J. JAGERSBERGER & A. ZEMANN.

ROTARY ENGINE.

APPLICATION FILED MAR. 12, 1909.

947,430.

Patented Jan. 25, 1910.

5 SHEETS—SHEET 1.

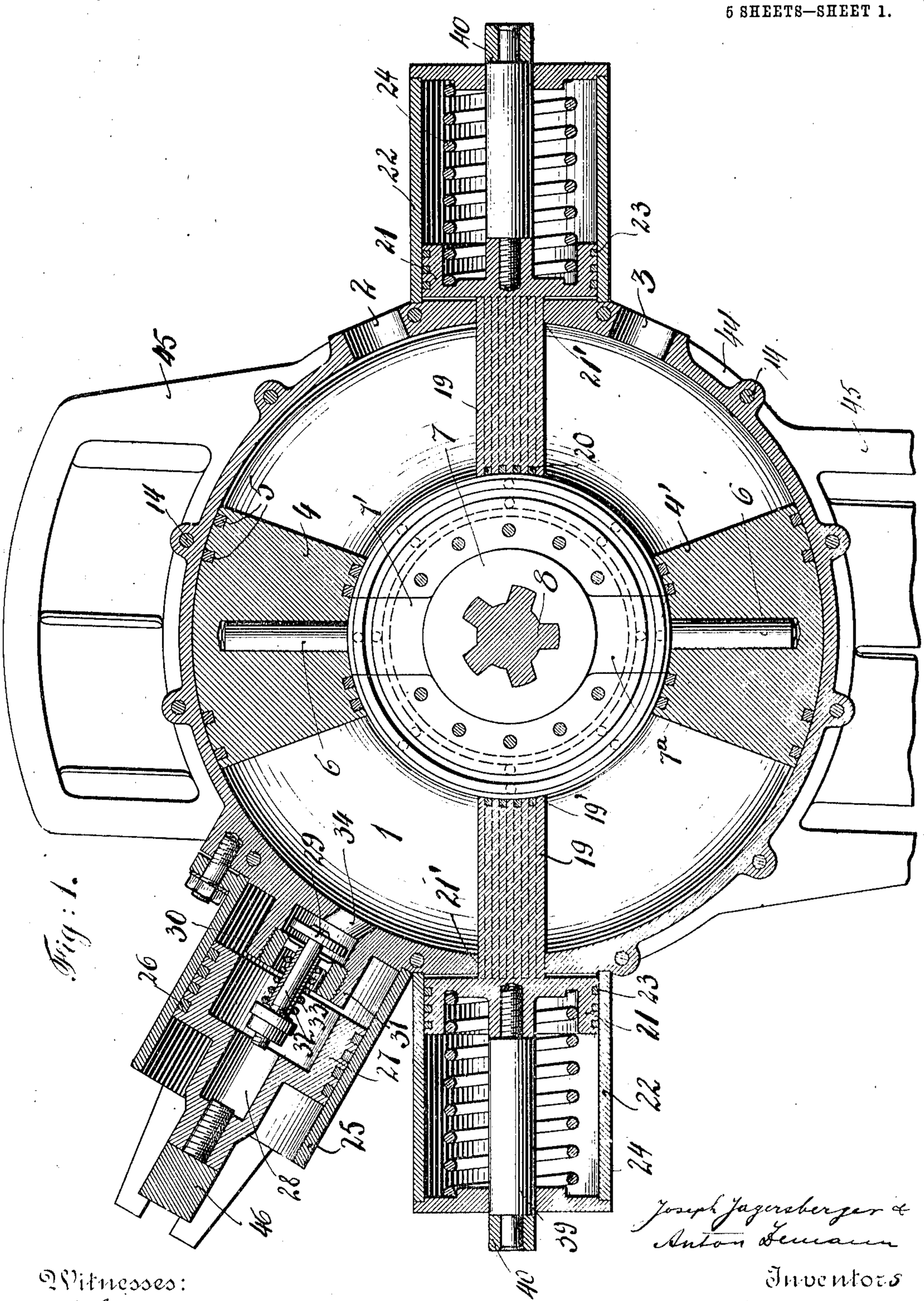

Fig: 1.

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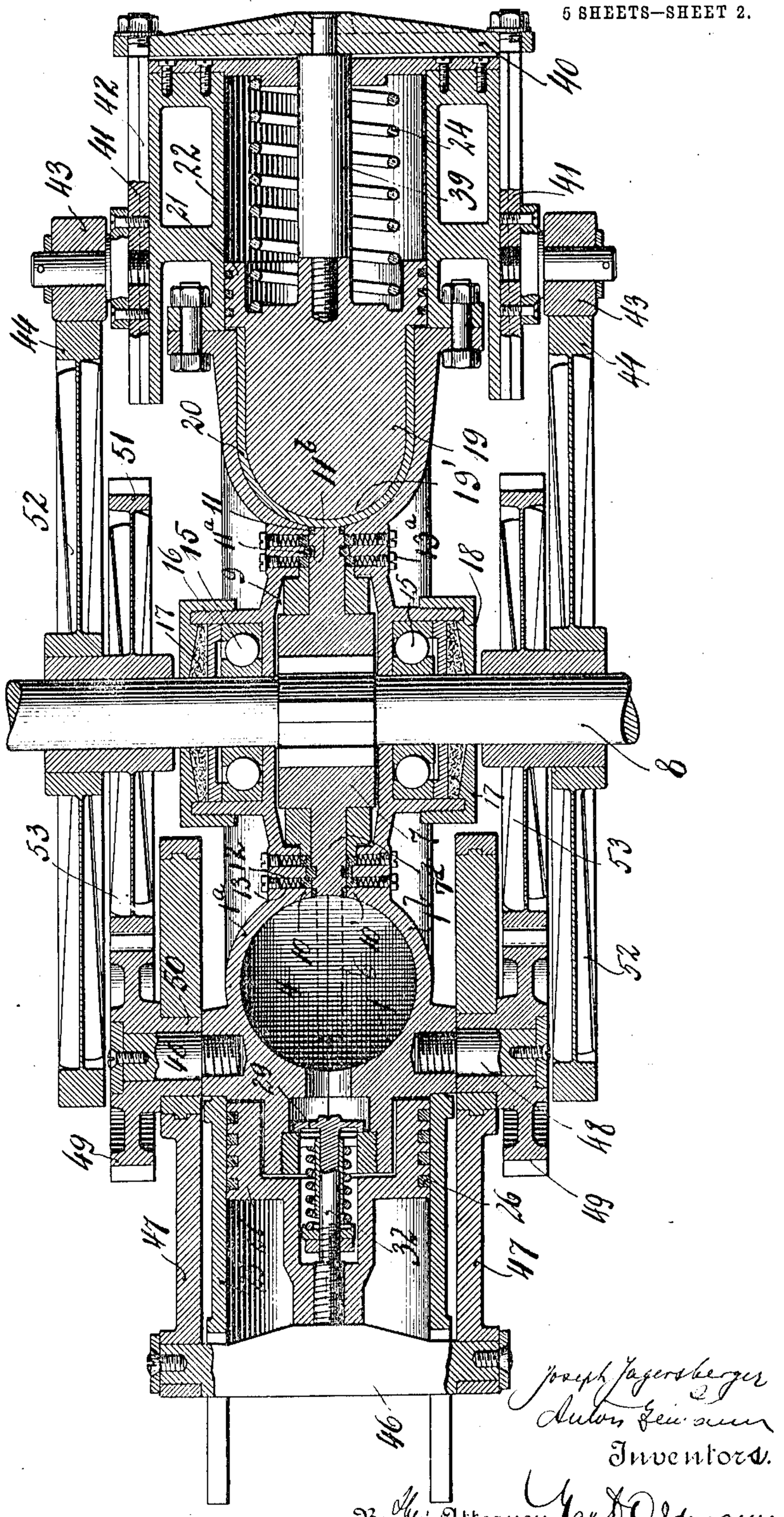

Fig. 2.

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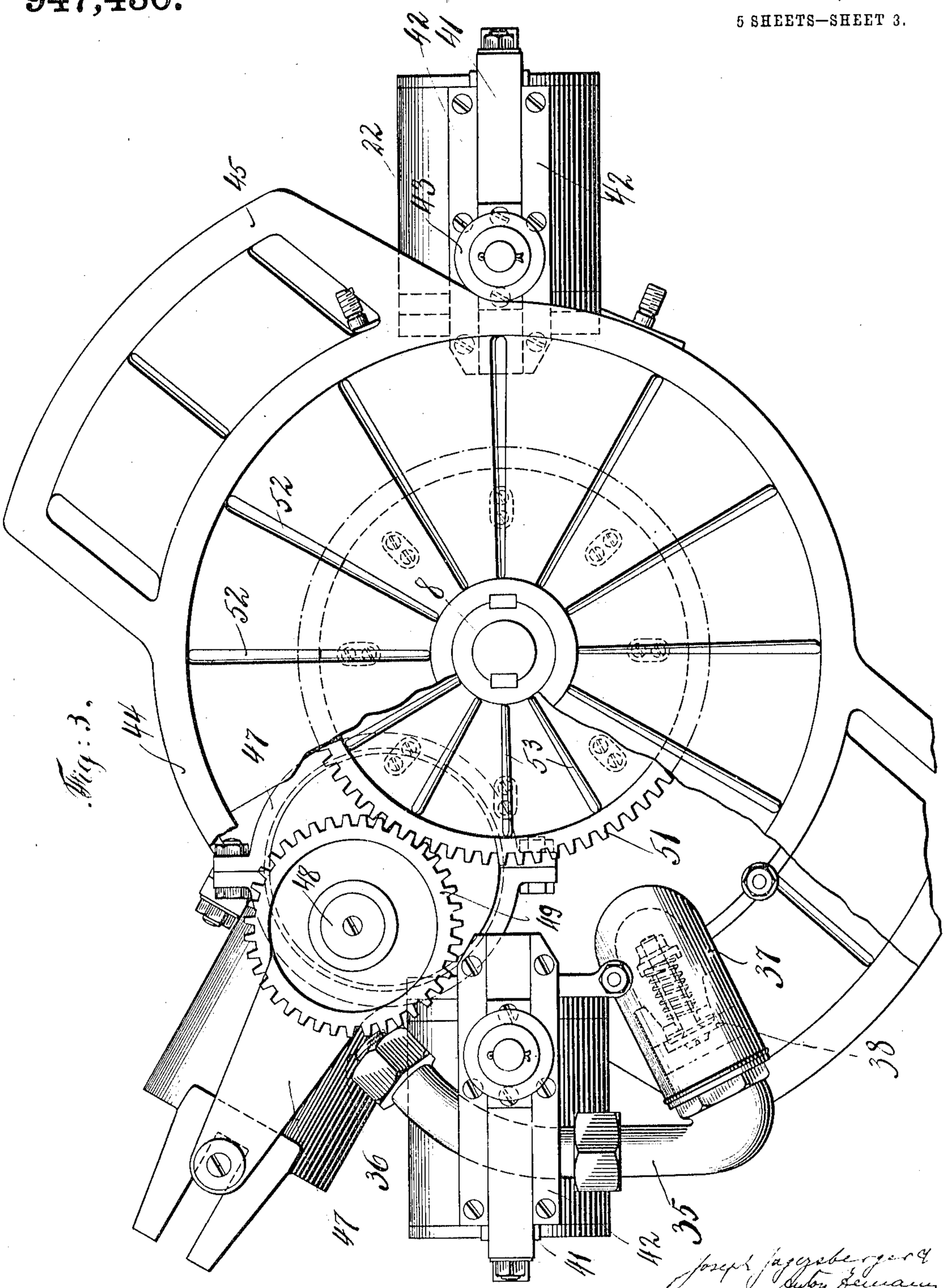

Fig. 3.

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5 SHEETS—SHEET 4.

Fig: 4.

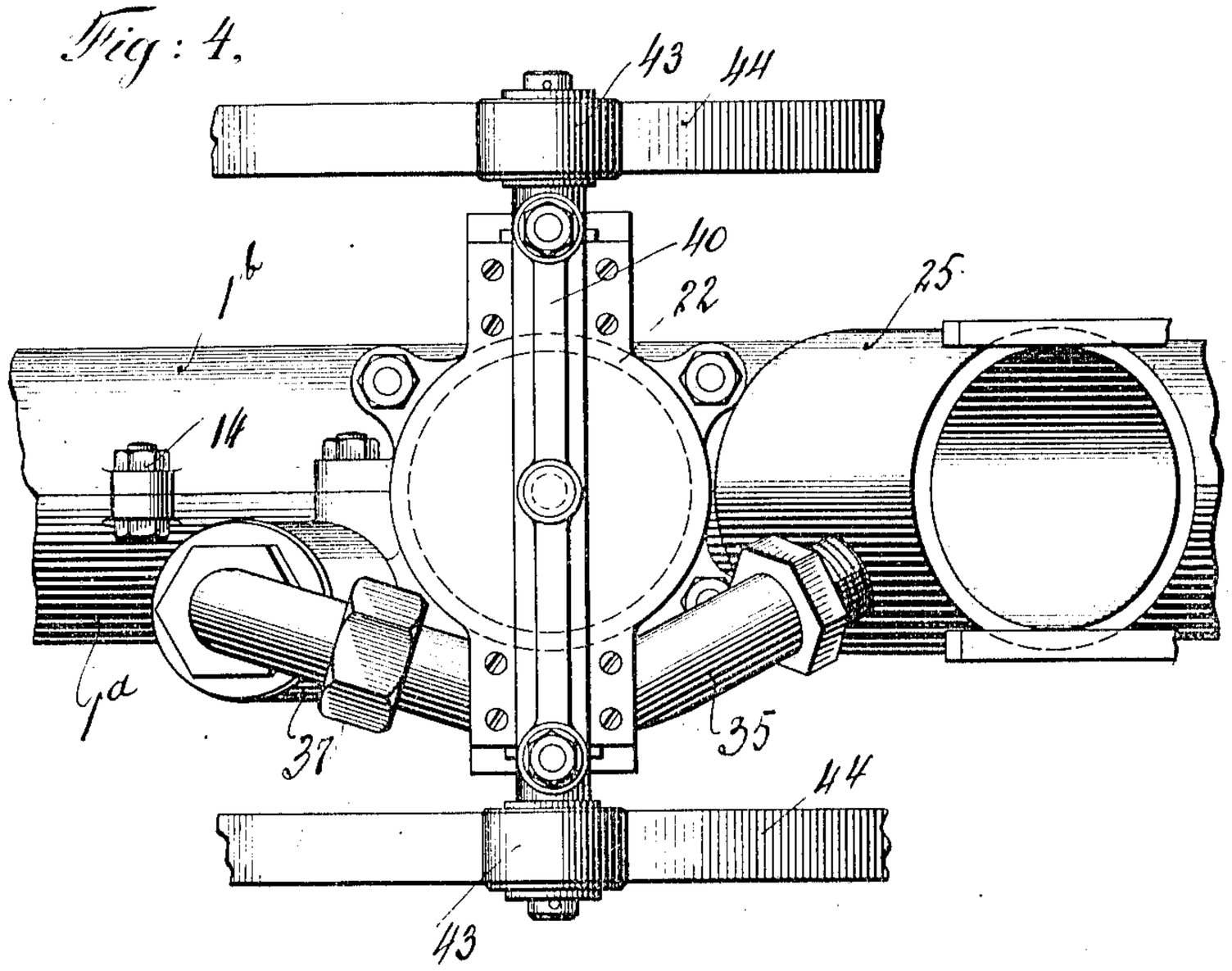
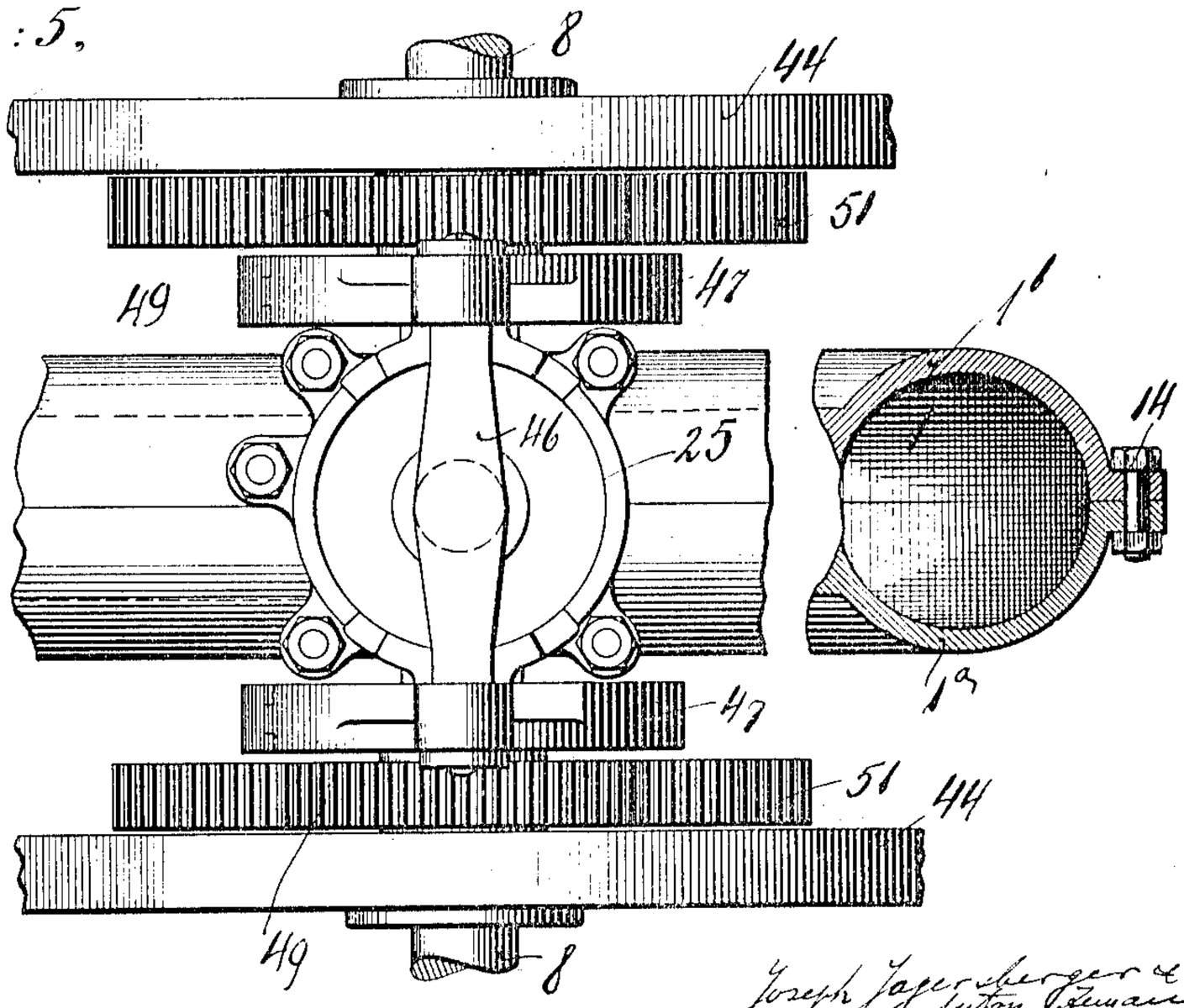


Fig: 5.



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5 SHEETS—SHEET 5.

Fig: 6.

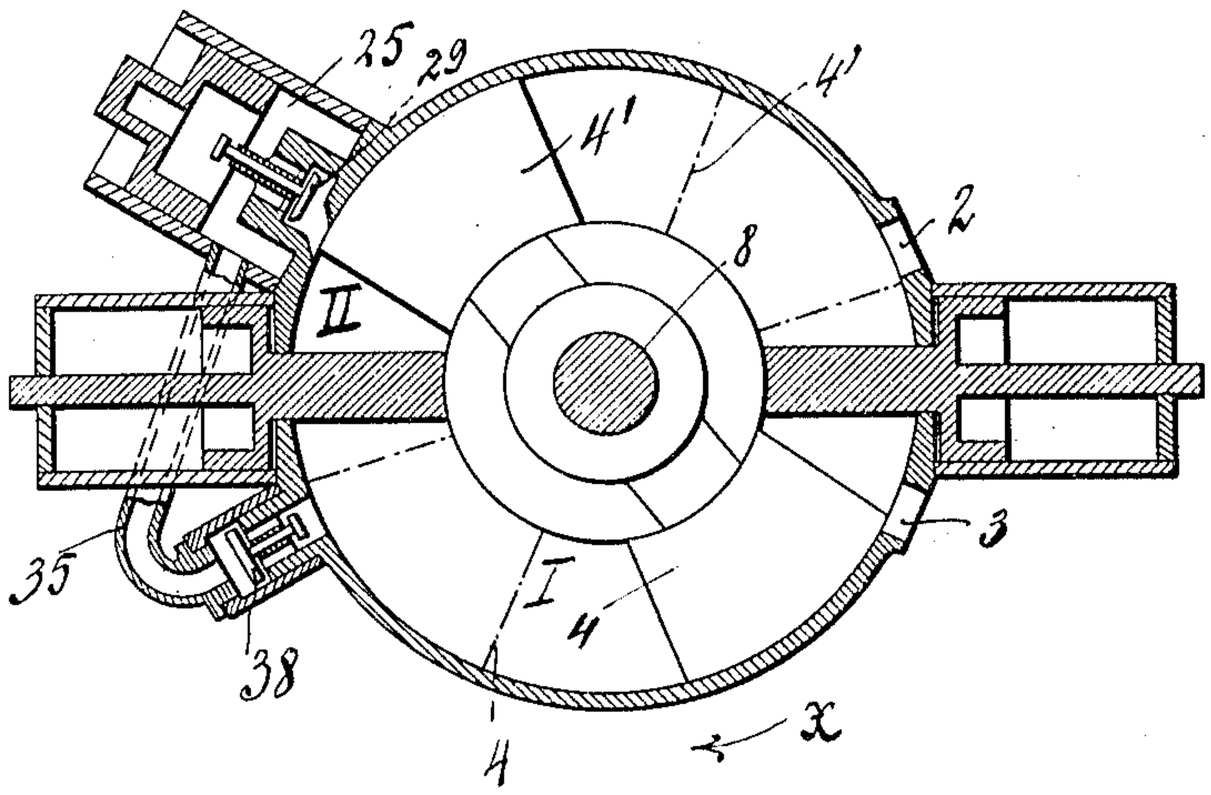
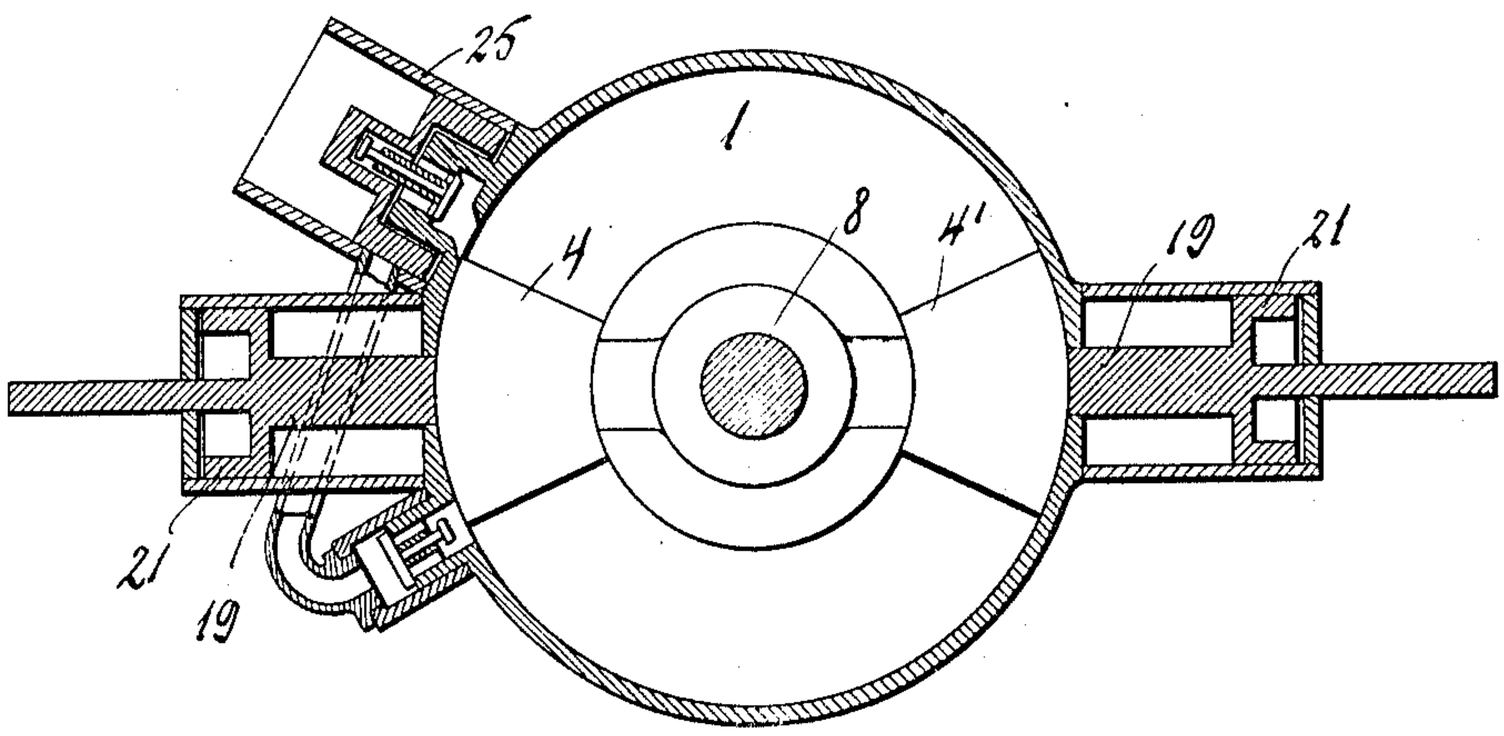


Fig: 7.



Witnesses:

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UNITED STATES PATENT OFFICE.

JOSEPH JAGERSBERGER AND ANTON ZEMANN, OF NEW YORK, N. Y.

ROTARY ENGINE.

947,430. Specification of Letters Patent. Patented Jan. 25, 1910.

Application filed March 12, 1909. Serial No. 482,897.

To all whom it may concern:

Be it known that we, JOSEPH JAGERSBERGER and ANTON ZEMANN, the former a citizen of the United States and the latter a subject of the Emperor of Austria-Hungary, both residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

The present invention pertains to rotary engines and particularly to explosion engines, and has for its chief object to greatly simplify the construction thereof.

Another object of the present invention is to increase the efficiency of the engine which is accomplished by providing a motor having two or more rotary pistons, of which each will have a double function, viz: suction at one side, compression on the other, and explosion at one side, discharge on the other, the functions of one piston alternating with those of the succeeding piston.

Our invention also pertains to the particular arrangement, novel construction and combination of parts which will be hereafter fully specified.

An explosion engine of the construction shown and specified in the present application can be advantageously used with automobiles and airships or flying machines where one of the chief requirements is to reduce the number of elements and the weight of the engine to a minimum.

While, as stated, our invention principally pertains to engines, the driving fluid of which is gas, oil or other explosive mixtures, it is understood that the same can be also used for steam and hydraulic power, in which case, accordingly some slight modifications of the construction will be necessary.

To make our invention more clear the same is illustrated in the accompanying drawing, in which similar reference characters denote corresponding parts and in which—

Figure 1 is a central cross section of the engine; Fig. 2 a section on line 2—2 of Fig. 1; Fig. 3 a side view of the engine; Figs. 4 and 5 end views showing details of construction, and Figs. 6 and 7 diagrams illustrating the operation of the engine.

The engine consists of a casing composed of two dish-shaped sections 1^a, 1^b (Fig. 2), in which an annular space 1 is formed constituting the cylinder, and which is provided with a discharge 2 and a suction opening 3 (Fig. 1). Working in the annular cylinder are pistons 4, 4′ having a circular cross section and radially extending end surfaces (Figs. 1 and 2). There may be any number of such pistons, but in the present example only two are shown. These pistons which are tightly fitted in the cylinder by circumferential packing rings 5 are secured to radial arms 6 projecting from a disk 7 which is keyed upon the driven shaft 8 and which is inclosed in the hollow sleeve-shaped central portion or socket 9 of the casing 1^a, 1^b. At the inner or bottom wall of the annular cylinder 1 the opposite edges 10, 10′ of the sections 1^a, 1^b of the casings are separated from each other to form when the sections are joined an annular space in which the outer reduced portion 7^a of the disk 7 that carries the pistons 4 is adapted to revolve. At its ends this reduced portion 7^a is provided with circumferential packing rings 11 and face rings 11^a which are adapted to tighten the crevices between the portion 7^a of the disk 7 and the inner edges 10, 10′ of the sections 1^a and 1^b. The face rings 11^a are pressed down in the grooves 11^b formed in the faces or sides of the disk 7^a by springs 12 arranged in lateral bores 13 in the sections 1^a and 1^b and adjustable by means of screw bolts 13^a. The sections 1^a and 1^b forming the casing and joined by screw bolts 14 (Figs. 1—4) are mounted upon the shaft by ball bearings 15 provided in the lateral extensions or bushings 16 of the socket 9 that contain packings 17 and are closed to the outside by caps 18.

The annular cylinder according to the number of pistons employed is divided into a number of compartments, (in the present example two) by means of radially movable slides or closers 19, the inner ends 19′ of which are semicircularly curved and which carry a number of horseshoe-shaped elastic packing bands 20. These slides 19 project through slots 21^1 in the casing 1^a, 1^b and are attached to or integral with pistons 21 which work in cylindrical casings 22 secured to the casing 1^a, 1^b of the engine. The pistons carry packing rings 23 and by the action of springs 24 tend to normally occupy the inner position, in which the slides are projected inward dividing the cylinder 1 into tightly closed up compartments I and II (Fig. 6). The slides are diametrically opposed to one

another and are caused to open during a certain period by a mechanism that will be hereafter fully specified.

Attached to the casing 1^a, 1^b of the motor is a compressor consisting of a cylindrical receptacle 25. This receptacle is provided with double valves, one formed as a hollow piston 27 having packing rings 26 and an outwardly projecting reduced hollow portion 28, and the other being an ordinary back pressure valve 29, the seat 30 of which is formed in a casing 31 projecting from the casing 1^a, 1^b of the motor. This valve 29 has a guide rod 32 projecting toward the hollow extension 28 of the piston valve 27 and is normally held upon its seat by a spring 33. The receptacle 25 communicates on one side with one of the compartments of the annular cylinder 1 through a passage 34. With the other compartment of said cylinder 1 the receptacle 25 communicates through a pipe 35 which at one end terminates in the inner end of the receptacle, as at 36, and at the other into a valve casing 37 secured to the casing 1^a, 1^b and carrying a back pressure valve 38 (Fig. 3). This valve casing is open to the annular cylinder 1.

The piston valve 27 is operated by a mechanism to be hereafter specified, in such a manner that during a certain period it will be caused to move outward, establishing communication between one of the compartments of the cylinder 1 and receptacle 25 through valve 38 and pipe 35 and allowing the fluid to be compressed into the receptacle 25 and hollow spaces of the piston 27. When the movement of the piston 27 is reversed the compressed fluid will cause the valve 29 to open, whereupon the compressed fluid will enter the other compartment of the cylinder 1.

From the diagrams Figs. 6 and 7 the mode of operation of the engine will be understood. Assuming that the pistons are revolving in the direction of the arrow *x*, then one of the pistons, say piston 4, in the position shown in full lines in Fig. 6, will at its rear just begin to draw in the driving fluid through opening 3 from a suitable reservoir (not shown). Its forward end, on the other hand, will compress the fluid drawn into the cylinder by the preceding piston 4′. When the piston 4 reaches the position indicated by dotted lines the fluid will be sufficiently compressed to raise the valve 38 from its seat, and as the compression action of the piston 4 continues, the fluid will be pressed into the receptacle 25 through the open valve 38 and pipe 35. Simultaneously the piston valve 27 of the compressor begins its outward stroke and establishes communication between the compressor and the compartment I of the annular cylinder 1. Previous to this piston 4′ will have reached the position shown in full lines in Fig. 7. The compressed fluid now contained in the receptacle 25 will by the inward movement of the piston valve 27 be still more compressed and finally cause by its pressure the opening of valve 29 and rush into the compartment II of the cylinder 1 at the rear of the piston 4, where by a suitable igniter (not shown) the ignition and the explosion of the fluid will occur. This will impart to the pistons a fresh impulse. As the piston 4 continues to revolve its forward end will expel through the discharge 2 the burned gases of the previous explosion that had taken place at the rear of the piston 4′. Then the piston 4′ begins the functions of the piston 4 and vice versa. The double function of each of the pistons is rendered possible by the provision of the radially operating slides 19 which as stated divide the annular cylinder 1 into separate tightly closed up compartments. At the moment when, during the revolution of the pistons, the same approach the radial slides the latter are automatically moved outward to clear the path of the revolving pistons and thus do not hinder the continuous revolution of the latter. Immediately upon the passage of the latter from one compartment into the other the slides are vehemently thrust inward to again close up the compartments (Fig. 7).

We will now proceed with the description of the mechanisms which are designed to automatically operate the radial slides and the valves of the compressor.

Secured to piston rods 39 which project outward from the pistons 21 carrying the closers 19 are cross bars 40, to the ends of which are secured rods 41 sliding in guide pieces 42. These rods carry rollers 43 which are adapted to coöperate with cam disks 44 keyed upon the driven shaft 8. The projections 45 forming the cam portions are so admeasured and shaped that at a certain moment when the pistons 4, 4′ approach the slides, they will meet the rollers 43 and begin to move the latter and consequently the slides 19 outward and immediately upon the passage of the said pistons from one compartment into the other causes the slides to be vehemently thrust inward.

The piston valve 27 of the compressor is secured to a cross bar 46, the ends of which carry eccentrics 47. Keyed upon spindles 48 borne in the casing 1^a, 1^b are toothed wheels 49, to the laterally extended nave 50 of which the eccentrics 47 are keyed. Meshing with these toothed wheels are wheels 51 keyed on the shaft 8 of the motor. The eccentricity is so calculated that at the moment when one of the pistons 4, 4′ approaches the inlet valve 38 of the compressor, the piston valve 27 of the latter will begin its outward stroke to establish communication between the compartment I

and the receptacle 25, and as soon as the same piston approaches the passage 34 of the compressor the said piston valve 27 will begin its reverse stroke, to still more compress the fluid now contained therein and to force the highly compressed fluid into the compartment II of the cylinder 1 at the rear of the revolving piston, in which it will be caused to explode.

To provide for an efficient cooling of the engine, the cam disks 44 designed for the operation of the slides and the gears 51 are formed with ventilating blades 52, 53 which while revolving with high speed will draw fresh air to the engine, thereby cooling the latter.

What we claim and desire to secure by Letters Patent is:—

1. In a rotary engine, the combination with the shaft to be driven, of an annular cylinder, pistons secured to the shaft and revolving in said cylinder, radial slides dividing the cylinder into tightly closed up compartments and adapted to open to permit the passage of the pistons from one compartment into the other, and a compressor to receive the compressed fluid from one compartment and to discharge the same into the other.

2. In a rotary engine, the combination with the shaft to be driven, of an annular cylinder, pistons secured to the shaft and revolving in said cylinder, radial slides dividing the cylinder into tightly closed up compartments and adapted to open to permit the passage of the pistons from one compartment into the other, means for automatically operating said slides, and a compressor to receive the compressed fluid from one compartment and to discharge the same into the other.

3. In a rotary engine, an annular cylinder, pistons revolving therein, radially reciprocating slides dividing said cylinder into tightly closed up compartments and adapted to open to allow the passage of the pistons from one compartment into the other, a compressor and means for automatically operating said compressor to cause the fluid in one compartment to be compressed into the compressor, and to be discharged from the latter into the other compartment.

4. In a rotary engine, an annular cylinder, pistons revolving therein, radially reciprocating slides dividing said cylinder into tightly closed up compartments and adapted to open to allow the passage of the pistons from one compartment into the other, a compressor directly communicating with one of the compartments and consisting of a receptacle, a piston valve, a back pressure valve, a valve-controlled connection between said receptacle and another compartment of the cylinder, and means for automatically operating the said piston valve to cause the fluid in one compartment to be compressed into the compressor and to be discharged from the latter into the other compartment.

5. In a rotary engine, the combination with the shaft to be driven, of an annular cylinder, pistons revolving therein, radially reciprocating slides dividing said cylinder into tightly closed up compartments, a compressor directly communicating with one of the compartments and consisting of a receptacle, a piston valve working in said receptacle, a back pressure valve, a valve-controlled connection between the receptacle and another compartment of the cylinder, and means for operating the piston valve of said compressor.

6. In a rotary engine, the combination with the shaft, of an annular cylinder having recesses in its outer wall, pistons working therein, spring actuated slides projecting through the recesses of the cylinder and dividing the latter into closed up compartments and adapted to open to allow the passage of the pistons from one compartment into the other, and a compressor to receive the compressed fluid from one compartment and to discharge the same into the other.

7. In a rotary engine, the combination with the shaft, of an annular cylinder having recesses in its outer wall, pistons working therein, spring actuated slides projecting through the recesses of the cylinder and dividing the latter into closed up compartments and adapted to open to allow the passage of the pistons from one compartment into the other, a compressor to receive the compressed fluid from one compartment and to discharge the same into the other, and means for automatically operating said compressor.

8. In a rotary engine, the combination with the shaft, of an annular cylinder having recesses in its outer wall, pistons revolving therein, spring actuated slides projecting through the outer recesses of the cylinder and dividing the latter into closed up compartments and adapted to open to allow the passage of the pistons from one compartment into the other, means for automatically operating said slides, a compressor to receive the compressed fluid from one compartment and to discharge the same into the other, and means for automatically operating said compressor.

9. In a rotary engine, the combination with the shaft, of an annular cylinder having recesses in its outer wall, pistons revolving therein, spring actuated slides slidably borne in the outer recesses of the cylinder and dividing the latter into closed up compartments, casings secured to the cylinder, pistons working therein, cross bars secured to said pistons, rods carried by said bars, rollers at the free ends of said rods, cam disks secured to the above-named shaft

and coöperating with said rollers, and causing the slides to open to let the pistons pass from one compartment into the other.

10. In a rotary engine, the combination with the shaft to be driven, of an annular cylinder, pistons revolving therein, radially reciprocating slides dividing said cylinder into tightly closed up compartments, a compressor directly communicating with one of the compartments and consisting of a receptacle, a piston valve working in said receptacle, a back pressure valve, a valve-controlled connection between the receptacle and another compartment of the cylinder, gears driven from the above named shaft, and eccentrics carried by the piston valve and connected with the gears to impart a reciprocating movement to the piston valve.

11. In a rotary engine, the combination with the shaft to be driven, of an annular cylinder, pistons secured to said shaft and revolving in said cylinder, radially reciprocating slides dividing said cylinder into tightly closed up compartments, a compressor to receive the fluid from one compartment and compress and discharge the same into the other, cam disks secured to the shaft for operating the slides, gears secured to the shaft for operating the compressor and ventilating blades formed on said cam disks and gears to cool the engine.

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

JOSEPH JAGERSBERGER.
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Witnesses:
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