No. 791,939. PATENTED JUNE 6, 1905.

J. A. PETERSON.

ROTARY ENGINE.

APPLICATION FILED FEB. 23, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

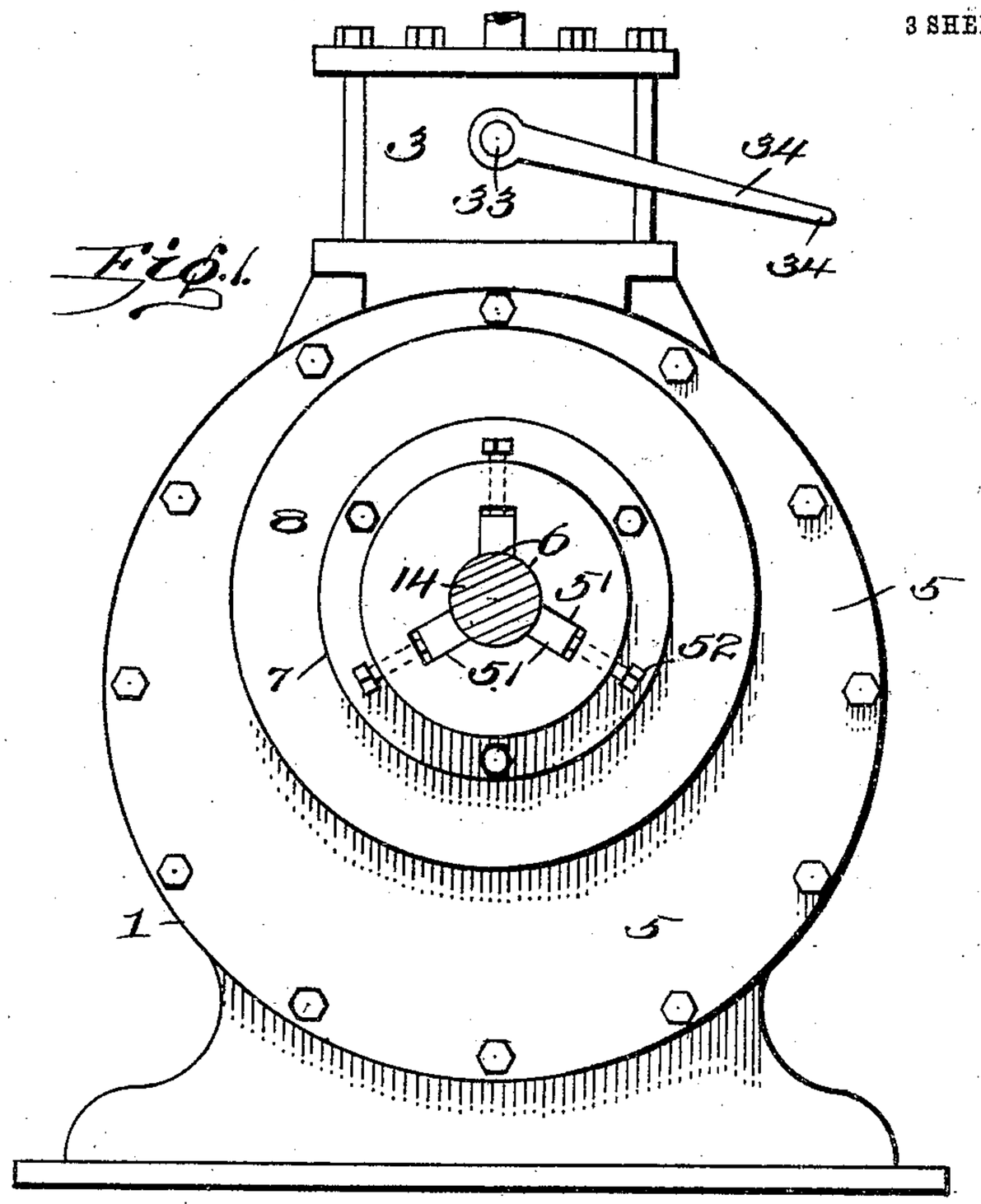

Fig. 2.

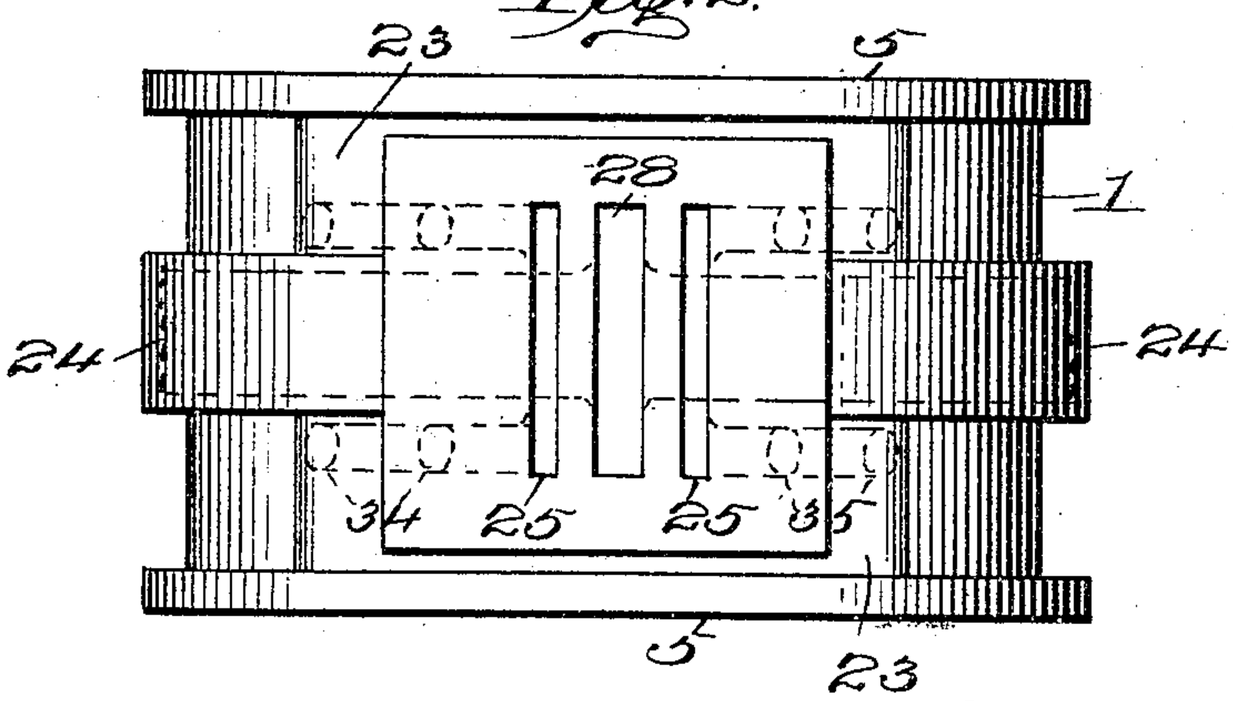

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Fig. 3.

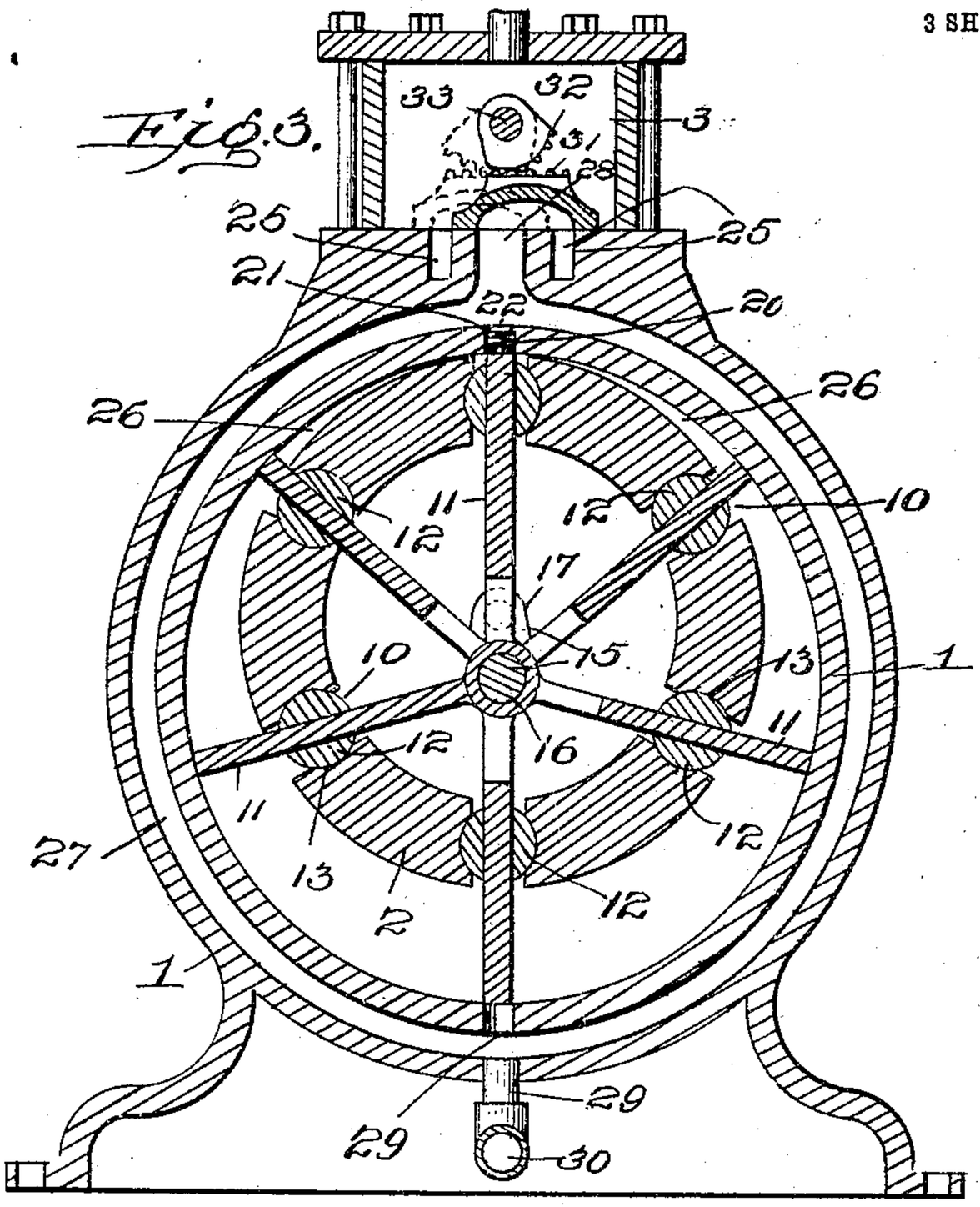


Fig. 9.

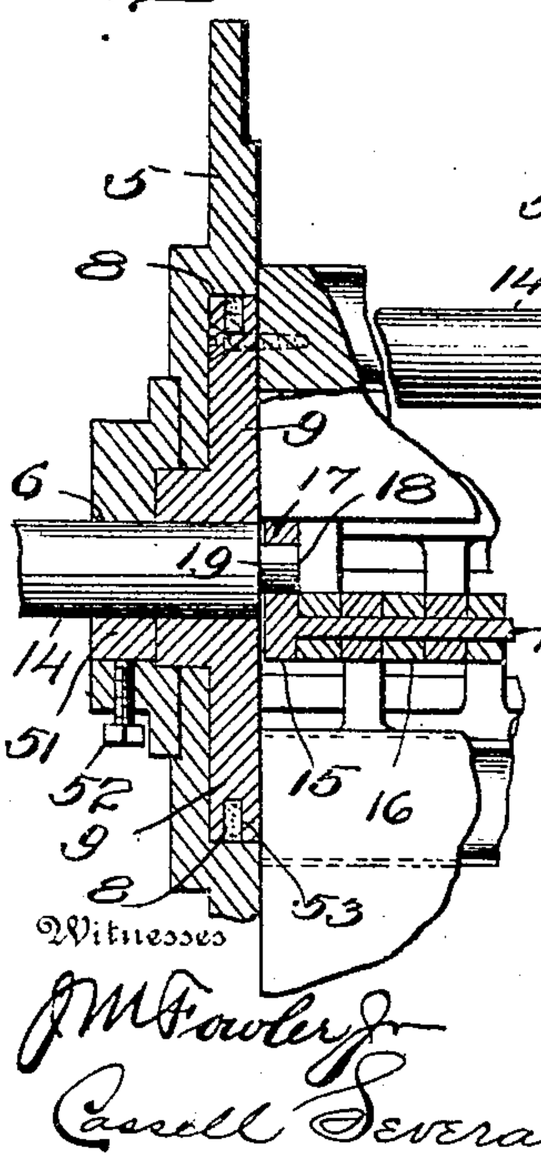


Fig. 14.

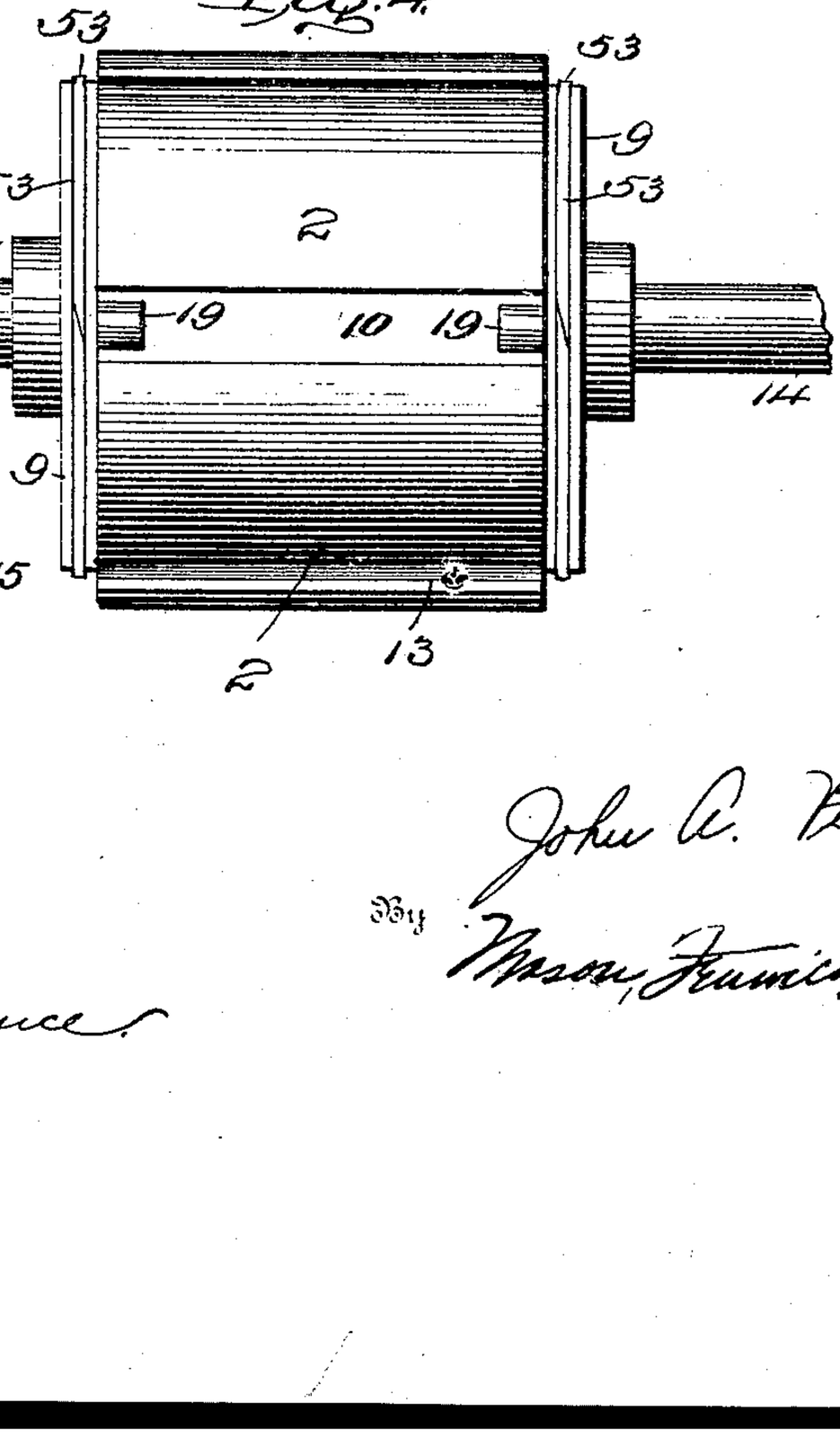
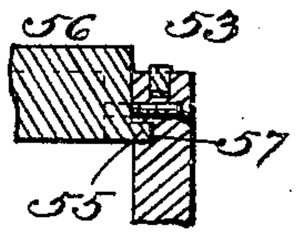


Fig. 10.



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3 SHEETS—SHEET 3.

Fig. 5.

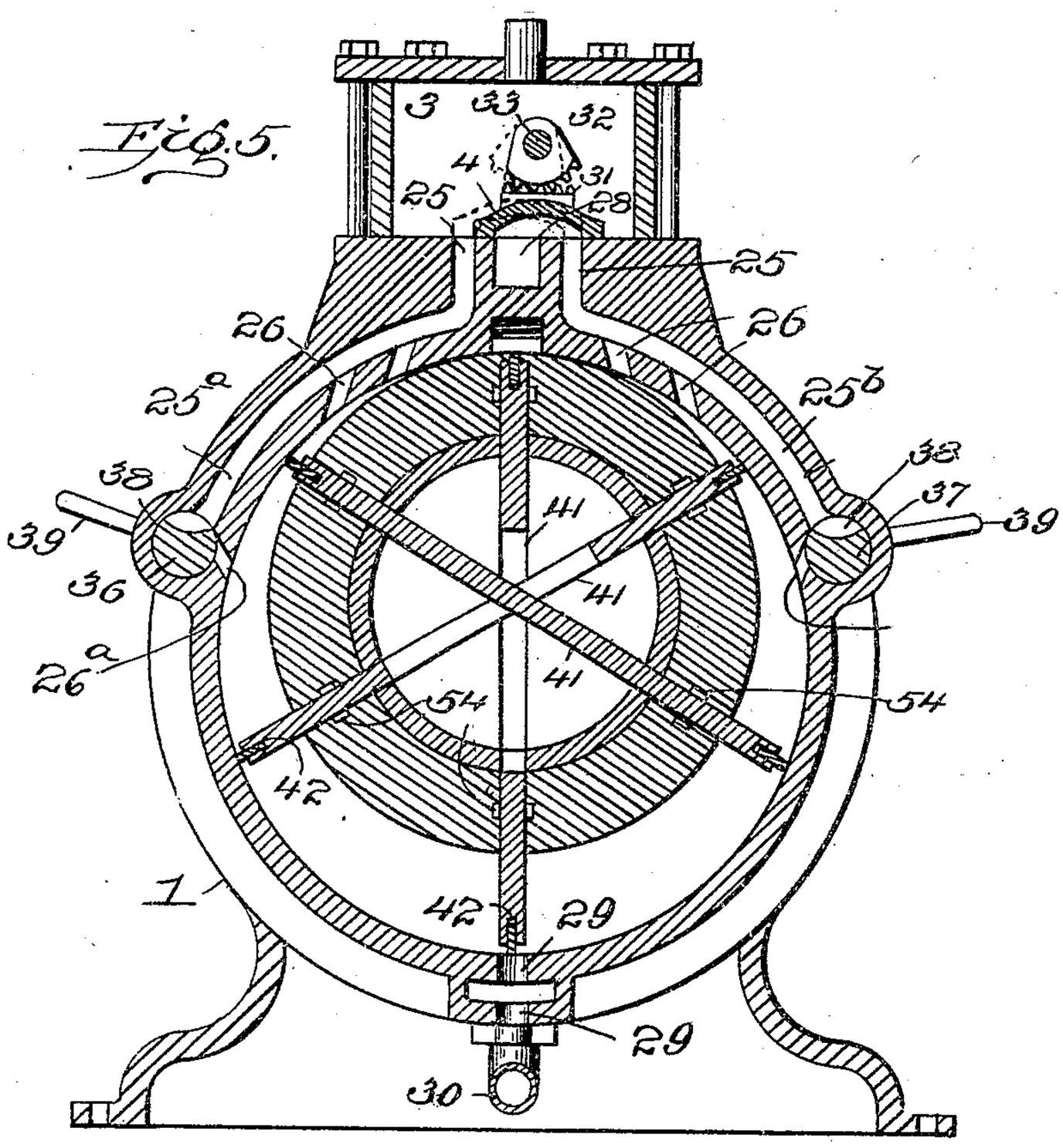


Fig. 7

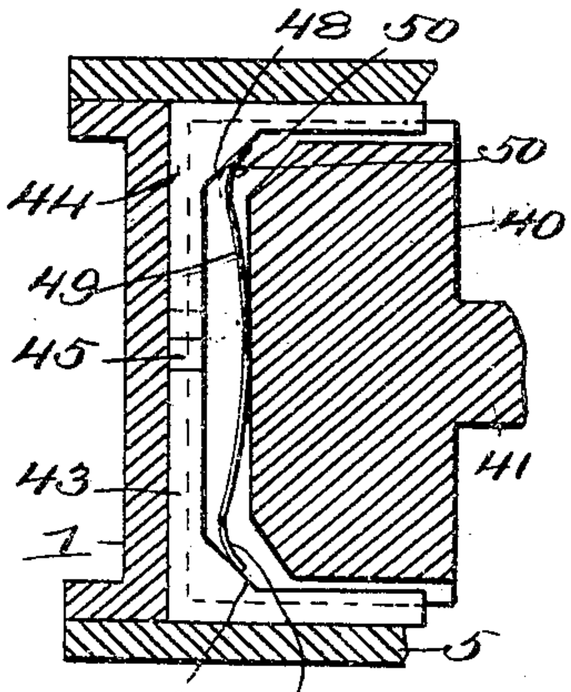


Fig. 6.

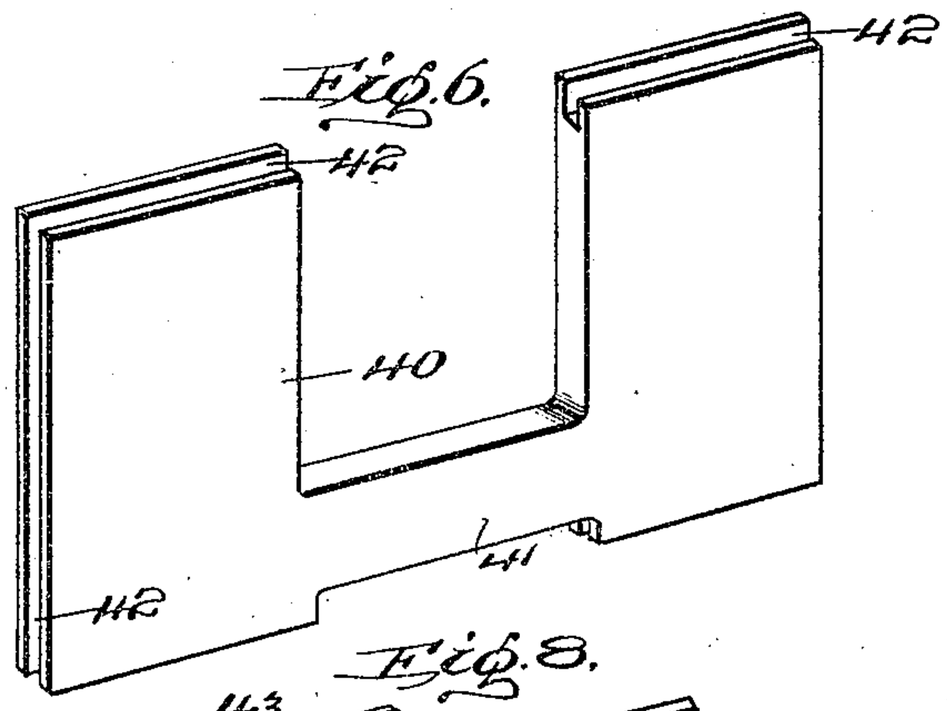
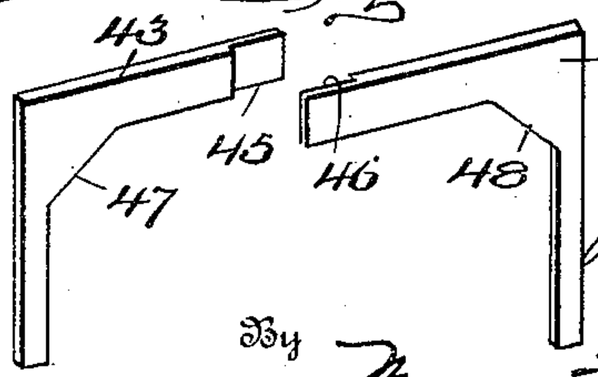


Fig. 8.



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No. 791,939. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

JOHN A. PETERSON, OF SHEFFIELD, PENNSYLVANIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 791,939, dated June 6, 1905.

Application filed February 23, 1905. Serial No. 246,971.

To all whom it may concern:

Be it known that I, JOHN A. PETERSON, a citizen of the United States, residing at Sheffield, in the county of Warren and State of Pennsylvania, 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.

This invention relates to improvements in rotary engines; and it consists in certain novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of an engine constructed in accordance with the present invention. Fig. 2 is a top plan view of the cylinder, the valve-chest and controlling-valve being removed therefrom. Fig. 3 is a central vertical section through the engine, taken at right angles to the axis of motion. Fig. 4 is a detail view in elevation, showing the body portion of the piston. Fig. 5 is a central sectional view through an engine, showing a different manner of constructing and mounting the slides or piston-heads in the pistons. Fig. 6 is a detail perspective view of one of the piston-heads or slides. Fig. 7 is a detail view showing the packing-strips carried by the piston-heads or slides. Fig. 8 is a detail view showing the members of one of said packing-strips. Fig. 9 is a detail sectional view through a portion of the cylinder and a portion of the piston. Fig. 10 is a detail sectional view through a portion of the piston, showing one way of securing the body portion of the piston to the heads thereof.

In the illustration accompanying this application I have shown a preferable construction of the engine, in which—

1 indicates a casing or cylinder, and 2 a rotating piston mounted therein.

3 indicates a steam-chest, and 4 a valve movable therein.

The casing or cylinder 1 is provided with removable heads 5, which are provided with shaft-supporting bearings at 6. The cylinder-heads 5 are formed with recesses at 7 to receive the head or member which carries the bearing 6. The inner surface of each of the heads 5 is formed with an eccentrically-arranged recess 8, in which is fitted one of the end heads 9 of the piston.

The piston 2 is formed with a hollow body portion connected with the end head portions 9 and rigidly connecting the same. The body portion is formed with a series of slots or openings 10, through which the piston-heads or slides 11 pass. In the slots 10 bearing-strips 12 are mounted, the said bearing-strips being approximately semicylindrical and fitting concaved bearing-surfaces 13, formed in the adjacent edges of the body portion of the piston. The inner flat surfaces of each of the strips 12 fit against the side faces of the piston-heads or slides 11, as clearly indicated in Fig. 3. In the rotation of the piston within the casing 1 the piston-heads or slides 11 are thus permitted to slide back and forth through the openings 10 in the body portion of the piston. The strips 12 while permitting of the movement of the said slides or piston-heads also form pressure-excluding joints between the body portion of the piston and the said heads or slides.

The piston 2 is rigidly connected with shaft-sections 14, which extend through the bearings 6, the said shaft-sections being fastened to the heads 9 of the piston. The turning of the piston will thus operate to rotate the shaft-sections 14. The shaft-sections are of course eccentrically mounted with relation to the cylindrical walls of the cylinder 1, and the center of movement of the piston-heads or slides 11 is located at a point concentric with the axis of the cylinder 1, so that the outer edges of the said piston-heads or slides 11 will move against the inner periphery of the cylinder, as indicated in Fig. 3. The said piston-heads 11 are properly centered in the cylinder by means of a crank-shaped member 15, which is loosely mounted within the body portion of the piston 2, but is so held therein that the portion which engages the piston-heads or slides 11 may always remain in a position concentric with relation to the cylinder. The said member 15 is constructed with a shaft portion 16, which engages bearings extend-

ing inwardly from each of the piston-heads 11. To the ends of the shaft portions 16 are secured hangers 17, which extend to one side of the shaft 16 and are provided with bearings 18, which loosely engage studs 19, extending inwardly beyond the inner faces of the heads 9. The studs 19 may be made integral with the said shafts or may be formed upon the inner ends of the shaft-sections 14, which are extended through the heads 9 for this purpose. The shaft portion of the hanger 15 forms a means for pivotally connecting and properly centering all of the piston-heads 11, so that the said piston-heads will always engage the inner surface of the cylinder 1 no matter what the position of the piston 2 within the cylinder. The eccentric mounting of the piston 2 is such that the body portion of the piston extends toward the inner periphery of the cylinder quite closely at one point, the space between the outer periphery of the said piston and the inner periphery of the cylinder widening gradually toward the opposite side of the engine. As shown in the drawings, the piston 2 is arranged so as to contact with the inner periphery of the cylinder at a point adjacent to the inlet-ports leading to and from the valve-chest 3. From this construction it follows that as the piston rotates the piston-heads will project more and more beyond the surface of the body portion of the piston as they recede from the side of the cylinder adjacent to the valve-chest 3. By introducing steam or other pressure into the space between the piston and the cylinder the pressure will be brought to bear upon the projecting ends of the piston-heads or slides 11 and will force the same, together with the body portion of the piston, around within the casing 1. In this way a rotary movement will be communicated to the shaft-sections 4 and of course to any machinery or mechanism which may be connected therewith. The body portion of the piston, it will thus be seen, is driven by the piston-heads, and the pistons are kept in proper relation to the body portion of the piston by the crank-shaped member 15, mounted within the said piston. In order to prevent any back pressure upon the receding pistons as they approach the side of the cylinder adjacent to the valve-casing again, a spring-pressed packing-strip 20 is mounted in a recess 21, formed in the inner face of the cylinder 1. One or more springs of any desired type are mounted in the said recess 21 and force the strip 20 outwardly against the periphery of the piston, making a tight joint between the two at this point.

The cylinder 1 is provided upon its outer surface with thickened portions, as at 23 and 24, for accommodating passage-ways to direct the pressure to the engine-piston and to carry the exhaust from the casing. The thickened portion of the casing 23 is provided with pressure inlet-ports 25, which lead from the valve-chest 3 into the interior of the cylinder at points to one side of the packing-strip 20, as indicated at 26. The said ports introduce the pressure into the cylinder a sufficient distance to one side of the packing-strip 20 to permit the incoming pressure to impinge upon the ends of the piston-heads or slides 11 as they begin to project beyond the body portion of the piston. The thickened portion 24 of the cylinder preferably extends entirely around the same and accommodates the exhaust-passage 27. The exhaust-passage 27 is provided with a port 28, leading into the valve-casing 3. The exhaust-passage 27 is provided with outlet-ports 29, which deliver the exhaust into a discharge outlet or pipe 30.

The valve 4 is a slide-valve and has a reciprocating movement within the casing 3, so as to connect the ports 25 with the exhaust-port 28, at the same time uncovering one of the ports 25 for admitting pressure to one side of the engine. If the engine is to be reversed, the valve is moved to the opposite end of the casing 3, so as to connect the previously-opened port 25 with the exhaust-port 28 and uncover the opposite port 25 for receiving pressure from the valve-casing. The valve 4 is preferably provided with a rack having teeth 31, which are engaged by a toothed segment 32, secured to a rock-shaft 33. The rock-shaft extends outside the casing 3 and is moved by a lever 34, as may be desired, for running the engine in one direction or the other. As shown in Fig. 2, the centrally-arranged exhaust-port 28 enters the valve-casing 3 at about the central portion thereof, while the ports which are used alternately for the inlet of pressure are arranged upon each side thereof. These ports are preferably all made of equal length, so that the hollow slide-valve 4 will readily fit over the same, as shown in Fig. 3. The passage-ways which lead from the ports 25 into the casing of cylinder 1 preferably separate and pass through the thickened portions of the cylinder 23 upon the opposite sides of the central thickened portion 24.

As shown in Fig. 5, the cylinder is so constructed that pressure may be admitted into the interior thereof at points so located that the initial pressure will engage the slides or pistons after they have been projected a considerable distance beyond the surface of the piston. For this purpose the passages 25^a and 25^b, which lead into the casing from the ports 25, are extended almost a quarter of the way around the cylinder, so that pressure may be introduced into the cylinder through the ports 26^a and 26^b in the walls of the said cylinder. The walls of the cylinder are, as stated, provided with ports 26, located at points adjacent to the packing-strip 20, so that after the engine has been started and is running well the pressure may be delivered only through the ports 26, thus having a longer time for bearing upon the piston-heads and exerting its ex-

pansive power thereon. The ports 26[a] are preferably controlled by rock-valves 36 and 37, which may be mounted in bearings 38, formed in the walls of the casing 1. Suitable handles or levers 39 are provided for turning the said valves, and thus opening or closing the ports 26[a] and 26[b]. It will be evident in starting the engine that by leading the incoming pressure to and through the ports 26[a] the initial pressure will be exerted upon one of the piston-heads, which is projected quite a distance beyond the body portion of the piston, and will have an immediate effect in causing the rotation of the said piston. As soon as the engine is well under way more benefit is obtained from the incoming pressure by closing the port 26[a] by means of the valve 36 and causing all of the pressure to enter through the ports 26 at a point higher in the cylinder. The port 26[a] and the valve 36 are of course used in this manner when running the engine in one direction. When the engine is reversed, the port 26[b] and the valve 37 are used in this manner for starting the engine. As shown in said Fig. 5, also the piston-heads instead of being jointed at the center of the engine may be made of single pieces of material, as illustrated in Fig. 6, the said piston-heads 40 thus formed extending entirely across the chamber within the engine-casing. When this form of piston-head is employed, they are so cut centrally that they may extend past each other without interfering with the movement of any of them. The said pistons for this purpose are reduced in size at the center, as indicated at 41, so that they may pass each other. Two of the pistons are formed with a reduced portion 41 at their outer edges, while the third one is formed with its reduced portion at the center.

The manner of packing the edges of the piston-heads which engage the inner surface of the cylinder forms an important feature of the invention. As indicated in Figs. 6 and 7, the edges of the piston-heads are grooved, as at 42, in which are mounted the members 43 and 44 of a composite packing-strip. These packing-strip members are made angular, so as to form means for packing the piston-heads both at the end and at the side. The packing-strip members are made with lapped offset meeting ends, the said ends being reduced in thickness, as at 45 and 46, for this purpose. At the inner angle of each of said strip-sections inclined surfaces 47 and 48 are provided, which are engaged by the ends of the springs 49, which are mounted in the end grooves of the piston-heads. The ends of the edge spring 49 are preferably curved, as at 50, so as to operate against the inclined surfaces 47 and 48, and in this manner one spring is capable of forcing the packing-strips outwardly, not only against the cylindrical portion of the casing, but against the inner surfaces of the heads 5. The lapping joint formed by the reduced ends 45 and 46 permit the strip-sections to separate more and more as the strips become worn in the use of the engine. In this manner the strips will always maintain a tight pressure-retaining joint between the piston-heads and the casing. The piston may be further provided with packing means to render the engine tight and practically non-leakable, especially by providing packing-rings, as 53, in the periphery of the piston-heads 9. The packing-strips are thus so located that they will engage the eccentric recess formed in the heads of the cylinder, making a tight joint at this point. In the form of piston-head shown in Fig. 5 the parts of the piston which engage the piston-heads may be provided with suitable packing, as at 54 and at any other points where it may be found desirable without affecting the spirit of the invention.

While the piston may be formed of head portions 9, between which are secured segmental pieces forming the head 2 by merely securing such pieces to the heads with screws, bolts, or the like, I preferably form projecting flanges or securing edges 55 upon the ends of the said segmental pieces, as 56, which form the body portion 2 and fit the same into segmental grooves 57, formed in the inner surfaces of the heads 9. In this manner the piston may be made more rigid and strong.

As illustrated in Fig. 1, the bearings 6 may be provided with adjusting bearing-blocks 51, which are fed forward by means of set-screws 52, there being preferably at least three of such blocks arranged around the shafts 14, so as to take up any wear occasioned by the running of the engine.

For operating the engine pressure is introduced into the valve-chamber 3, this pressure being preferably steam. The valve 4 is moved so as to introduce the pressure to the inlet-ports 25. When the engine is to be run in one direction—as, for instance, that indicated by arrows in Figs. 3 and 5—the valve is moved so as to uncover one of the ports 25, and the pressure will be permitted to enter through the ports 26 and at the starting of the engine through the port 26[a], the valve 36 being properly turned for this purpose. As soon as the engine has gained proper headway the valve 36 is generally closed, so that all the steam passes through the ports 26. The pressure is thus directed to the interior of the casing at such a point that its expansive power will continually have opportunity for acting upon the increasing surface of the piston-head, which is at that time being forced beyond the periphery of the body portion of the piston. The steam or other pressure will have an opportunity to further expand until the piston-head passes the exhaust ports or outlets 29. The engine may be then exhausted through said ports, and some of the exhaust will pass directly out through the aperture 30. Any remainder of the steam or

other pressure-producing agent which may be entrapped between the piston-heads and the casing will find its way through the ports 26 and be directed, by means of the valve 4, from the port 25, which is covered thereby, into the exhaust-port 28 and may thus find its way through the circular passage 27 to the exhaust-outlet 30. In reversing the engine it is only necessary to move the valve 40 to the opposite end of the valve-casing 3, as indicated in dotted lines in Fig. 3. By moving the valve to an intermediate point, so as to cover all of the parts which enter the valve-casing 3, the engine may be stopped, for the admission of pressure thereto will thus be cut off.

The parts of the invention as above described are simple in structure and not likely to get out of order easily and yet are effective for the desired purpose. The engine is so constructed that a minimum of wear upon the parts will be had, though the engine may be capable of developing tremendous speed. The packing-strips will take up any wear in the parts and will maintain a tight joint both at the ends and sides of the piston-heads.

I consider that any minor changes in the details of construction are well within the scope of the invention.

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

1. A rotary engine, comprising a cylinder, a piston moving therein, a shaft connected with the piston, piston-heads slidably mounted in the piston, and a loosely-mounted centering member within the said piston for properly controlling the position of the piston-heads.

2. A rotary engine, comprising a cylinder, a piston revolubly mounted therein and arranged eccentrically within the cylinder, sliding piston-heads projecting through the walls of the piston, and a loosely-mounted member arranged within the piston for centering the action of the piston-heads with respect to the cylinder.

3. A rotary engine, comprising a casing, an eccentrically-mounted piston therein, shaft-sections connected with each end of the piston, movable piston-heads carried by the piston, and a crank member loosely mounted within the piston and movably holding the piston-heads in a concentric relation to the cylinder.

4. A rotary engine, comprising a cylindrical casing, a rotating piston mounted therein, comprising a body portion having peripheral slots, heads secured to the ends of the body portion, shaft-sections rigidly secured to the heads and projecting through the ends of the casing, piston-heads or slides extending through the slots in the body portion of the piston, packing-strips forming bearings for said piston-heads and mounted in said slots, inwardly-projecting bearings extending from each piston-head or slide, a shaft pivotally connecting all of said bearings, and hangers at the ends of said shaft loosely engaging journals extending inwardly from the heads of the piston for properly centering the action of the piston-heads.

5. A rotary engine, comprising a casing, a piston member revolubly mounted therein, comprising a body portion made up of segments extending across the cylinder, connecting ends for joining the same, shaft-sections rigidly secured thereto and projecting outside the cylinder, studs extending inwardly from the shaft-sections, piston-heads or slides extending between the segmental portions, hangers or links movably engaging the said studs, and a shaft carried by said hangers and engaging the slides for centering their movement within the cylinder.

6. A rotary engine, comprising a casing having a revolubly-mounted piston therein, the said casing having inlet-ports extending partially around the same and means for temporarily introducing an initial pressure into the cylinder at an advanced point with relation to the movement of the piston for exerting a greater starting-pressure on said piston.

7. A rotary engine, comprising a casing having peripheral passage-ways formed therein and extending partially around the cylinder, means for controlling the introduction of pressure to the passage-ways, and starting-valves mounted across the said passage-ways for admitting a starting-pressure to the engine until the same is under way.

8. A rotary engine, comprising a casing having an exhaust-passage formed in its walls and extending entirely around the cylinder, inlet-passages being also formed in said walls and extending only partially around the cylinder, a valve for controlling the admission of pressure to said inlet-passages and valves for controlling the admission of inlet-pressure at certain points for facilitating the starting of the engine.

9. A rotary engine, comprising a casing, a revoluble piston mounted therein, piston-slides carried by the piston, end and side packing-strips carried by the piston-slides and having oblique surfaces adjacent to their corners, and springs bearing upon the said oblique surfaces for forcing the packing-strips in both directions simultaneously.

10. A rotary engine, comprising a cylinder, a revoluble piston mounted therein, having slides forming piston-heads, expansible packing-strips having oblique inner bearing-surfaces carried by each of said slides and a single spring engaging at its ends the said oblique bearing-surfaces of each of said expansible strips for forcing the same laterally and radially simultaneously.

11. A rotary engine, comprising a casing, a revoluble piston mounted therein, slides carried by the piston, sectional packing-strips

carried by the slides and engaging the peripheral and side walls of the casing, each of said sections having bearing-faces inclined with respect to the said peripheral and side walls, and a spring carried by each slide and bearing with its ends upon the said inclined faces.

12. A rotary engine, comprising a cylinder, a revoluble piston mounted therein having peripherally and laterally extending grooves, expansible packing-strips mounted in said grooves and having oblique corner-bearings, and a single spring mounted in each groove and capable of pressing on said corner-bearings of the expansible strips for forcing them simultaneously against the peripheral walls and the end walls of the cylinder.

13. A rotary engine, comprising a cylinder, a piston revolubly mounted therein having piston-heads or slides projecting therefrom and formed with grooves in the ends and side edges thereof, sectional angular packing-strips mounted in said grooves and formed with reduced meeting ends, the said strip-sections having inclined faces formed thereon opposite to their angular portions and springs mounted in the grooves and having their ends only engaging the said inclined surfaces for simultaneously forcing the strip-sections outwardly and laterally.

14. A rotary engine, comprising a cylinder having end walls formed with eccentrically-arranged recesses, a piston mounted within the cylinder, the ends of the piston fitting into said eccentric recesses, shaft-sections rigidly connected with the ends of the piston, slides movably extending through the piston and engaging the walls of the cylinder and a loosely-arranged member carried within the piston for properly centering the slides with respect thereto.

15. A rotary engine, comprising a casing having inlet-passages formed in thickened portions of its walls, the said passages also having a series of ports opening into the cylinder, and means capable of closing some of the ports so that pressure will only enter through the other ports.

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

JOHN A. PETERSON.

Witnesses:

JOHN SWANSON,

Y. L. STONE.