

No. 708,129.

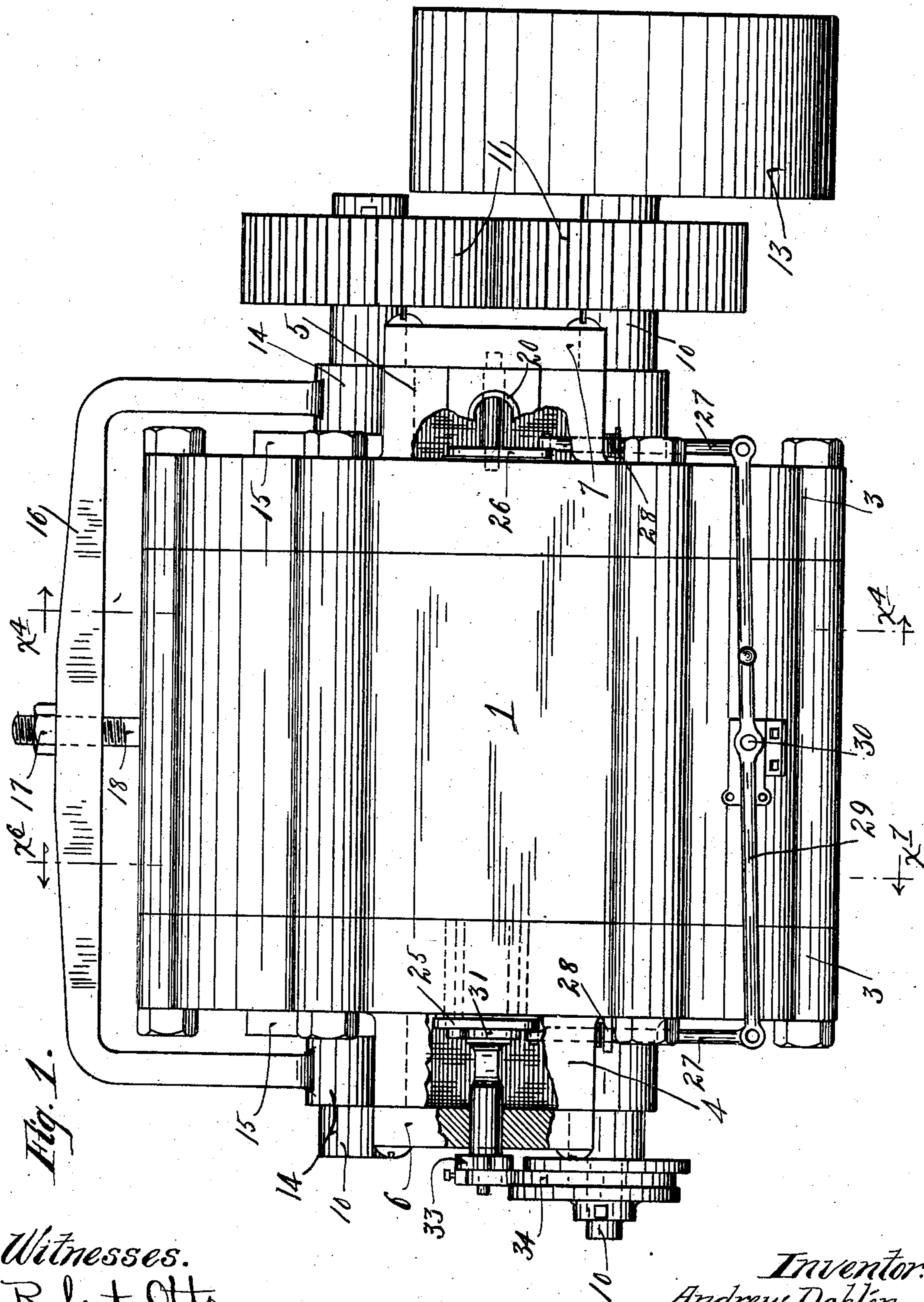
Patented Sept. 2, 1902.

**A. DAHLÉN.
ROTARY ENGINE.**

(Application filed Aug. 2, 1901.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses.
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Harry Kilgore.

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Fig. 2.

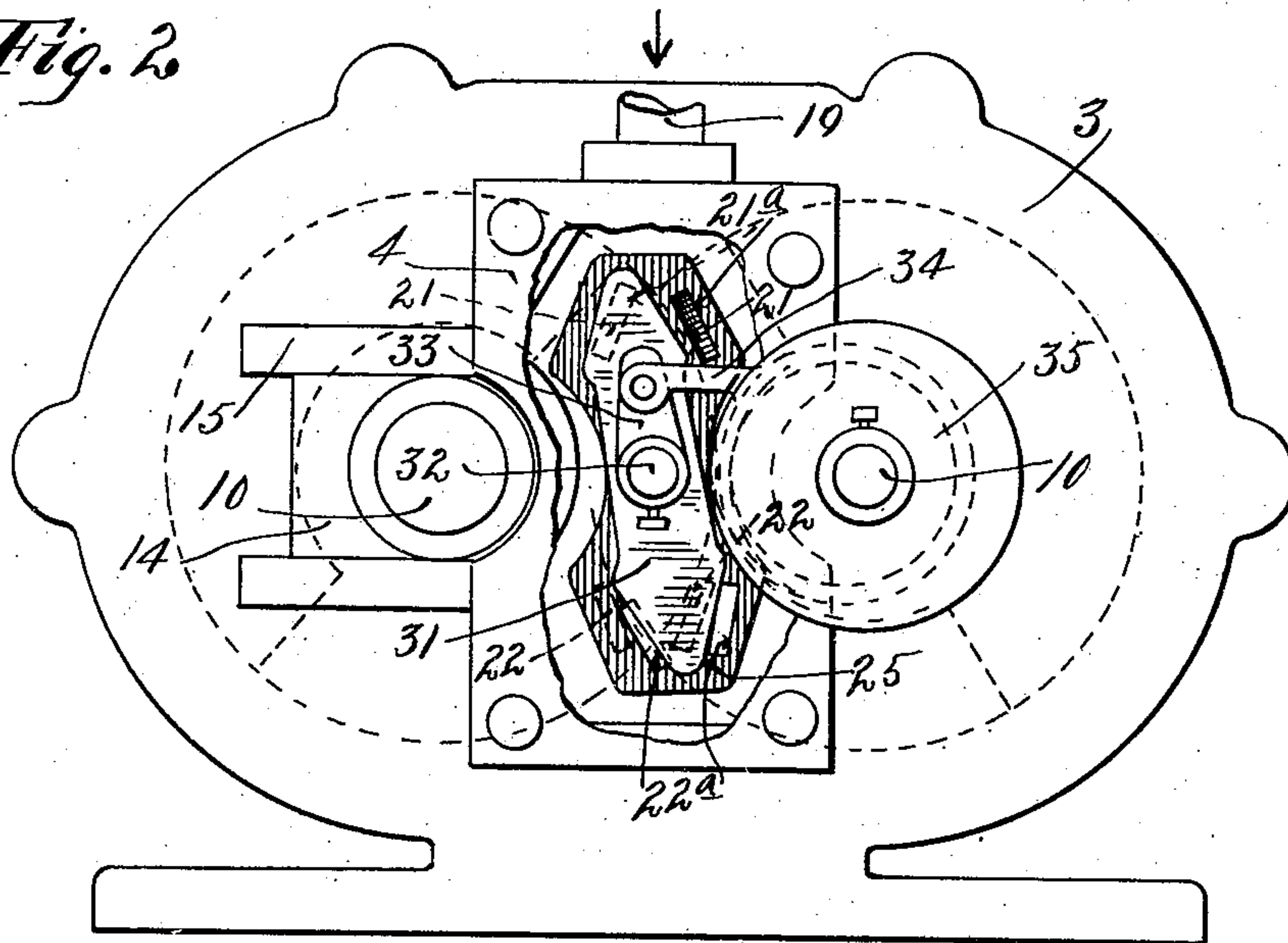
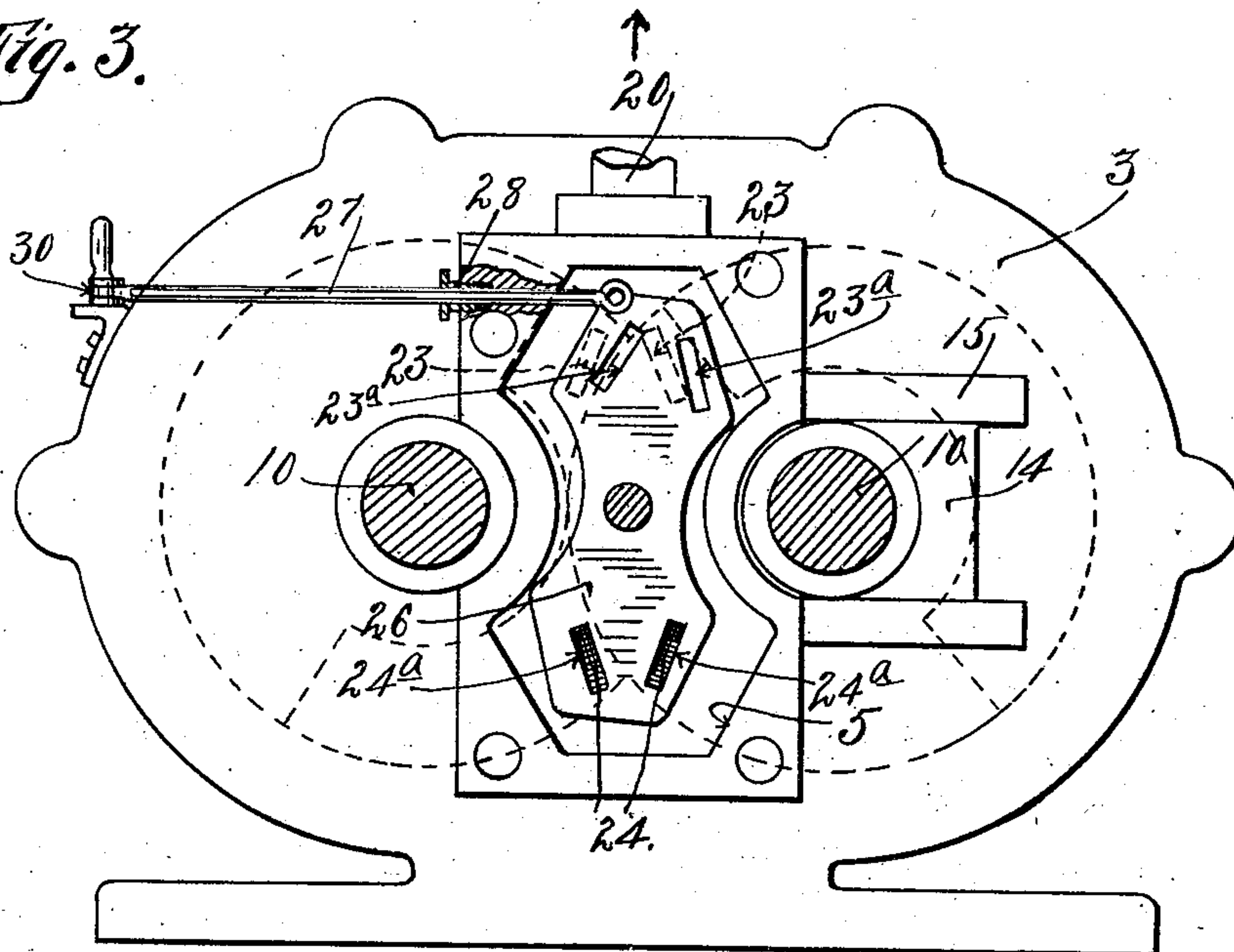


Fig. 3.



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Fig. 4.

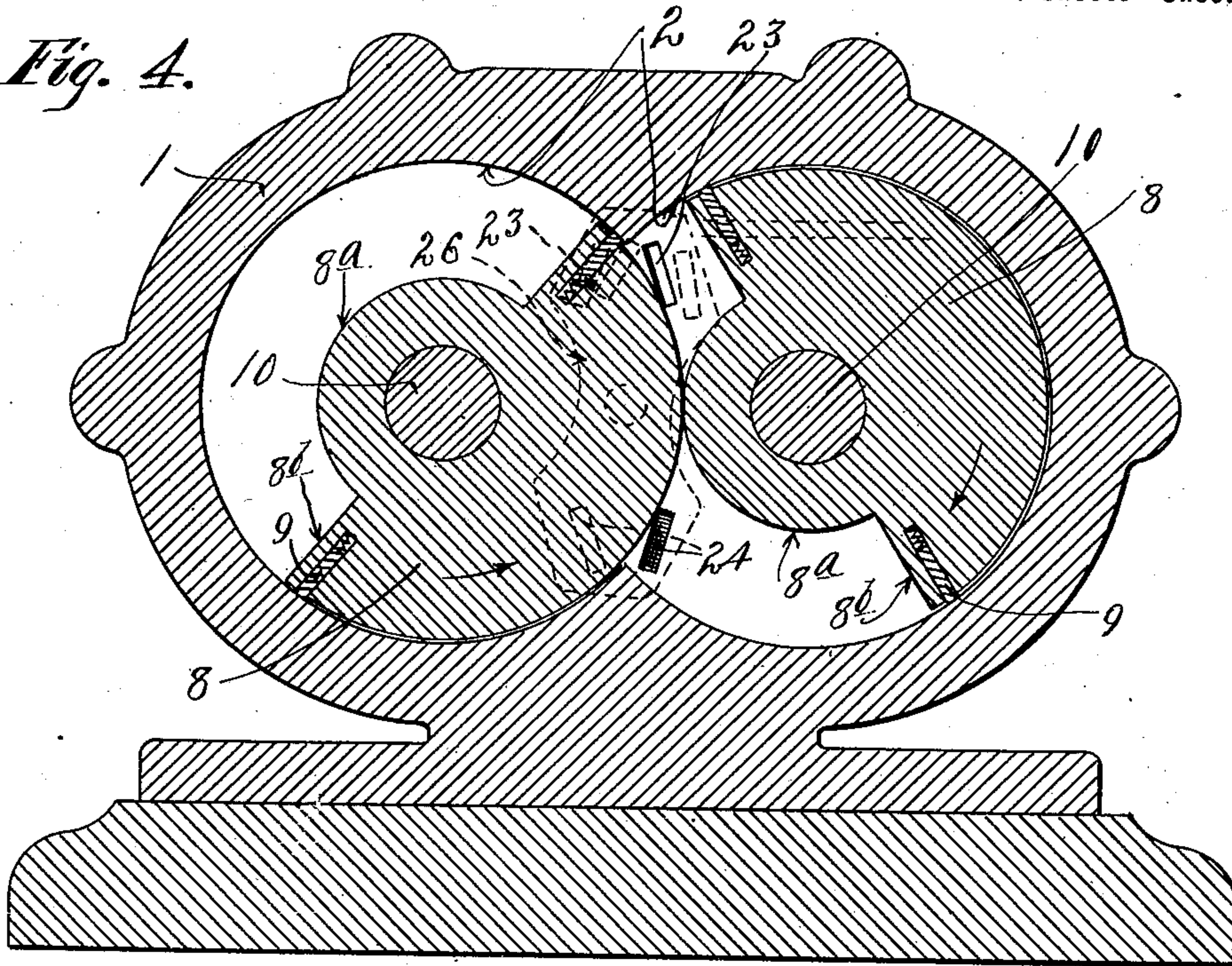
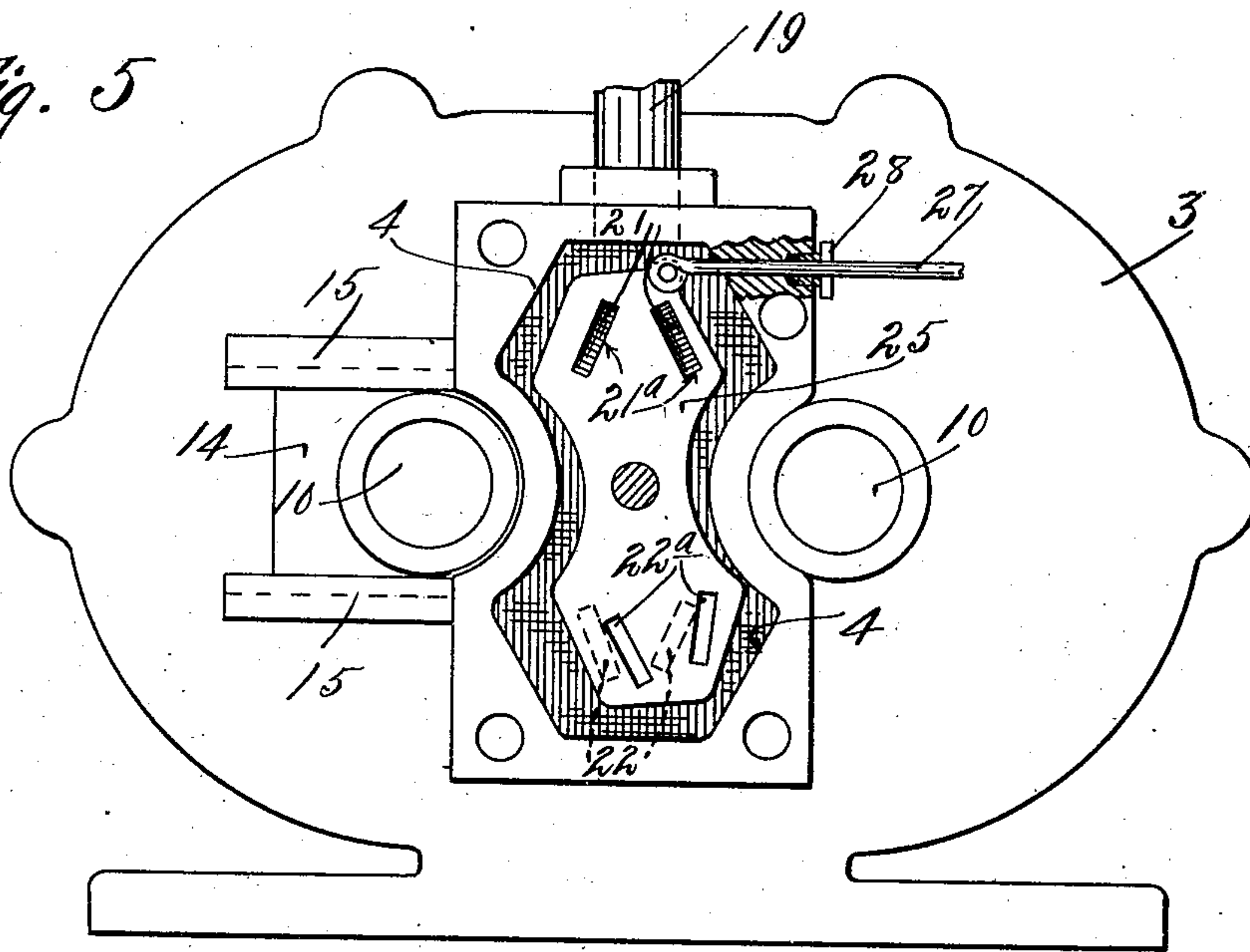


Fig. 5.



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4 Sheets—Sheet 4.

Fig. 6.

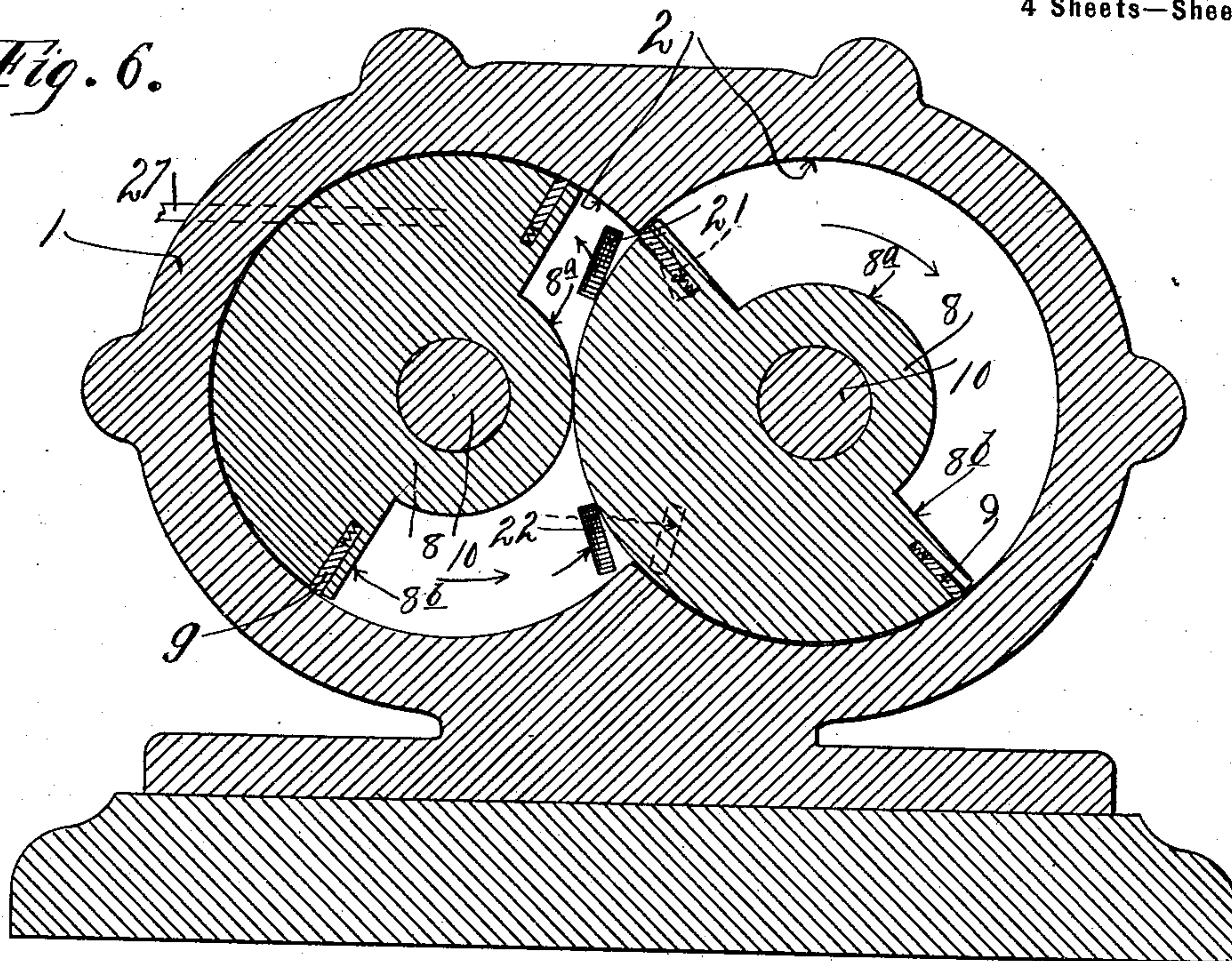
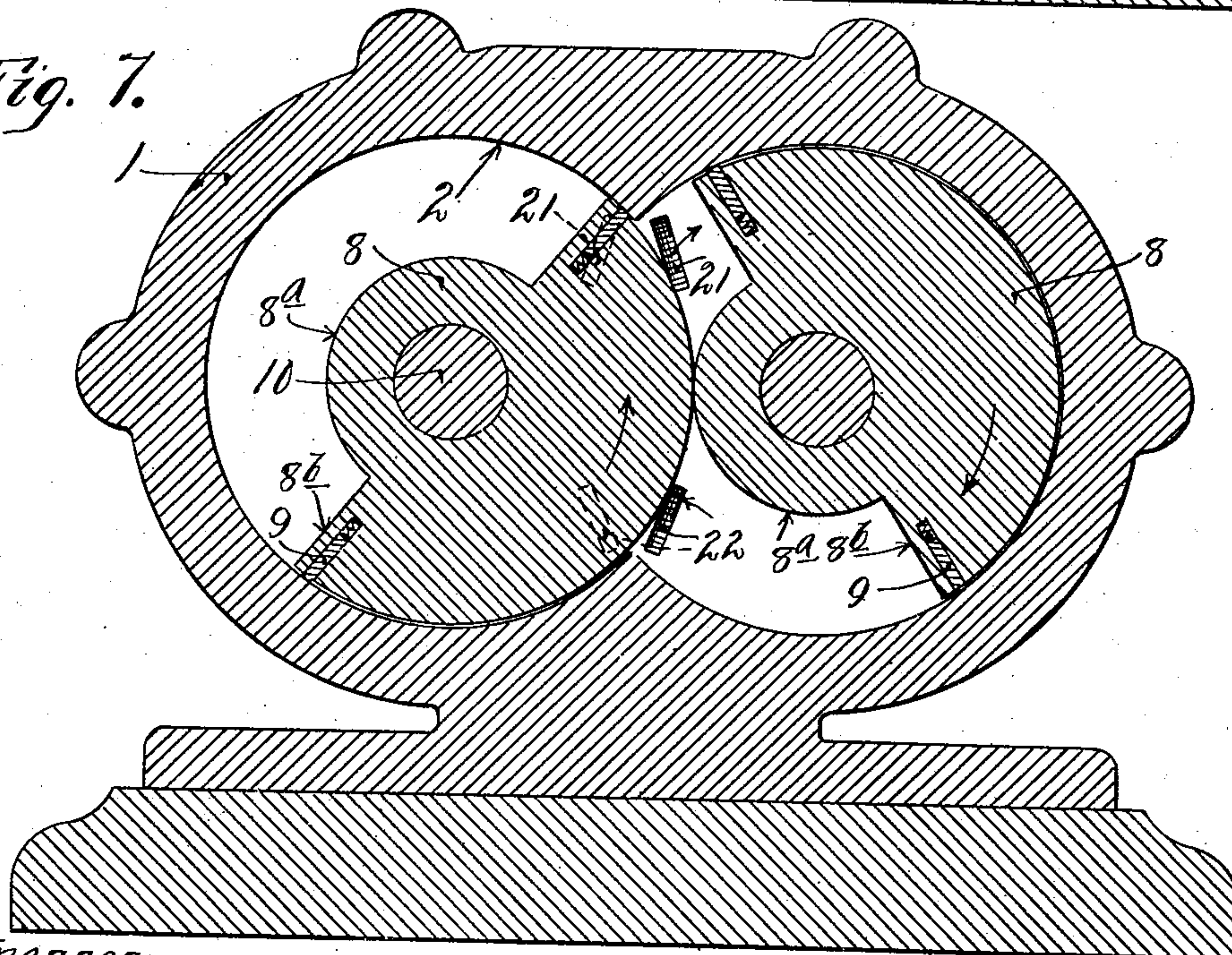


Fig. 7.



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 708,129, dated September 2, 1902.

Application filed August 2, 1901. Serial No. 70,681. (No model.)

To all whom it may concern:

Be it known that I, ANDREW DAHLÉN, a citizen of the United States, residing at Vasa, in the county of Goodhue and State of Minnesota, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention has for its object to provide an improved rotary engine; and to this end it consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a plan view with some parts broken away, showing an engine constructed in accordance with my invention. Fig. 2 is a side elevation of the engine looking from the left with respect to Fig. 1, some parts being removed. Fig. 3 is a view, principally in side elevation, looking from the right with respect to Fig. 1, but with some parts sectioned and others removed. Fig. 4 is a vertical section on the line $x^4 x^4$ of Fig. 1. Fig. 5 is a view corresponding to Fig. 2, but with the cut-off valve and certain other parts removed. Fig. 6 is a vertical section on the line $x^6 x^7$ of Fig. 1; and Fig. 7 is also a section on the line $x^6 x^7$ of Fig. 1, but showing the rotary pistons moved one hundred and eighty degrees.

The numeral 1 indicates the cylinder-casting, which is provided with a pair of intersecting cylindrical piston-seats 2, which are closed at their ends by cylinder-heads 3, bolted or otherwise rigidly secured to the said cylinder-casting. The left-hand cylinder-head 3 is provided with a supply-chest 4, and the right-hand cylinder-head is likewise provided with an exhaust-chest 5. As shown, the said chests 4 and 5 are respectively provided with removable outer plates 6 and 7, suitably secured thereto.

In each piston-seat 2 of the cylinder-casting 1 is mounted a segmental rotary piston 8, the larger peripheral surface of which closely fits the cooperating seat and extends approxi-

mately through one hundred and eighty degrees. Said segmental sections of the piston are provided near their extremities with transversely - extended and radially - removable spring-pressed packing-blades 9. Said pistons throughout the other one hundred and eighty degrees of their circumference are reduced at 8^a , so as to afford propelling shoulders or surfaces 8^b . The cylindrical surface of the larger segment of the one piston always closely engages the reduced cylindrical surface 8^a of the other piston, and this engagement takes place between the said pistons in alternate order.

The pistons 8 are rigidly secured on the shafts 10, which are suitably journaled in the cylinder-heads 3. To cause the said rotary pistons 8 to move with properly-timed action, their shafts 10 are provided with intermeshing gears 11. One of the said shafts 10 is provided at one end with a pulley 13, from which power may be transmitted. To provide means for adjusting one of the pistons with respect to the other to compensate for wear, its shaft 10, instead of being mounted in fixed bearings of the cylinder-heads 3, is mounted in sliding bearings 14, which in turn work with close-fitting engagements in keeper-guides 15, formed on the said cylinder-heads 3. The boxes 14 are yieldingly pressed inward by a yoke 16, the ends of which engage the same, which yoke is in turn drawn and held inward by a nut 17 on the stud 18, which projects from the cylinder-casting and works through a central perforation in the said yoke.

A steam-supply pipe 19 leads to the supply-chest 4, and an exhaust-pipe 20 leads from the exhaust-chest 5. Upper and lower pairs of admission-ports 21 and 22, respectively, open into the piston-seats 2 through the left-hand cylinder-head 3. In a similar manner upper and lower pairs of exhaust-ports 23 and 24, respectively, open through the right-hand cylinder-head 3. It will be noted that of the pairs of ports 21, 22, 23, and 24 one member of each pair is located within the circumference of each rotary piston 8, so that they will be intermittently opened and closed by the said piston.

25 indicates a pivoted reversing-valve which coöperates with the admission-ports 21 and

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22 and is provided, respectively, with upper and lower pairs of ports 21^a and 22^a. Likewise a vibrating reversing-valve 26 cooperates with the exhaust-ports 23 and 24. This reversing-valve 26 is provided, respectively, with upper and lower pairs of exhaust-ports 23^a and 24^a. The reversing-valves 25 and 26 are pivotally connected to stems 27, which work outward through suitable stuffing-boxes 28 and the cooperating chests 4 and 5 and are connected at their outer ends, as shown in Fig. 1, to a lever 29, pivoted at 30 to the cylinder-casting 1. The ports 21^a and 22^a, respectively, of the reversing-valve 25 cooperate, respectively, with the admission-ports 21 and 22. The ports 23^a and 24^a of the reversing-valve 26 cooperate, respectively, with the exhaust-ports 23 and 24.

A vibrating cut-off valve 31, pivoted at 32, works over the face of the reversing-valve 25, and its upper and lower ends, respectively, cooperate directly with the ports 21^a and 22^a. The cut-off valve 31 has an arm 33, to which the projecting arm of an eccentric 34 is pivotally connected. The eccentric 34 works on an eccentric 35, secured on one of the piston-shafts 10, as best shown in Figs. 1 and 2.

The operation is as follows: With the reversing-valves 25 and 26 set as indicated in Figs. 2, 3, 4, and 5 the two admission-ports 21 will be opened and the two admission-ports 22 will be closed by the said valve 25, and the two lower exhaust-ports 24 will be opened and the two operative exhaust-ports 23 will be closed by the said valve 26. With the ports thus opened the rotary pistons 8 will be driven in the direction indicated by the arrows marked on Figs. 4, 6, and 7.

When not desired to run the engine under an expansion of the steam or motive fluid, the so-called "cut-off valve" may be dispensed with. The said cut-off valve, however, serves to cut off the steam or motive fluid and cause the pistons to be driven during part of their rotation under the expansion of the motive fluid.

To reverse the direction of movement of the rotary pistons 8, the two reversing-valves 25 and 26 are simultaneously moved into positions reversed from those shown in the drawings by movement imparted thereto by the lever 29 and stems 27. If desired, suitable means (not shown) may be provided for locking the lever 29 in its set position. When said valves 25 and 26 are thus moved into reverse positions, the upper admission-ports 21 and the lower exhaust-ports 24 will be closed, while the lower admission-ports 22 and the upper exhaust-ports 23 may be opened. As is evident, in engines not designed to be reversible the valves 25 and 26 may be dispensed with, while in engines not designed to be reversible and not intended to be run under expansion the valves 25 and 26 and 31, as well as the valve-gear for actuating the latter valve, may be dispensed with.

The segmental rotary pistons 8 of themselves act as valves to open and close the admission and exhaust ports in proper order. To illustrate: In the positions of the pistons indicated in Fig. 6 the right-hand admission-port 21 is closed by the cooperating piston, while the left-hand port 21 is open. Again, by reference to Fig. 4, which shows the same positions of the pistons, viewing the same from a reverse direction, the right-hand exhaust-port 24 is open, while the left-hand exhaust-port is closed by the cooperating piston. Again, when the pistons have been rotated one hundred and eighty degrees, as shown in Fig. 7, the left-hand admission-port is closed and the right-hand admission-port 21 is opened. At this same time the exhaust-port 24 will be opened and closed in a reverse order from that above indicated. It is further evident that with an engine designed to run in but one direction two of the admission-ports and two of the exhaust-ports (shown in the illustration given) might be dispensed with. It will also be understood that suitable means may be provided for preventing the spring-pressed packing-blades 9 from being thrown too far out of their seats in passing through the intersecting portions of the piston-seats.

From the foregoing description it is evident that the pistons in alternate order act as abutments. More specifically stated, in the position indicated in Fig. 6 the right-hand piston is serving as an abutment for the left-hand piston, while in Fig. 7 the left-hand piston is serving as an abutment for the right-hand piston. The piston-seats 2 are true cylinders, except where they are cut away by their intersection. The outer segments of the pistons 8 extend through arcs which are greater than the arc of intersection of the said piston-seats. With this construction the pistons in passing the intersected portions of the piston-seats close the same for a considerable time, and thereby reduce to the minimum the time during which the two piston-seats are thrown into actual communication.

With my improved engine I am able to obtain a very high speed and to use steam expansively in a most advantageous manner. Furthermore, as reciprocating abutments are not employed the engine is free from pounding action. In practice suitable packings may be placed in the ends of the pistons; but their illustration for the purposes of this case is not deemed necessary. It will also be understood that other modifications not herein specifically set forth may be made within the scope of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a cylinder having intersecting piston-seats, of cooperating rotary pistons in said seats having reduced segmental sections intermeshing with the segmental body of the cooperating pistons, and admission and exhaust ports opening into

and from the said cylinder and arranged to be opened and closed by said pistons, substantially as described.

2. The combination with a cylinder having intersecting piston-seats, and a pair of admission and a pair of exhaust ports one admission-port and one exhaust-port opening into each piston-seat through a cylinder-head, of cooperating segmental rotary pistons working in said piston-seats and serving as valves to open and close said ports in the proper order, substantially as described.

3. The combination with a cylinder having intersecting piston-seats and two pairs of admission and two pairs of exhaust ports opening into said cylinder, two admission-ports and two exhaust-ports opening to each piston-seat, of cooperating intermeshing rotary pistons working in said seats and serving as valves to open and close said ports in the proper order, and a pair of reversing-valves cooperating with said ports, substantially as described.

4. The combination with a cylinder having intersecting piston-seats and the pairs of admission and exhaust ports 21 22 and 23 24, respectively, of the reversing-valves 25 and 26 having respectively, the ports 21^a 22^a and 23^a 24^a, connections for moving said valves simul-

taneously, and the intermeshing segmental rotary pistons working in said seats and serving as valves to open and close said admission and exhaust ports in the proper order, substantially as described.

5. The combination with a cylinder having intersecting piston-seats and pairs of admission and exhaust ports opening into said piston-seats, of the reversing-valves cooperating with said admission and exhaust ports, the cut-off valve cooperating with said admission-ports, and the rotary segmental intermeshing pistons working in said seats and serving as valves to open and close said ports in the proper order, substantially as described.

6. The combination with a cylinder having intersecting piston-seats and suitable admission and exhaust ports, of rotary segmental intermeshing pistons working in said seats, and means for adjusting one of said pistons with respect to the other comprising the sliding bearing 14, the yoke 16 and the nutted bolt 17 18, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ANDREW DAHLÉN.

Witnesses:

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A. G. SWANSON.