. The lever may have an upwardly extending portion constituting a handle 56, whereby the two levers may be shifted at will. From the two valve casings 49 and 50, there are preferably provided two branch exhaust conduits 57 and 58, both joining a main exhaust conduit 59, through which the motive fluid passes.

For automatically moving the valves 51 and 52 so as to reverse the exhaust ports upon the sliding of the valve 42 and the reversing of the inlet ports, I provide an automatic mechanism, including a cylinder 60 having a piston 61 therein, the piston rod 62 of which is connected to the lever 55. From one end of the cylinder 60, a conduit 63 extends to a port 64 in the steam chest 35, and from the opposite end of the cylinder 60, a conduit 65 leads to a second port 66 in the steam chest 35. These two ports 64 and 66 are disposed adjacent to but upon opposite sides of the two passages 37 and 38, so that in moving the valve 62 from its intermediate position, for instance, downwardly, it will first uncover the port 64 to permit the delivering of live steam through the conduit 63 to the cylinder 60 to force the piston outwardly, and to bring the valves 51 and 52 to the position indicated in Fig. 1. A further movement of the valve will uncover the passage 37, so that the motive fluid can enter. Thus the proper positioning of the exhaust valves takes place before the entrance of motive fluid to the working chamber.

For moving the valve in the opposite direction to reverse the engine, the port 66 is first uncovered, which will permit the delivery of motive fluid to the opposite end of the cylinder 60, to reverse the exhaust valves

before the motive fluid is permitted to enter through the passage 38.

I do not wish to be limited to the specific construction illustrated, as various changes may be made in the construction and arrangement of the parts within the scope of the appended claims, without departing from the spirit of my invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A rotary engine having a rotary member, an inlet port and an exhaust port for the passage of motive fluid to drive said rotary member in one direction, an inlet port and an exhaust port for the passage of motive fluid to drive said rotary member in the opposite direction, valve mechanism for controlling said inlet ports, valve mechanism for controlling said exhaust ports, a member operated by the motive fluid, means for delivering motive fluid thereto, said means being controlled by said inlet valve mechanism, and means connected to said last-mentioned member for operating said exhaust valve mechanism.

2. A rotary engine having a rotary member, an inlet port and an exhaust port for the passage of motive fluid to drive said rotary member in one direction, an inlet port and an exhaust port for the passage of motive fluid to drive said rotary member in the opposite direction, valve mechanism for controlling said inlet ports, valve mechanism for controlling said exhaust ports, a member operated by the motive fluid, and means for delivering motive fluid thereto, said means being connected to said last-mentioned member for operating said exhaust valve mechanism, to open either exhaust port prior to the opening of the corresponding inlet port.

3. A rotary engine having a rotary member, an inlet port and an exhaust port, for the passage of motive fluid to drive said rotary member in one direction, an inlet port and an exhaust port for the passage of motive fluid to drive said rotary member in the opposite direction, a valve for controlling said inlet ports, an auxiliary cylinder having a piston therein, ports also controlled by said valve for the passage of motive fluid to said cylinder, valve mechanism for controlling the exhaust ports, and means connecting said piston and said exhaust valve mechanism.

4. A rotary engine having a rotary member, an inlet port and an exhaust port for the passage of motive fluid to drive said rotary member in one direction, an inlet port and an exhaust port for the passage of motive fluid to drive said rotary member in the opposite direction, valve mechanism for controlling the inlet ports, two separate valves for controlling said exhaust ports, means connecting said exhaust valves whereby the opening of one valve closes the other, and fluid-operated means controlled by said inlet valve mechanism for reversing said exhaust valves.

5. A rotary engine having a rotor provided with a piston, an abutment wheel having an annular flange provided with ports therethrough, an inlet passage leading to one side of said flange, and a port for delivering motive fluid from the opposite side of said flange to the piston of said rotor.

6. A rotary engine having a casing provided with separate inlet ports in one end wall and separate exhaust ports in the opposite end wall, a rotor within the casing, a rotary abutment having an annular flange provided with ports adapted to register with said inlet ports, a reversing valve for controlling the admission of motive fluid through the said inlet ports, exhaust valves for controlling said exhaust ports, and fluid-operated means controlled by said inlet valve for operating said exhaust valves, each exhaust valve opening prior to the opening of its corresponding inlet valve.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

RUSSEL CLINTON LEEDHAM.

Witnesses:

JAMES BRIERLY,

DAN STOSSI.