

No. 708,328.

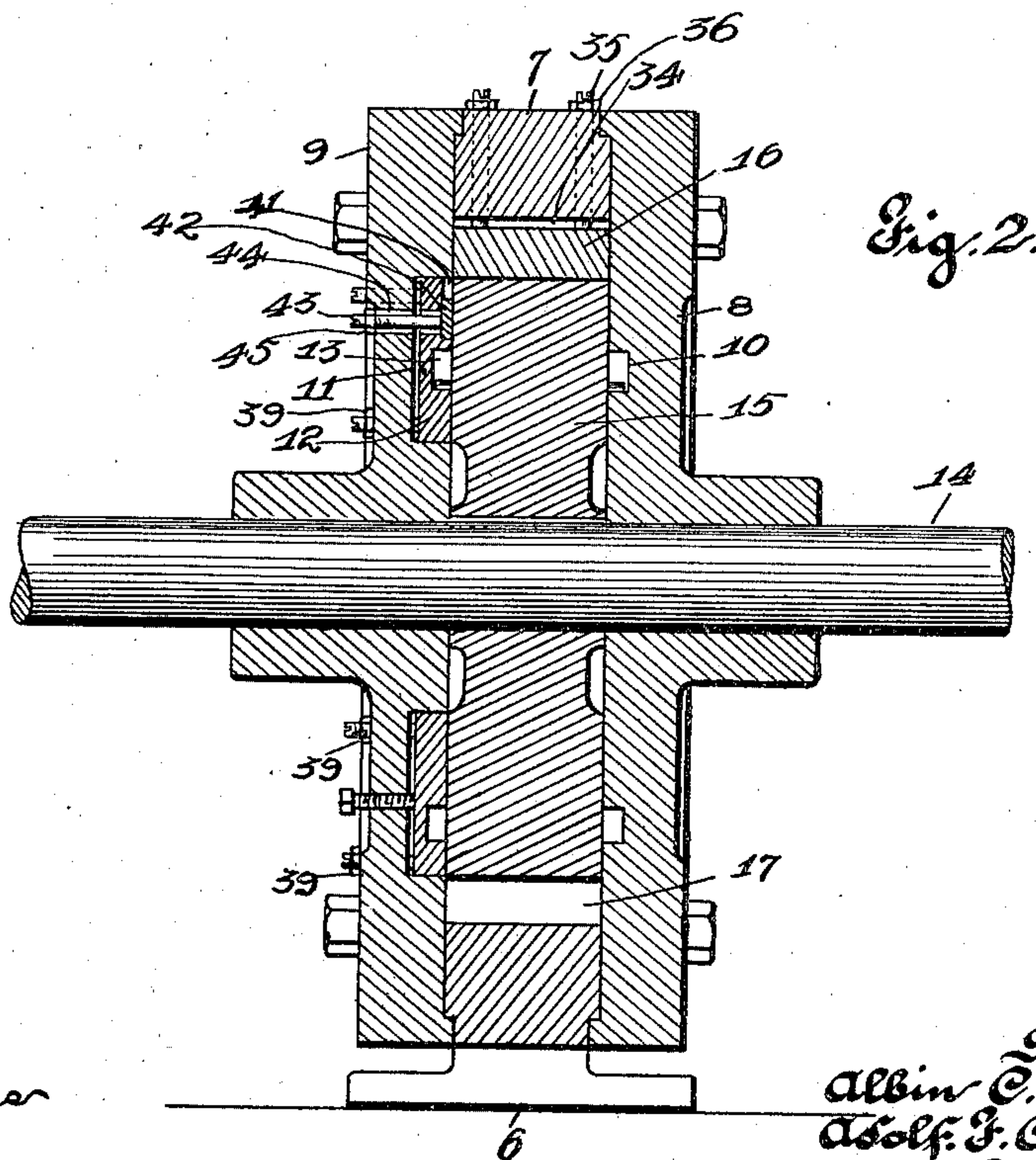
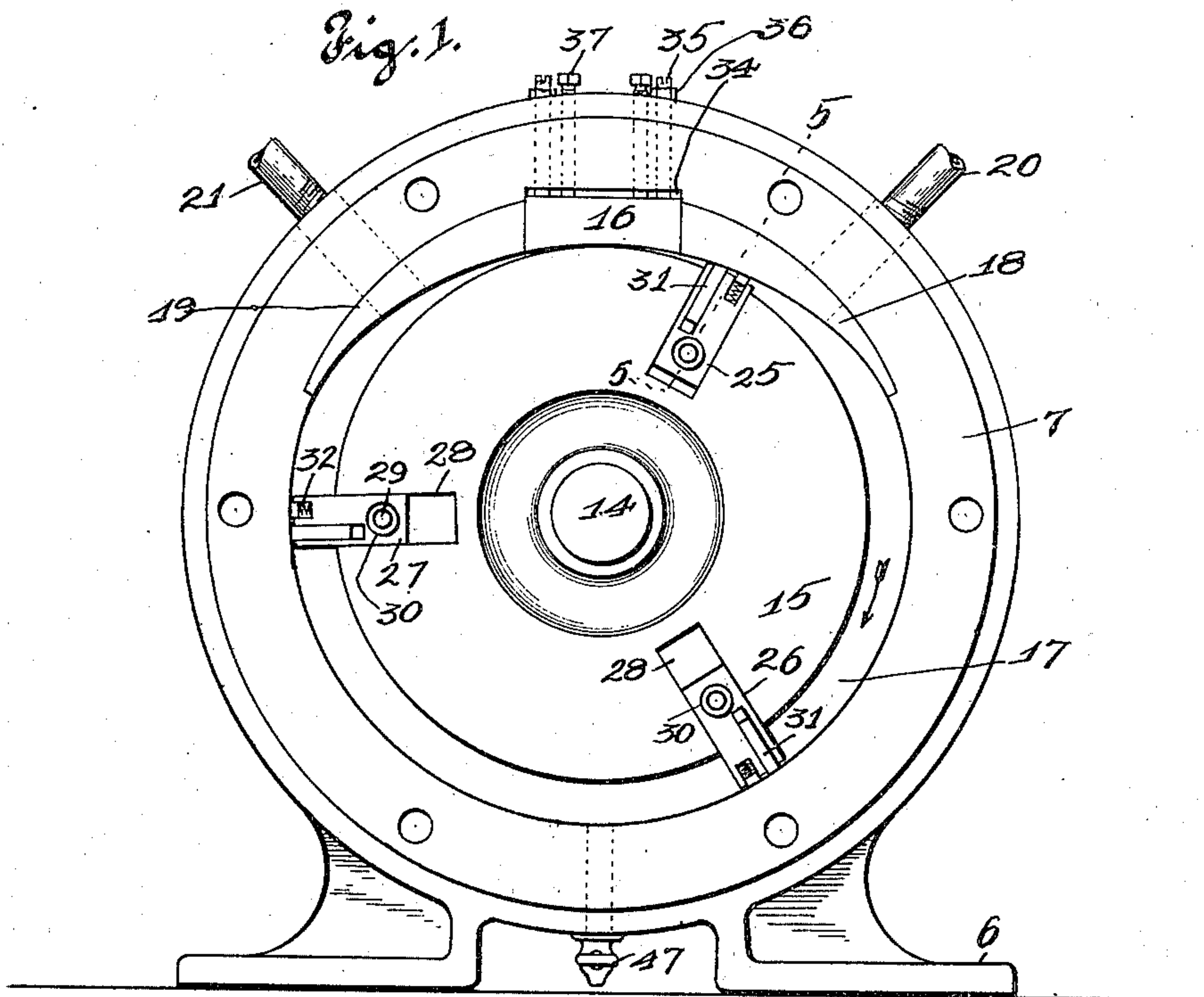
Patented Sept. 2, 1902.

A. C. EEK & A. F. CEDERQUIST.  
ROTARY ENGINE.

(Application filed Feb. 18, 1902.)

(No Model.)

2 Sheets—Sheet 1.



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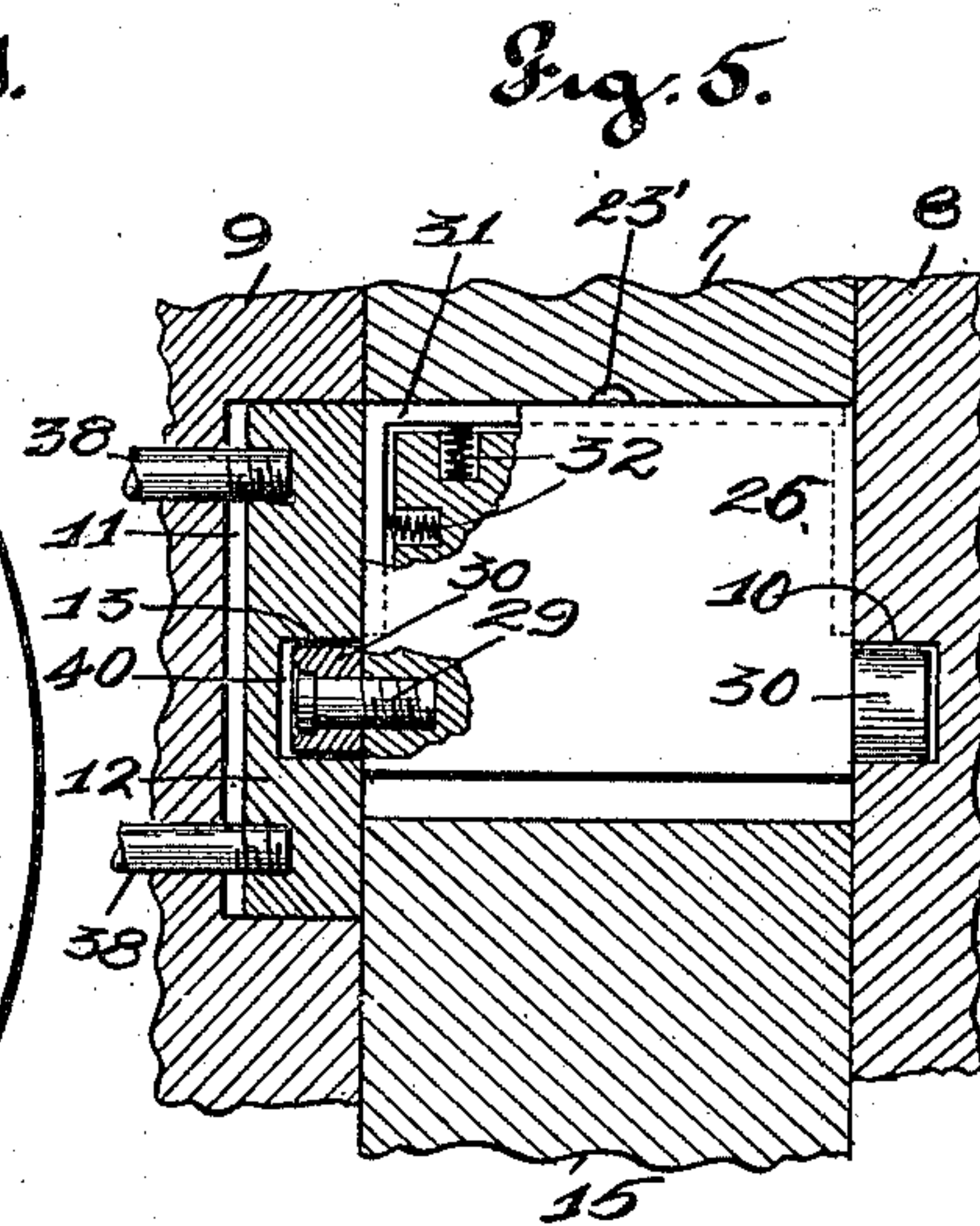
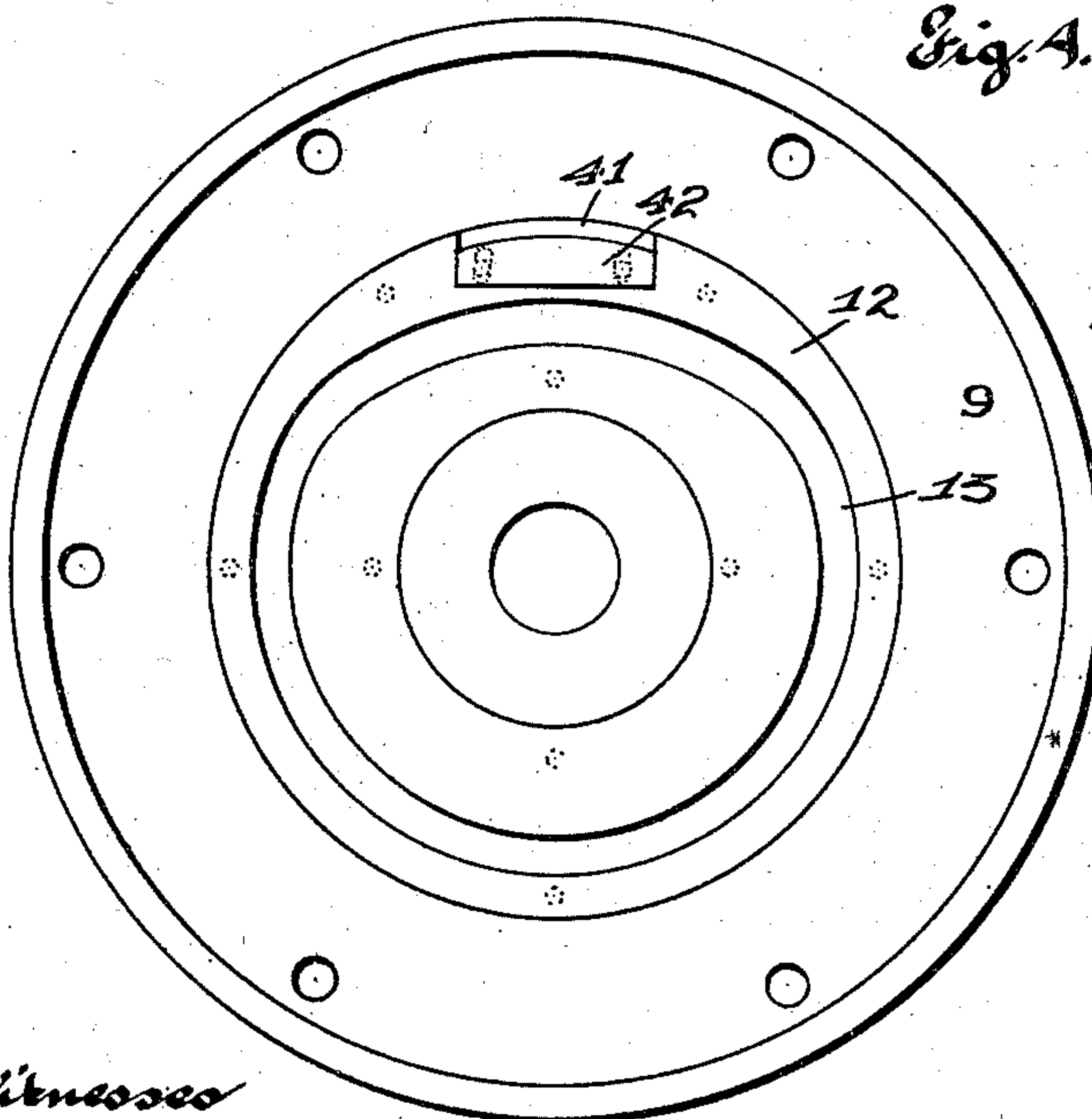
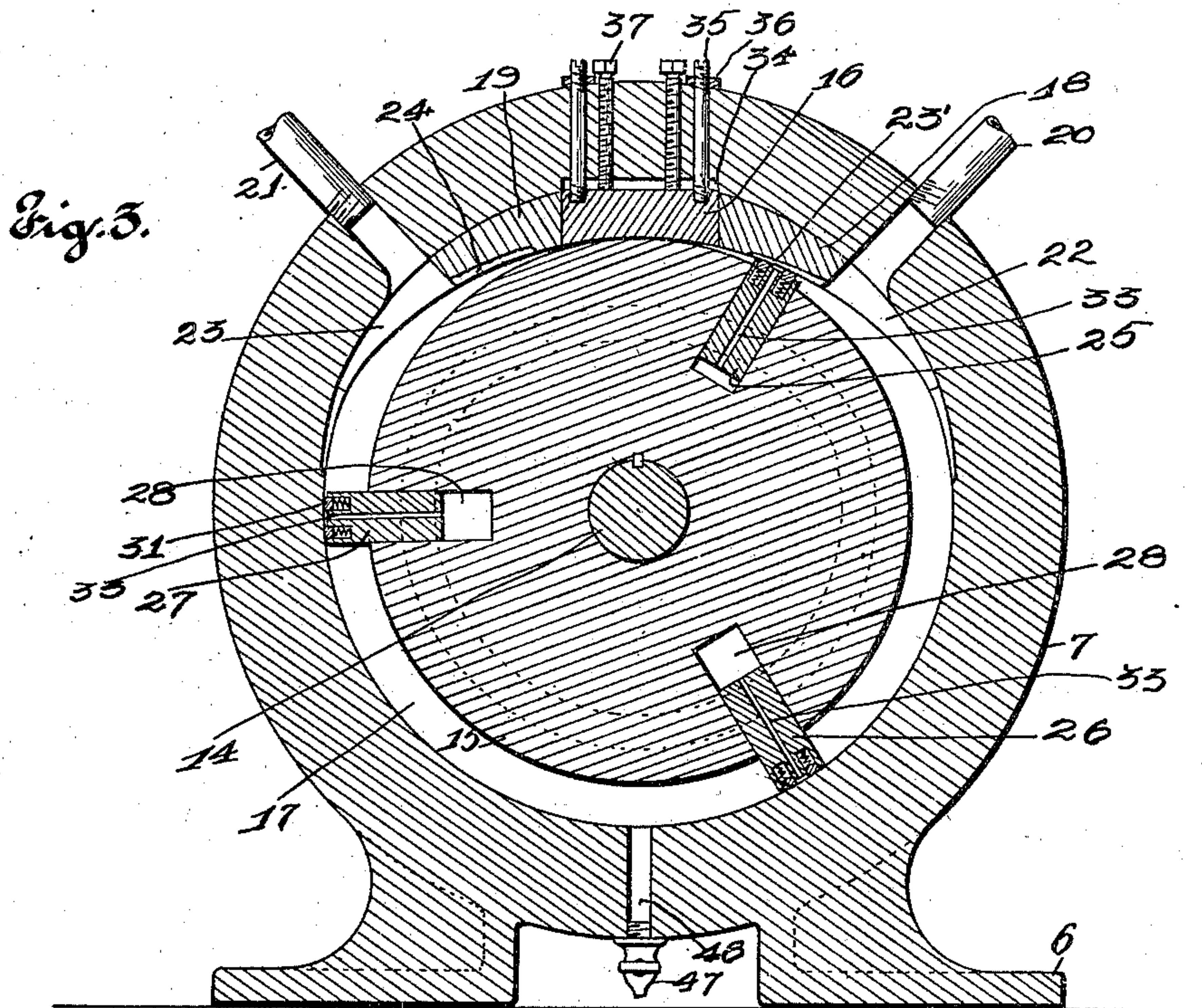
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# UNITED STATES PATENT OFFICE.

ALBIN C. EEK AND ADOLF F. CEDERQUIST, OF ST. LOUIS, MISSOURI.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 708,328, dated September 2, 1902.

Application filed February 18, 1902. Serial No. 94,648. (No model.)

*To all whom it may concern:*

Be it known that we, ALBIN C. EEK and ADOLF F. CEDERQUIST, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Rotary Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention relates to rotary engines; and it consists of the novel combination, construction, and arrangement of parts hereinafter shown, described, and claimed.

Our object is to construct a reversible rotary engine having no dead-center; and our invention consists of a suitable casing, said casing comprising a base, a ring mounted upon or formed integral with the base and forming the cylinder, plates attached to said ring and forming the cylinder-head, there being an eccentric cam-groove in the inner face of one of said plates and a concentric groove in the inner face of the other plate, a cam-plate adjustably mounted in said concentric groove and having an eccentric cam-groove matching the first cam-groove, a shaft mounted in bearings at the centers of said heads, a rotary piston mounted upon said shaft in said cylinder, the periphery of said piston being concentric, an abutment recessed into said ring and adjustably bearing against the periphery of said piston, the diameter of the opening in said ring being greater than the diameter of said piston, as required to form a steam-chamber around said piston, and said abutment serving to divide the steam-chamber, inclined approaches mounted in said ring, one upon each side of said abutment, and wing-valves mounted to reciprocate radially in slots in said piston and having trunnions extending into said eccentric cam-grooves, so as to move the valves in and out by the rotation of the piston.

Figure 1 is a view in elevation of a rotary engine constructed in accordance with the principles of our invention with one of the heads removed. Fig. 2 is a vertical central section of the engine. Fig. 3 is a sectional elevation on a plane parallel with Fig. 1. Fig. 4 is a view in elevation of the inner face of the head which is removed from Fig. 1. Fig. 5 is a sectional detail on a line 5 5 of Fig. 1.

Referring to the drawings in detail, the cas-

ing consists of the base 6, the ring 7, made integral with the base and forming the cylinder, the plates 8 and 9, attached to the ring or cylinder 7 and forming the cylinder-heads, there being an eccentric cam-groove 10 in the inner face of the plate 8 and a concentric groove 11 in the inner face of the plate 9, and the cam-plate 12, adjustably mounted in the groove 11 and having the second eccentric cam-groove 13 in its inner face and matching with the cam-groove 10. The shaft 14 is mounted in bearings at the centers of the heads 8 and 9, and the rotary piston 15 is mounted upon said shaft within the cylinder, the periphery of said piston being concentric. The abutment 16 is recessed into the ring 7 and adjustably mounted with its inner face bearing against the periphery of the piston 15. The diameter of the opening of the cylinder is greater than the diameter of the piston 15, thus forming the steam-chamber 17 around the piston in the cylinder, and the abutment 16 divides this chamber. The inclined approaches 18 and 19 are recessed into the ring 7, and the steam-pipes 20 and 21 are tapped into the ring and connected with the ports 22 and 23, leading through said ring and through said abutment to the steam-chamber 17. Small ports 23' and 24 extend from the ports 22 and 23, respectively, along the inner faces of the approaches 18 and 19 to the abutment 16. The wing-valves 25, 26, and 27 are mounted to slide radially in the notches 28, formed in the piston 15. Trunnions or studs 29 extend outwardly from the valves 25, 26, and 27 into the eccentric cam-grooves 10 and 13, and rollers 30 are mounted upon said trunnions in said grooves, so that the valves will be reciprocated out and in by the rotation of the piston, as required to hold the outer edges of the valve against the inner surfaces of the cylinder 7. Grooves are cut in the outer edge and each end of each of the valves, and the packing-strips are mounted in said grooves, said packing-strips being pressed yieldingly outwardly by the springs 32. The packing-strips 31 are right-angled bars, there being one for each outer corner of each valve, said strips overlapping on the outer edge of the valve. A small port 33 runs through the center of each of the valves, so as to let air or steam out of and into the



notches 28 behind the valves. The abutment 16 is mounted in a recess 34. The studs 35 are rigidly fixed in the abutment 16 and project outwardly through the ring or cylinder 7, and nuts 36 on the outer ends of said studs serve to draw the abutment outwardly away from the piston. The screws 37 are screw-seated through the cylinder 7, with their points in engagement with the abutment, as required to press the abutment inwardly. The screws 35 are loosened until the abutment is properly adjusted against the periphery of the piston. Then the screws 37 are tightened to hold the abutment rigidly in position.

The cam-plate 12 is mounted in the recess 11 in the inner face of the head 9, and the studs 38 are rigidly fixed in said cam-plate and extend outwardly through the head 9, and nuts 39 upon the outer ends of said studs serve to draw the cam-plate outwardly. The set-screws 40 are screw-seated through the head 9, with their points engaging the cam-plate 20, as required to push the cam-plate inwardly against the piston. The screws 38 are loosened and the screws 40 are tightened until the proper adjustment of the cam-plate is obtained, and then the nuts 39 are tightened to hold the cam-plate rigidly in position. A recess 41 is formed in the inner face of the cam-plate 12 to allow the abutment 16 to move downwardly as the periphery of the piston wears away, and a packing-plate 42 is mounted in said recess 41. The studs 43 are fixed in the plate 42 and extend outwardly through the slots 44 in the head 9, and the nuts 45 upon the outer ends of said studs serve as a means of adjusting the plate 42 in the recess 41. A drain 46 leads from the steam-chamber 17 downwardly through the cylinder, and a drain-cock 47 controls the drain.

The operation is as follows: If the steam-pipe 21 is closed to the boiler-pressure and open to the air and the pipe 20 is open to the boiler-pressure, steam will be admitted into the right-hand side of the steam-chamber 17 and press against the wing-valve 26, thus causing the cylinder to rotate in the direction indicated by the arrow in Fig. 1. When the steam-pressure comes in through the pipe 21, the pipe 20 is closed to the steam-pressure and open to the air, and the exhaust goes out through the pipe 20, and when the steam-pressure comes in through the pipe 20 said pipe 21 is closed to the steam-pressure and open to the air, and the exhaust goes out through the pipe 21. When the valve 25 is in the position shown, there is a vacuum formed between the valve and the abutment 16, and the small port 23 admits steam into this vacuum-chamber. When it is desired to reverse the engine, the steam-pipe 21 is opened and the steam-pipe 20 is closed. It is obvious that the two inlet-pipes 20 and 21 and the three valves 25, 26, and 27 be no dead-center, as there is no position in which the

valve can be set that will not provide an expansion-chamber and drive the piston one way or the other.

We claim—

1. In a rotary engine, a base; a ring mounted upon and formed integral with the base to form a cylinder; plates attached one to each side of said cylinder and forming the cylinder-heads, there being an eccentric cam-groove in the inner face of one of said cylinder-heads, and a concentric groove in the inner face of the other cylinder-head; a cam-plate adjustably mounted in said concentric groove and having an eccentric cam-groove matching the first cam-groove; a shaft mounted in bearings through the centers of said cylinder-heads; a rotary piston mounted upon the shaft in the cylinder and having a concentric periphery; an abutment recessed into said ring and adjustably bearing against the periphery of said piston; inclined approaches mounted in said ring one upon each side of said abutment; wing-valves mounted to reciprocate radially in slots in said piston; and trunnions extending from said wing-valves into said cam-grooves, substantially as specified.

2. In a rotary engine, a cylinder; a shaft mounted in the cylinder; a piston upon the shaft in the cylinder, said piston having a concentric periphery; wing-valves mounted to slide radially in the piston; an abutment 16 recessed into the cylinder to engage the periphery of the piston, said abutment being adjustably mounted by means of the studs 35 rigidly fixed in the abutment and projecting outwardly through the cylinder; the nuts 36 on the outer ends of said studs to draw the abutment outwardly; and the screws 37 screw-seated through the cylinder with their points in engagement with the abutment to press the abutment inwardly, substantially as specified.

3. In a rotary engine, a cylinder; a shaft mounted in the cylinder; a piston upon the shaft in the cylinder, said piston having a concentric periphery; wing-valves mounted to slide radially in the piston; an abutment 16 recessed into the cylinder to engage the periphery of the piston, said abutment being adjustably mounted by means of the studs 35 rigidly fixed in the abutment and projecting outwardly through the cylinder; the nuts 36 on the outer ends of said studs to draw the abutment outwardly; the screws 37 screw-seated through the cylinder with their points in engagement with the abutment to press the abutment inwardly; and the inclined approaches 18 and 19 mounted one on each side of the abutment, there being ports 22 and 23 leading through the cylinder and through the approaches to the steam-chamber, and there being ports 23' and 24 leading from said ports 22 and 23 to the abutment, substantially as specified.

4. A rotary engine comprising a base; a ring mounted upon and formed integral with the



base and forming a cylinder; plates attached to said ring and forming cylinder-heads, there being an eccentric cam-groove in the inner face of one of the cylinder-heads; and a concentric cam-groove in the inner face of the other cylinder-head; a cam-plate adjustably mounted in said concentric groove and having an eccentric cam-groove matching the first cam-groove; a shaft mounted in bearings at the centers of the cylinder-heads; a rotary piston mounted upon the shaft in the cylinder, the periphery of the piston being concentric; an abutment recessed into said ring and adjustably bearing against the periphery of the piston; inclined approaches mounted in the ring one upon each side of said abutment; wing-valves mounted to reciprocate radially in slots in said piston and having trunnions extending into said eccentric cam-grooves; the studs 38 rigidly fixed in the cam-plate and extending outwardly through the head of the cylinder; the nuts 39 upon the outer ends of said studs to draw the cam-plate outwardly; and the set-screws 40 screw-seated through the end 9 with their points engaging the cam-plate, substantially as specified.

5. In a rotary engine, the cylinder-head 9 having a concentric groove in its inner face; the cam-plate 12 adjustably mounted in said groove, there being a recess 41 formed in the inner face of said cam-plate; a concen-

tric piston mounted beside said cylinder-head and the cam-plate; an adjustable abutment mounted to engage the periphery of said piston and move downwardly into said recess 41; the packing-plate 42 mounted in said recess 41; the studs 43 fixed in the plate 42 and extending outwardly through the slots in the cylinder-head; and nuts upon the outer ends of said studs for adjusting said plate 42, substantially as specified.

6. In a rotary engine, a concentric piston; a wing-valve mounted to slide radially in recesses in the piston, there being grooves in the outer edge and each end of said valve; packing-strips mounted in said grooves, said packing-strips being right-angled bars mounted parallel in the outer edge of the valve, the end of one bar extending down on one end of the valve, and the end of the other bar extending down on the other end of the valve; and springs for pressing said packing-strips yieldingly outwardly, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

ALBIN C. EEK.

ADOLF F. CEDERQUIST.

Witnesses:

ALFRED A. EICKS,

M. G. IRION.