

No. 751,872.

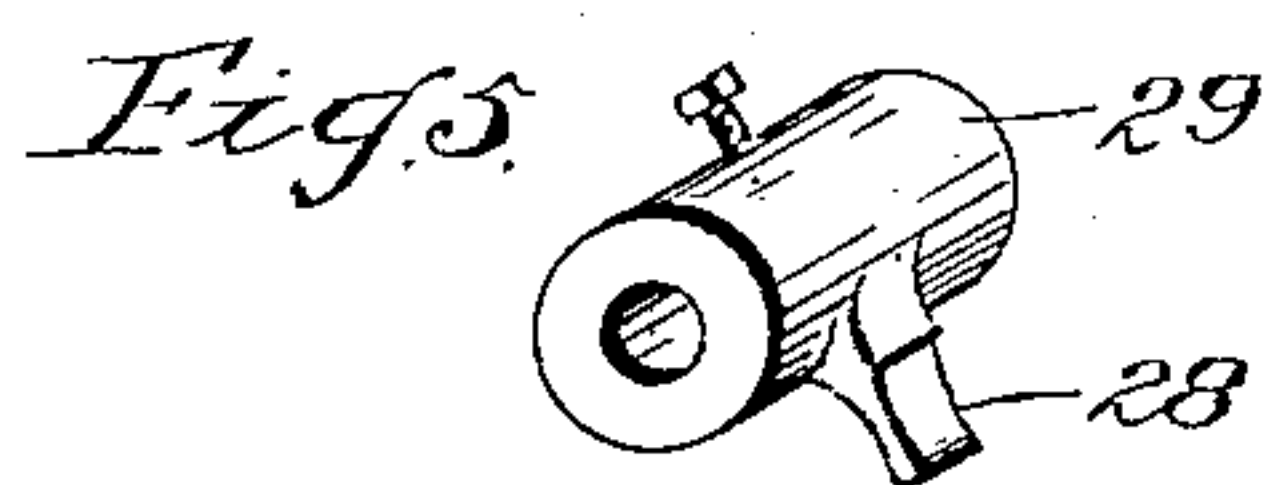
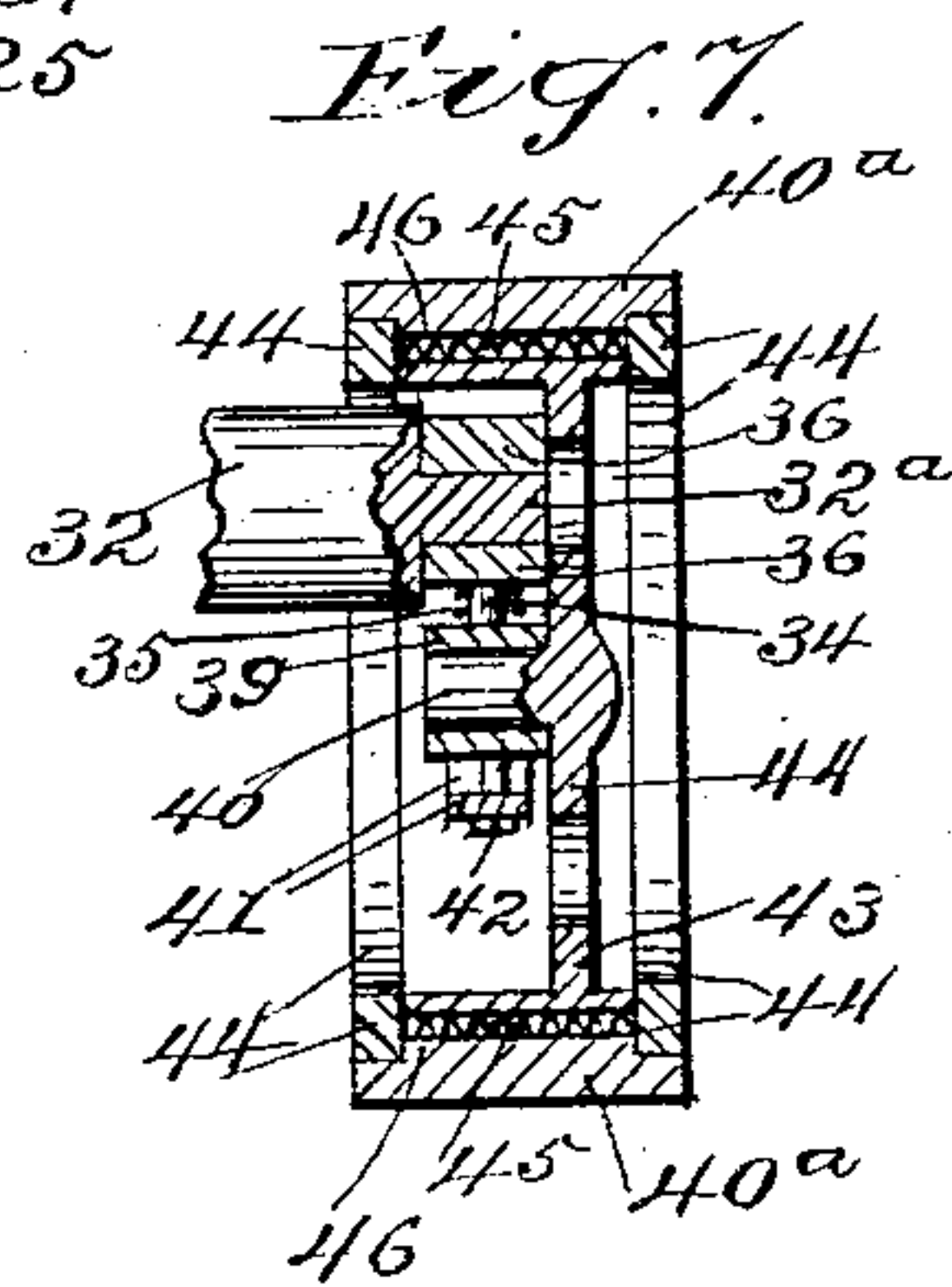
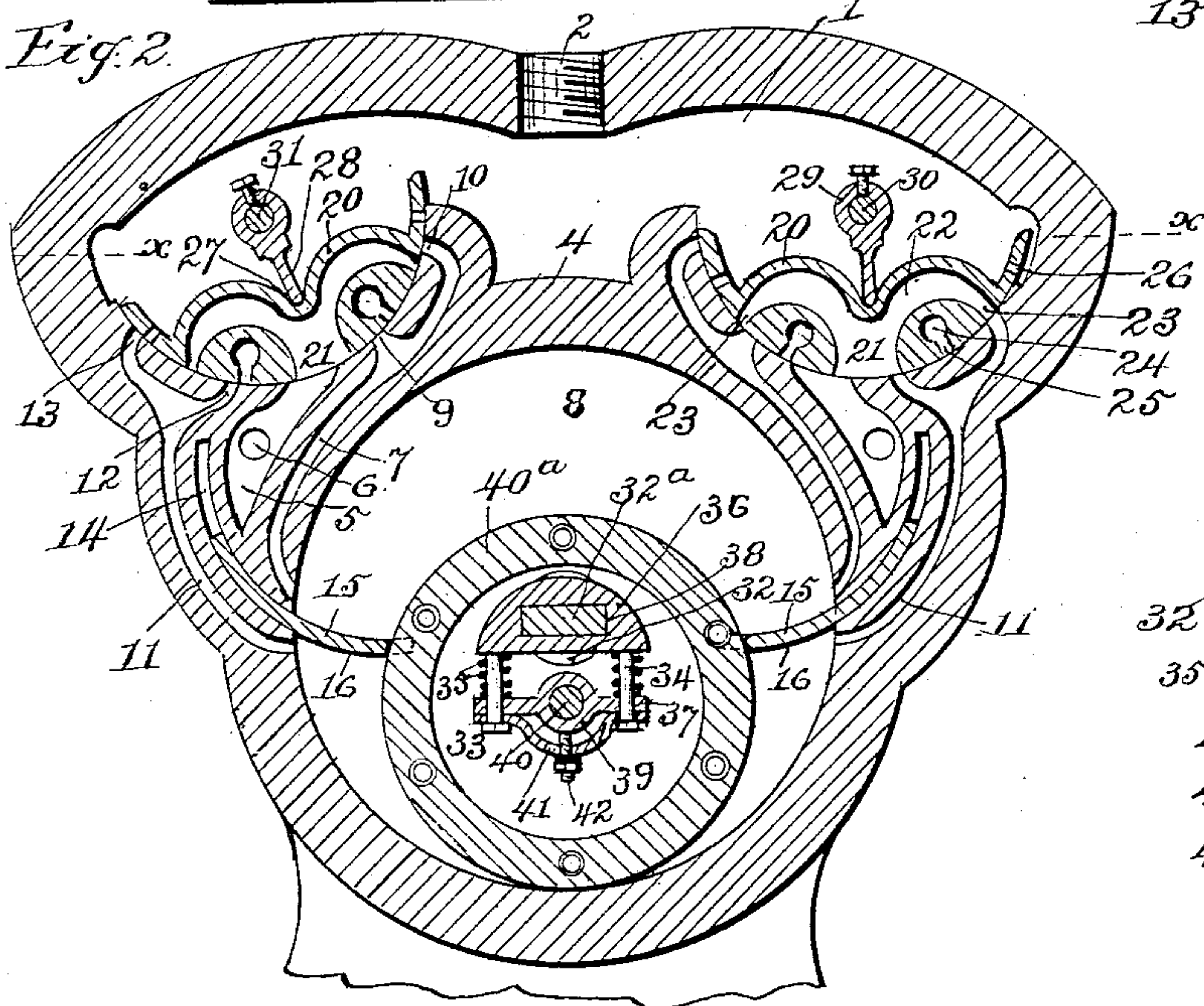
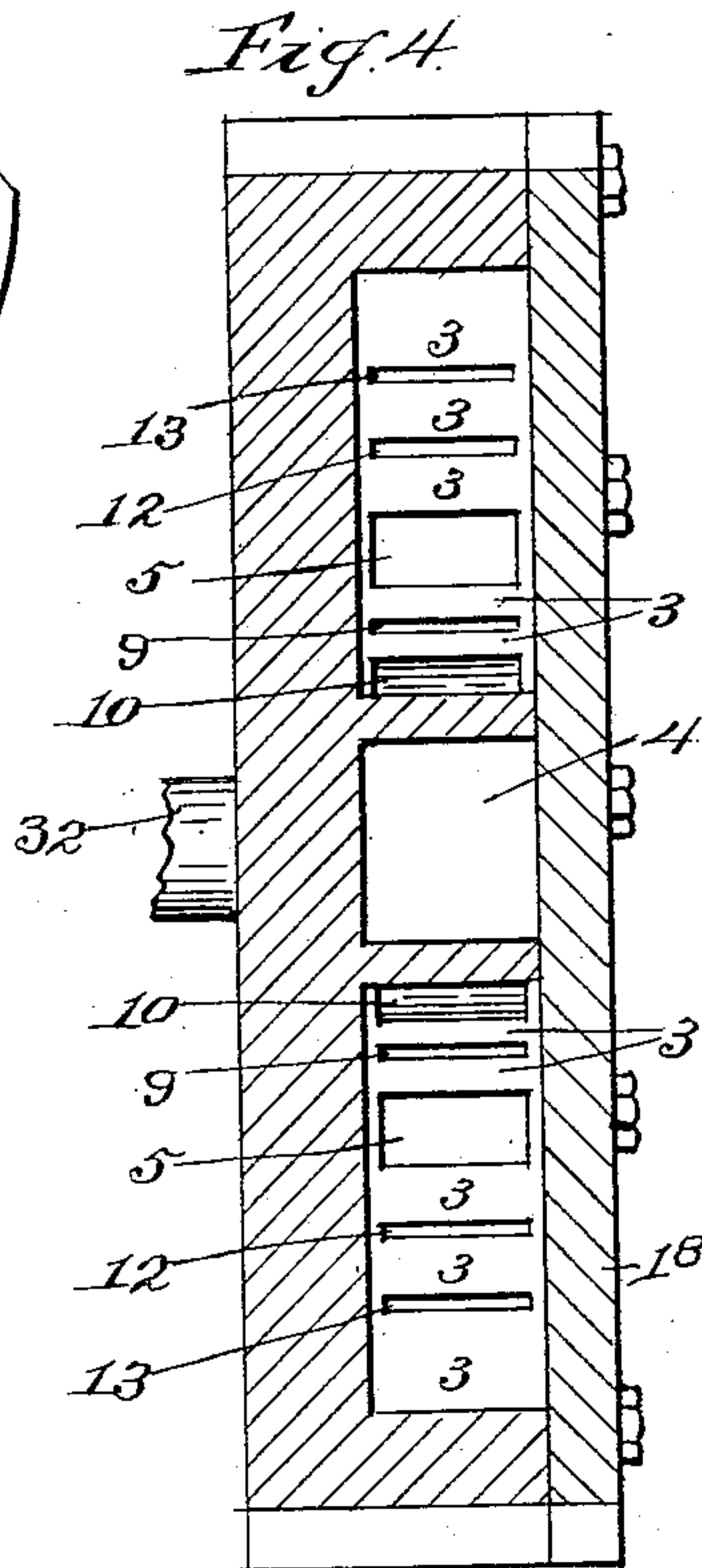
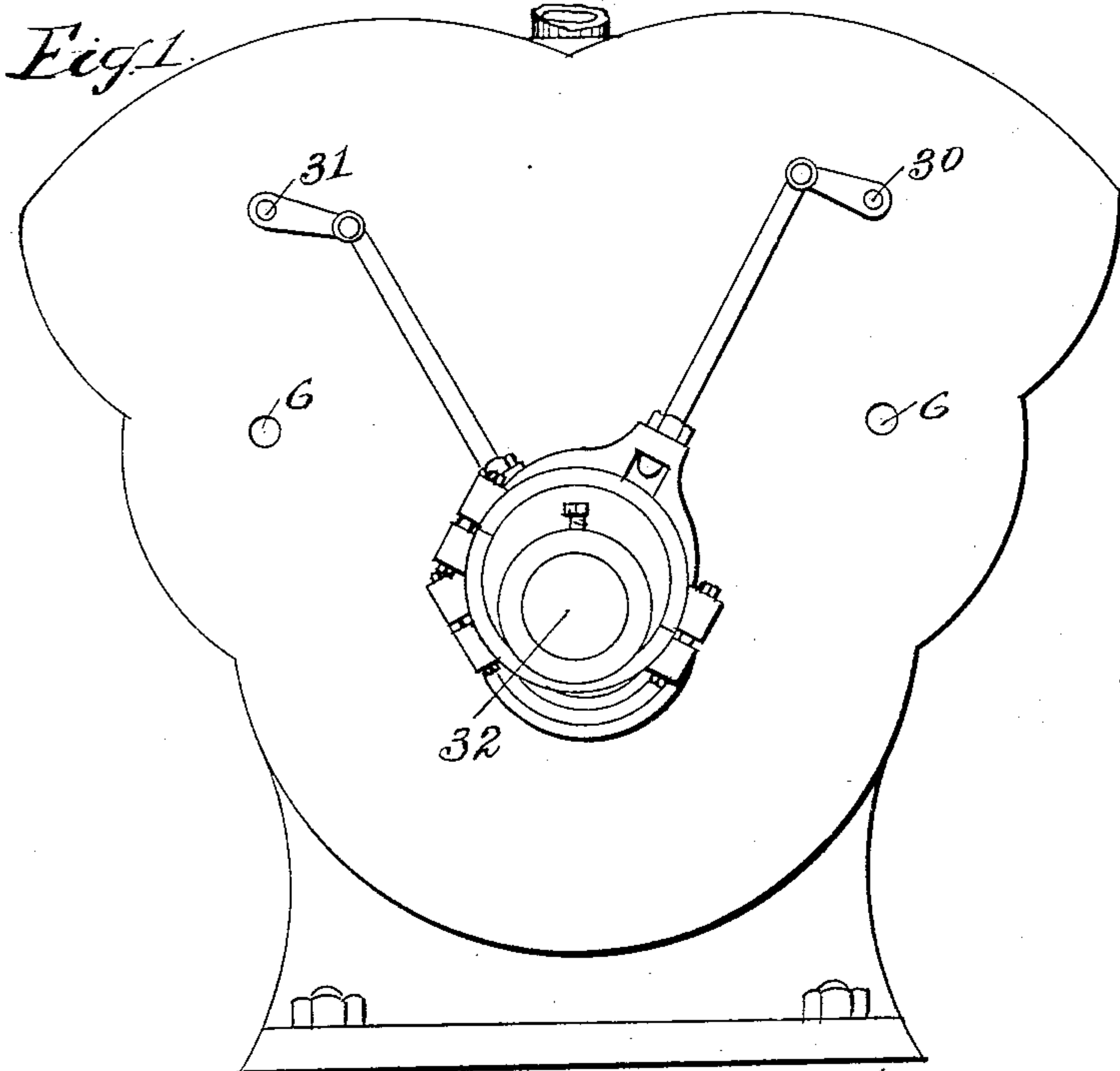
PATENTED FEB. 9, 1904.

W. F. ROACH.
ROTARY ENGINE.

APPLICATION FILED MAY 15, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses
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2 SHEETS—SHEET 2.

Fig. 3.

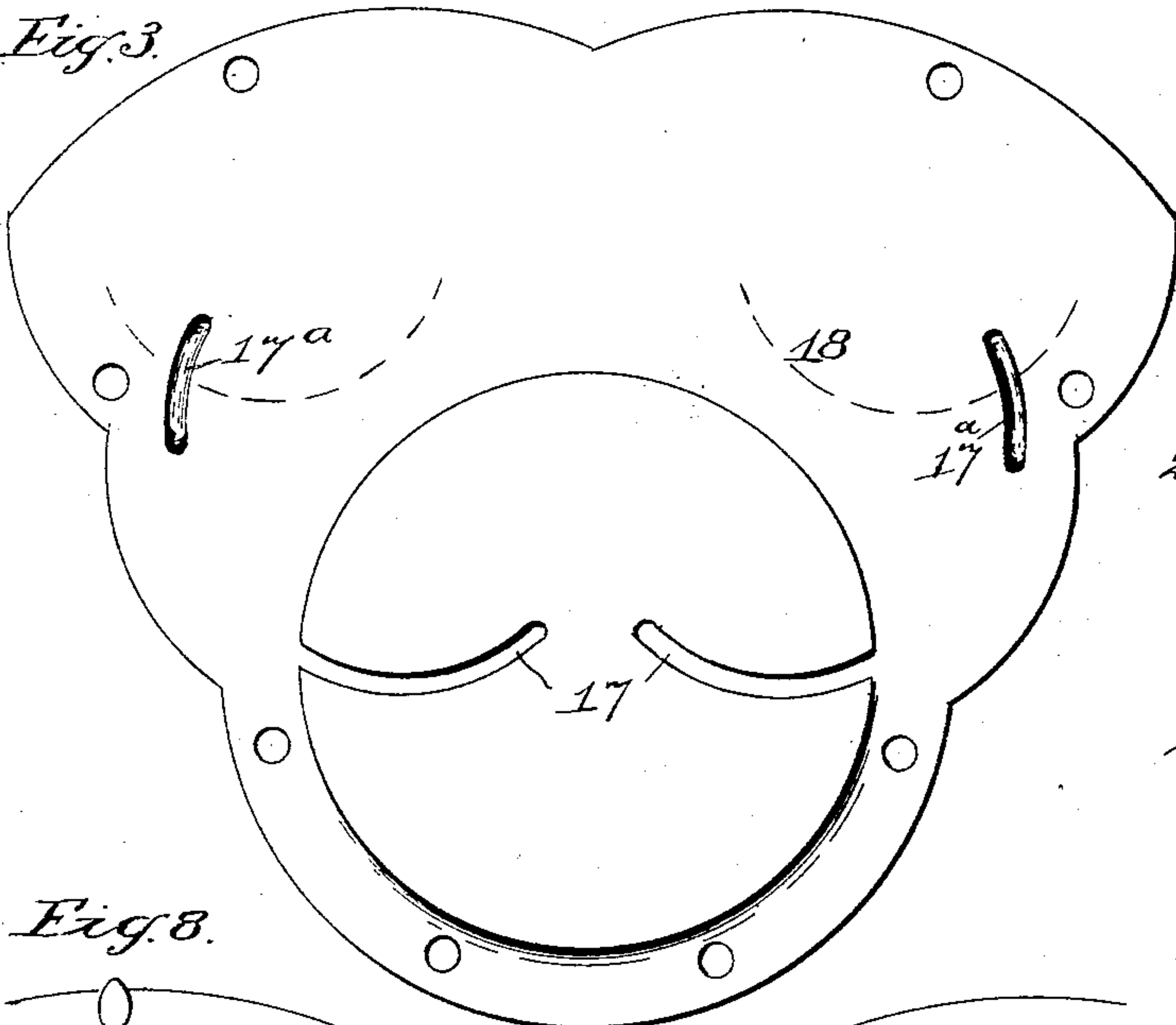


Fig. 6.

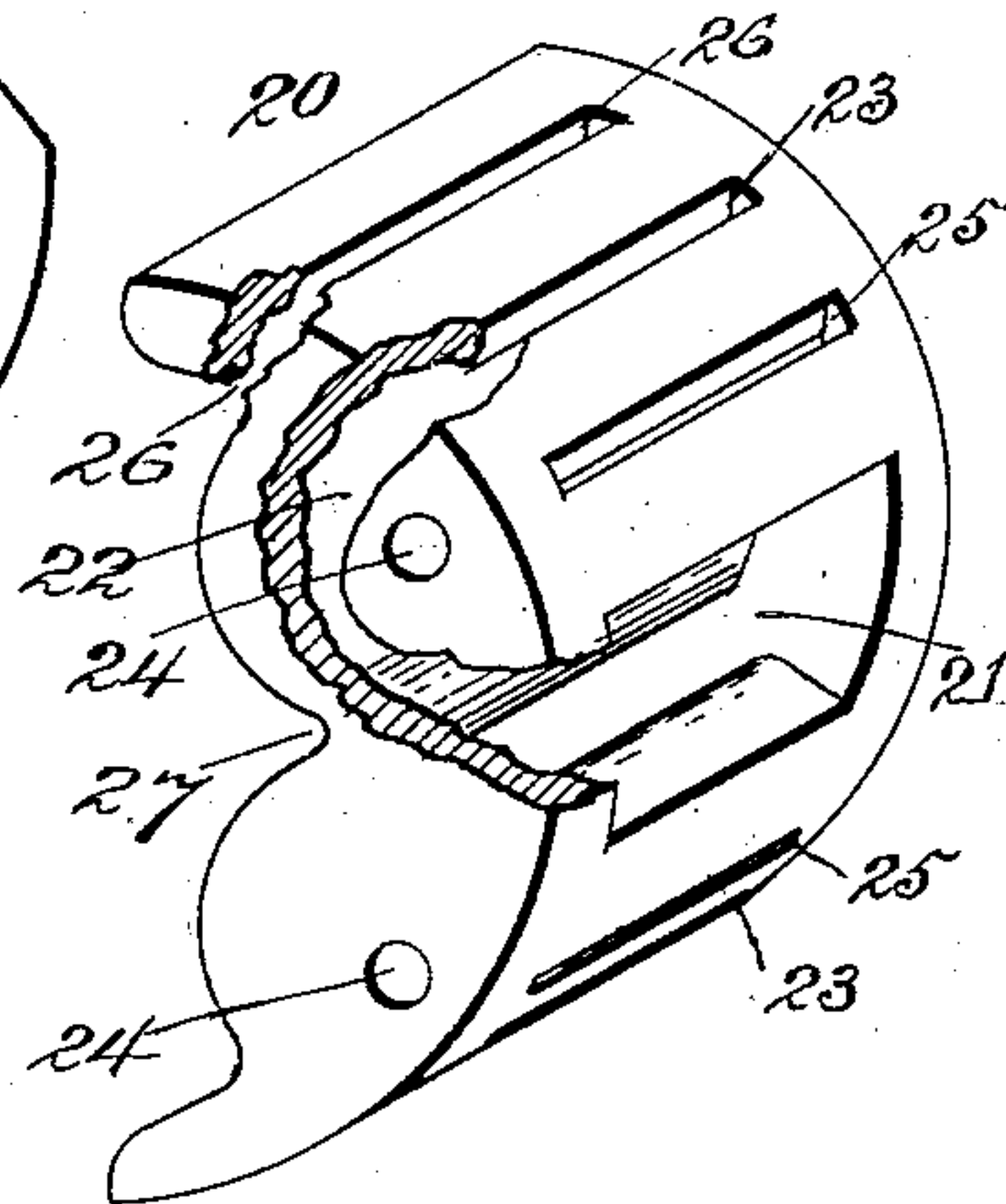


Fig. 8.

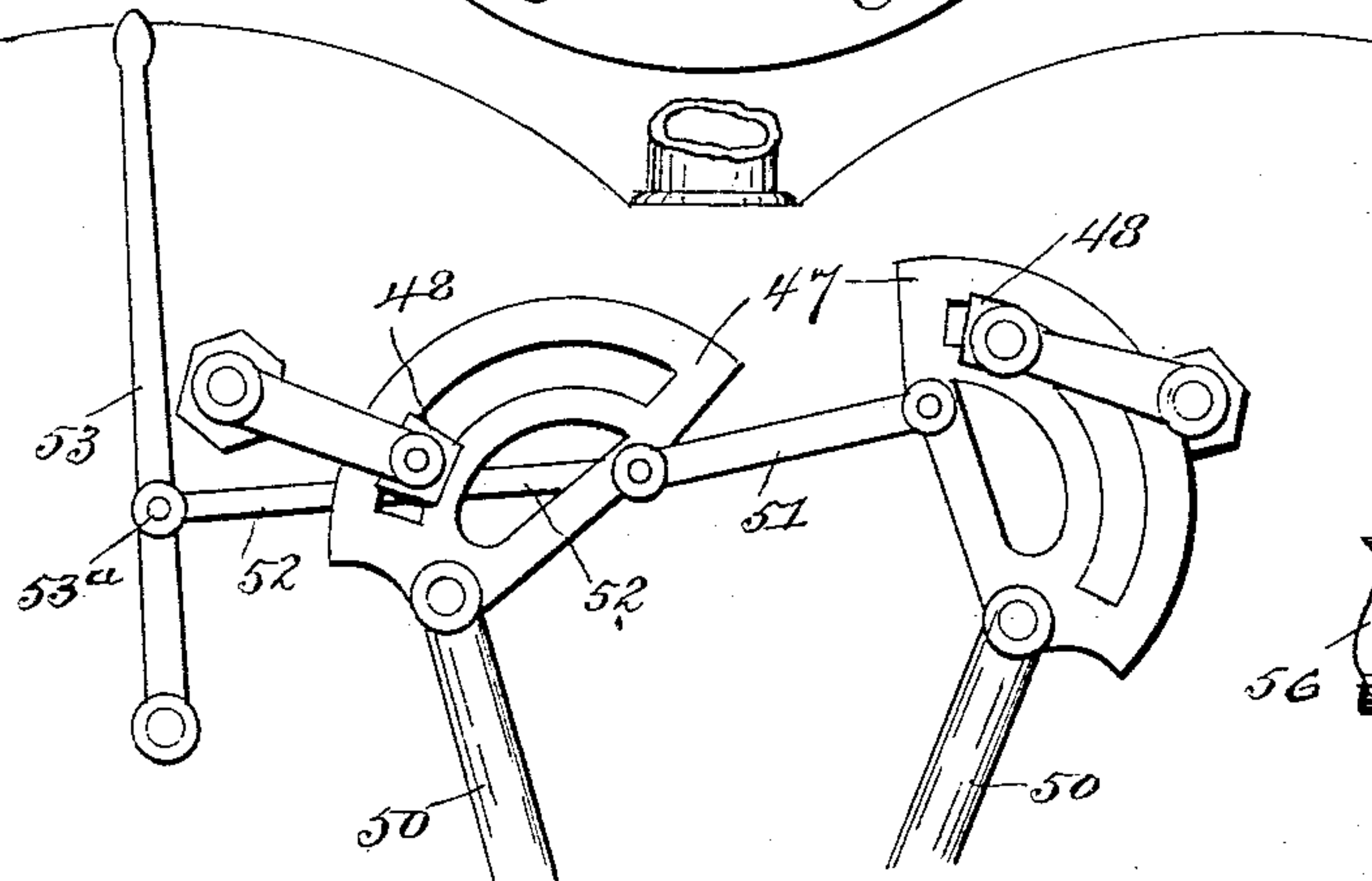


Fig. 10.

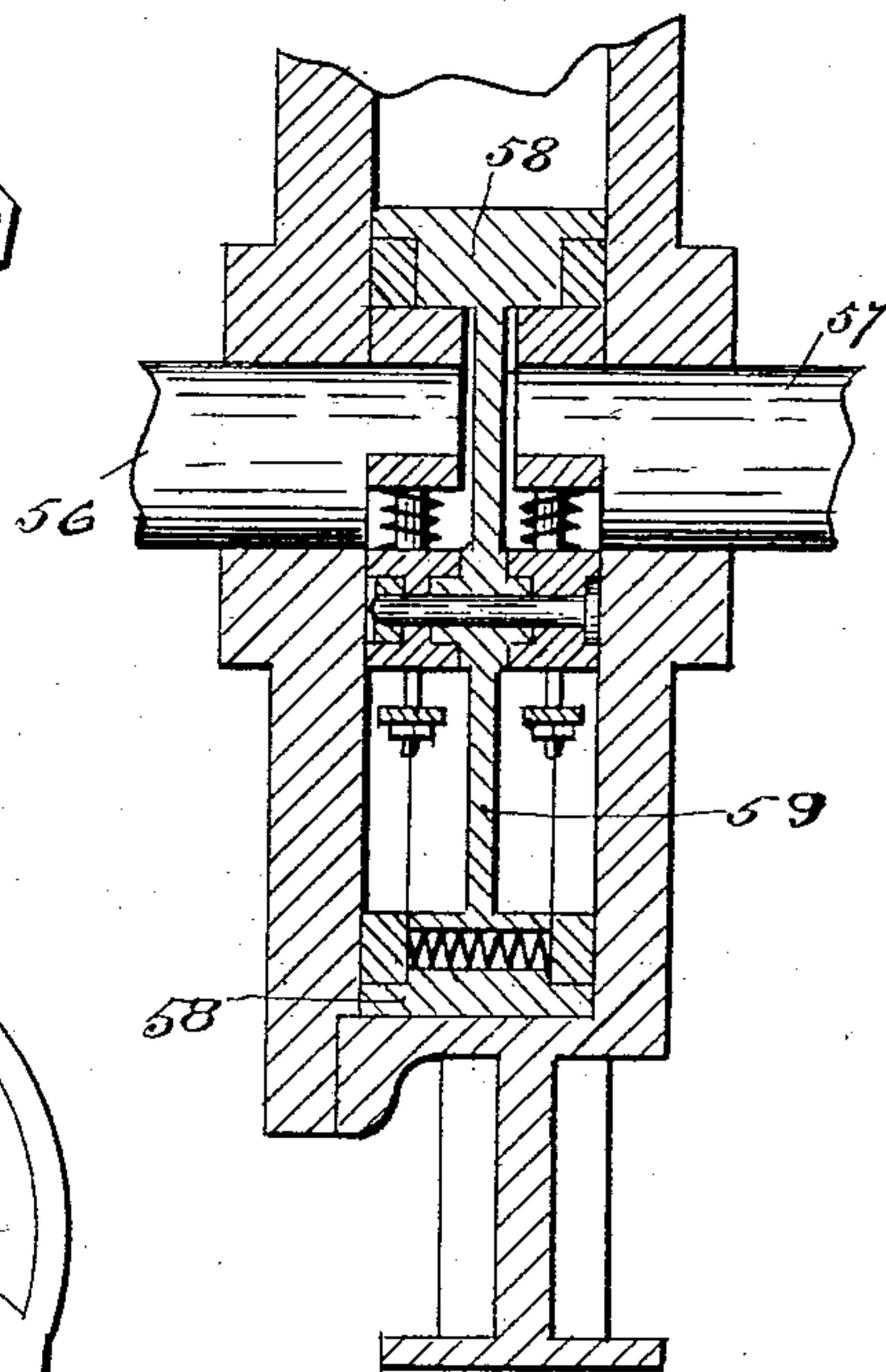
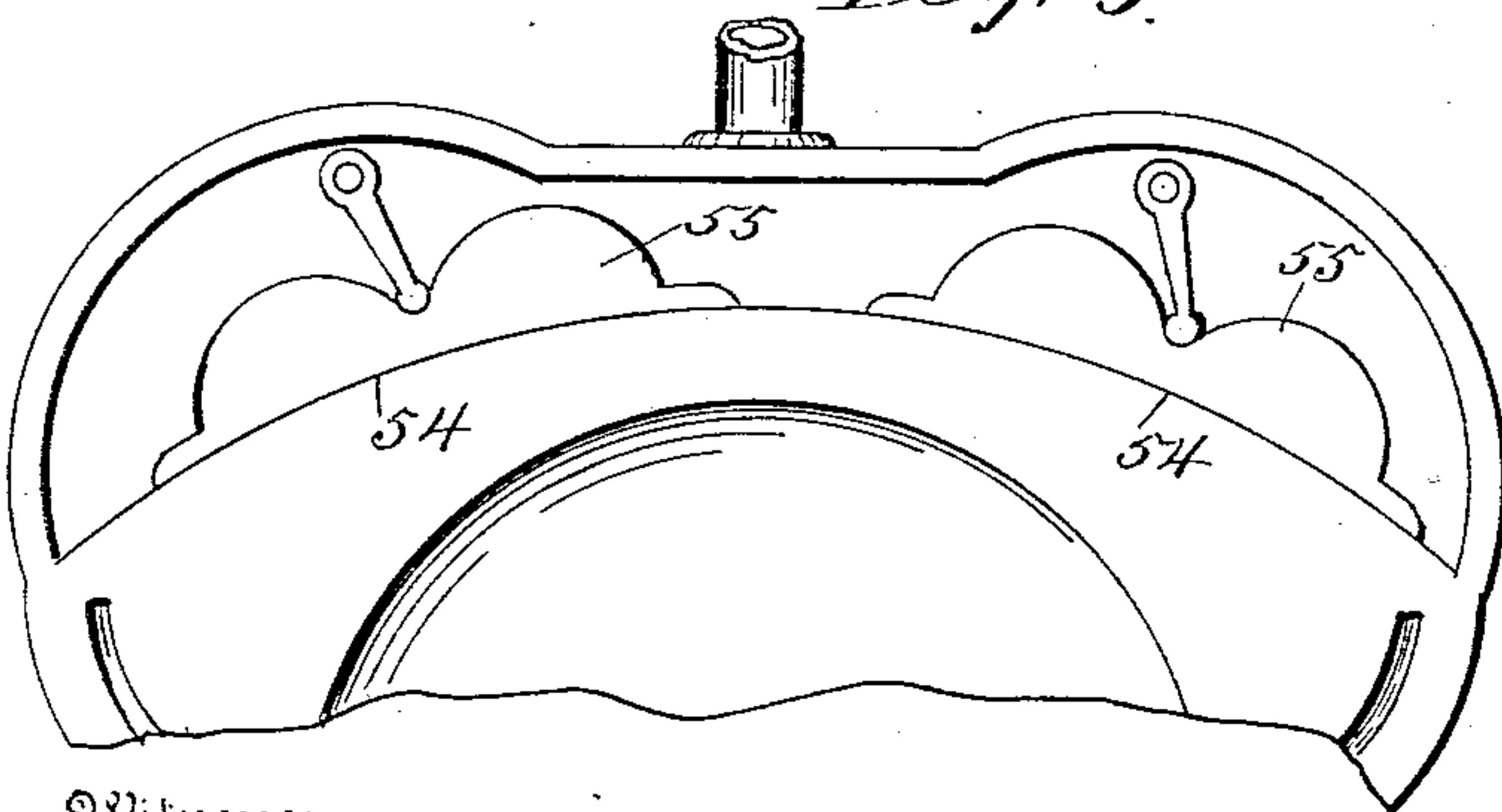


Fig. 9.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM F. ROACH, OF LINDSEY, PENNSYLVANIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 751,872, dated February 9, 1904.

Application filed May 15, 1903. Serial No. 157,205. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. ROACH, a citizen of the United States, residing at Lindsey, in the county of Jefferson and State of Pennsylvania, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to rotary engines, and particularly to a compound rotary engine employing a revolving rotatable piston—that is, a piston which makes several revolutions around its own axis while it is making one revolution around the engine-shaft from which it is hung.

The object of the invention is to provide a compound rotary engine having a cylinder provided with induction and discharge ports, a shaft journaled in the cylinder, an expandible or flexible hanger secured to the shaft in the cylinder, and a revoluble and rotatable piston carried by and journaled in the hanger.

A further object of the invention is to provide a steam-chest having valve-seats of special construction, gates operated by a revolving and rotating piston flexibly hung in the engine-cylinder from a shaft journaled in the cylinder, novel and peculiar connections between the shaft and steam-chest valves, and a special form of hanger connecting the piston with the shaft.

In the accompanying drawings, forming part of this application, Figure 1 is an elevation of the engine. Fig. 2 is a central vertical section. Fig. 3 is a plan view of the face-plate looking at the inner side thereof. Fig. 4 is a section on the line *x x*, Fig. 2, with the valves and crank-shafts removed. Fig. 5 is a perspective view of the tongued sleeve or collar. Fig. 6 is a perspective view of one of the slide-valves, partly broken away. Fig. 7 is a central sectional view through the hanger, piston, and shaft. Fig. 8 is an elevation, partly broken away, showing hand-reversing device. Fig. 9 is an elevation of a modification with face-plate removed. Fig. 10 is a vertical section, partly broken away, showing a further modification.

The same numeral references denote the same parts throughout the several views of the drawings.

The steam-chest 1 has an induction 2 and concaved arc-shaped or semicircular valve-seats 3, one of which is located upon each side of the center of the cylinder-top 4, with the inner ends thereof projecting above the said top and at an elevation higher than the other or outer ends of the valve-seats. Under the seats 3 and communicating therewith is an exhaust-chamber 5, having an exhaust-opening 6. Steam-passages 7 extend from the cylinder 8 and terminate at the valve-seats 3 in ports 9 and 10, positioned upon one side of the exhaust 5. Steam-passages 11 extend from the cylinder 8 and terminate at the valve-seats 3 in ports 12 and 13, positioned upon the other side of the exhausts 5. Between the exhausts 5 and passages 11 are gateways formed by a cavity or recess 14, which extends from under the wall of the ports 12 and 13 and terminates in the cylinder 8 between the passages 7 and 11. Concaved or arc-shaped gates 15 are operated in the recesses 14 and in channels or grooves 16 of the cylinder back and in like grooves 17 in the face-plate 18 by a piston 19 and with the latter divide or separate the cylinder into two compartments, whatever be the position of the gates and the piston.

The face-plate 18 has pockets 17^a to permit steam to pass from the steam-chest to the gateways 14, whereby the gates 15 are under steam-pressure, so that while one gate is operated by the piston the other gate is made to follow the piston.

The slide-valves 20 (being alike, only one will be here described in detail) are of semicircular shape on their face or bearing side with the seats 3. A central steam-pocket 21 is formed in the face of the valves and has passages 22, terminating in ports 23. Transverse ports 24, open at each end, are formed in the valve and have a port 25 opening through the valve-face between the pocket and ports 23. Ports 26 are made at each end of the valve, and the top of the valve has a central groove or bearing 27, in which is fitted a tongue 28 of a collar or sleeve 29, secured to a crank-shaft 30. A crank-shaft 31 is likewise connected to the other valve, and by these crank-shafts and their eccentric connections to a main shaft 32 the valves are connected to shaft 32.

The inner end of the shaft 32 is angular, and from it is hung a flexible or expansible piston-shaft hanger 33, comprising two parts resiliently, flexibly, or expansively connected together by rods 34, having spiral springs 35 between the parts. The part 36, which I will term the "main-shaft" part, has an opening 38 to fit the end 32^a of the main shaft, so as to be turned with and by said shaft. The part 37, designated as the "piston-shaft-spindle" part, has a bearing 39 for the piston spindle or shaft 40 and an adjusting-spring 41, controlled by a set-bolt 42. The main shaft 32 is suitably journaled at the back of the engine and extends into the cylinders.

The piston spindle or shaft 40 is preferably made integral with the piston-web 43 and fits loosely in the hanger-bearing 39, so that the hanger 33 is within the piston 40^a, and the latter is cushioned between the back of the cylinder and the cylinder face-plate by rings 44 and spiral springs 45, which extend through holes 46 in the body of the piston. It will be seen that the piston is free to revolve according to the steam-pressure thereon and that the flexibility of the hanger permits the piston to follow and have its bearing upon the surface of the cylinder, so that the piston will work the gates simultaneously with the working of the slide-valves.

In the event of the engine requiring a reverser I provide a device, as shown in Fig. 8, which consists of the links 47, adapted to be worked on pivot-block connections 48 between the crank-shafts 49 and the eccentric-arms 50, a bar 51, coupling the links together, a lever 52, attached to one of said links and pivoted to a hand-lever 53, fulcrumed at 53^a.

Referring to the modifications shown in Fig. 9, the valve-seats 54 are convexed, and the valves 55 have concaved bearing-faces; otherwise the structure of the engine is the same as that hereinbefore described.

In the modification shown in Fig. 10 there are two main shafts 56 and 57 employed, a flexible hanger for each shaft and a piston 58, having a central web 59, so that the hangers are contained in the piston, one upon each side of the web. This arrangement is specially fitted for low-pressure engines.

It is obvious that in the operation of the engine the piston is moved from side to side and revolves around the cylinder, according to the pressure and exhaust steam to and from the valves into and from the cylinder-compartments, and turns the main shaft, which operates the valves simultaneously with and according to the movement of the piston. It will therefore be seen that the valves act both as induction and exhaust valves.

The operation in detail is as follows: Steam from the chest is carried by the ports 24 and 25 through ports 9 or 12 and through passages 7 or 11 to the cylinder, according to the

position of the slide-valves and the movement of the piston, so that one set of said ports and passages in each side of the chest induct steam, while the other set exhaust it from the cylinder. With the piston in the position shown in Fig. 2 of the drawings the left-hand ports 25 and 26 have cut off steam by way of passage 11 and ports 12 and 13 from the chest to the cylinder under the left gate. A continued movement of the left toward the right from its position shown will exhaust from the cylinder above the piston by way of the left passage 7 and ports 9 and 10 of the left valve and through the pocket 21 of this valve to the exhaust-port 6. During such movement of said valve the right valve has opened the right exhaust-passage 11 and ports 12 and 23 to its pocket 21 and the latter to the right exhaust 6. As the piston climbs the right-hand side of the cylinder it closes the entrance of the right passage 11 to the cylinder, and the right valve will have moved toward the left to close communication between the cylinder-compartment below the piston, and the left end of the said right valve begins to open communication between the steam-chest and the upper cylinder-compartment through the right passage 7 and ports 25 and 26, communicating with ports 9 and 10. A further movement of the piston in the same direction will reverse the valve, close the ports last mentioned, and open the exhaust for steam from the lower cylinder-compartment, which has just been admitted to this compartment by the left-hand valve.

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

1. The combination, with the cylinder, the steam-chest, the main shaft, and the piston revoluble and rotatable in the cylinder, of the two-part hanger one part thereof carrying the shaft and the other part the piston, and the gates slidable under the steam-chest and in the cylinder and operated by the piston and with the latter separating the cylinder into two compartments.

2. In a rotary engine, a compartment-cylinder, a steam-chest provided with inlet and outlet ports, and passages to and from the compartments, a shaft centrally journaled in the cylinder, an expansible hanger fixed to the shaft, a revolving and rotating piston journaled on the hanger, and the curved or arc-shaped gates working in the steam-chest against the piston and with the latter separating the said compartments.

3. The combination, with the shaft, the cylinder having gates, the piston, the two-part flexible hanger in which the piston is journaled and the shaft is secured eccentric to the piston, and the valves, of means to convert the rotary motion of the shaft to a slidable motion of the valves comprising the crank-

shafts, collars or sleeves on the crank-shafts having a tongue engaging the valves, and the eccentric connections from the crank-shafts to the said shaft.

5 4. The combination, with the shaft, and the piston, of means for flexibly and expansively connecting the shaft and piston eccentric to each other, comprising a two-part hanger, one part thereof being fixed to the shaft and the
10 other part thereof having the piston-spindle journaled therein, rods loosely connecting said hanger parts, and springs to control the movement of the parts relative to each other.

15 5. The combination, with the cylinder, the steam-chest having steam-passages leading into the cylinder and gateways between said passages, valves slidable over said passages to open and close the latter, and a shaft having eccentric connections with the valves, of the
20 piston, the hanger secured to the shaft and in which the piston is journaled eccentric to the shaft, and the slidable gates operated by the piston and with the latter dividing the piston into two compartments, and permitting
25 the piston to close the said passages at their entrance to the cylinder.

6. In a rotary engine, a casing formed with a steam-cylinder, a steam-chest above the cylinder, gateways between the steam-chest and
30 the cylinder, and the steam-ports in the steam-chest connected by passages to the cylinder, slide-valves to open and close the ports, sliding gates in said ways, a shaft journaled centrally in the cylinder, an expansible hanger
35 on the shaft within the cylinder, a rotatable piston journaled in the hanger eccentric to the shaft, eccentrics on the shaft, and operative mechanism between the eccentrics and the valves to effect a reversal of the engine.

40 7. In a rotary engine, a cylinder having steam-ports to admit and discharge the steam, oppositely arranged and extending shafts journaled in the cylinder, duplicate expansible hangers on the ends of the said shafts within
45 the cylinder, a rotatable and revoluble piston eccentrically journaled in the hangers and disposed between them, and slidable gates bearing on the piston at different points.

50 8. In a rotary engine, the combination, with a cylinder and a flexibly-hung revolving rotating piston therein having a central web, of the two-part hanger having springs therebetween and in which the piston is journaled, a two-part shaft journaled in the cylinder and hav-
55 ing ends fitting and terminating in the hanger

with a space between the hanger parts to permit the passage of the piston-web.

9. The combination, with the cylinder, the steam-chest at the top thereof, and the shaft centrally journaled in the cylinder, of the re- 60
volving and rotating piston, two-part hanger for flexibly hanging the piston from and eccentric to the shaft, and the gates working under the steam-chest in the cylinder upon each side of the vertical center thereof and 65
against the piston.

10. In a rotary engine, the combination, with the cylinder having a steam-chest, the piston, and the shaft centrally journaled in the cylinder, of the hanger for expansively 70
and eccentrically hanging the piston from the shaft to revolve with the latter and rotate during such revolution, the gates with the piston dividing the cylinder into two compartments, each compartment having independent 75
induction and exhaust passages from and to the said steam-chest.

11. The combination, with a rotary engine, a main shaft, a revoluble piston eccentrically connected to the shaft, and curved valve-seats 80
in the engine steam-chest, of the slide-valves connected to the said shaft and having the same curvature as the said seats and in which are formed transverse induction-openings to take steam from the chest and having ports 85
25, a central pocket to exhaust steam from the cylinder, passages from the pocket terminating in ports to carry steam to the exhaust-chambers of the engine, and a port 26 through each end of the valves. 90

12. In a rotary engine, the combination, with the cylinder and the flexible hanger, of the piston having apertures therethrough the rings contained in the piston, and the springs working in the apertures and against the rings, 95
to form side cushions for the piston.

13. In a rotary engine, the combination, with the cylinder, the face-plate, the shaft, and the flexible hanger secured to the shaft, of the piston hung from the hanger and hav- 100
ing holes therethrough, the rings contained in the piston and bearing against the face-plate, and the springs loose in the holes and working against the rings.

In witness whereof I hereunto set my hand 105
in the presence of two witnesses.

WILLIAM F. ROACH.

Witnesses:

M. J. TRACEY,

JOHN STELOLESTOM.