No. 885,732. PATENTED APR. 28, 1908.

P. J. DARLINGTON.

ROTARY MOTOR.

APPLICATION FILED JAN. 20, 1908.

2 SHEETS—SHEET 1.

FIG. 1

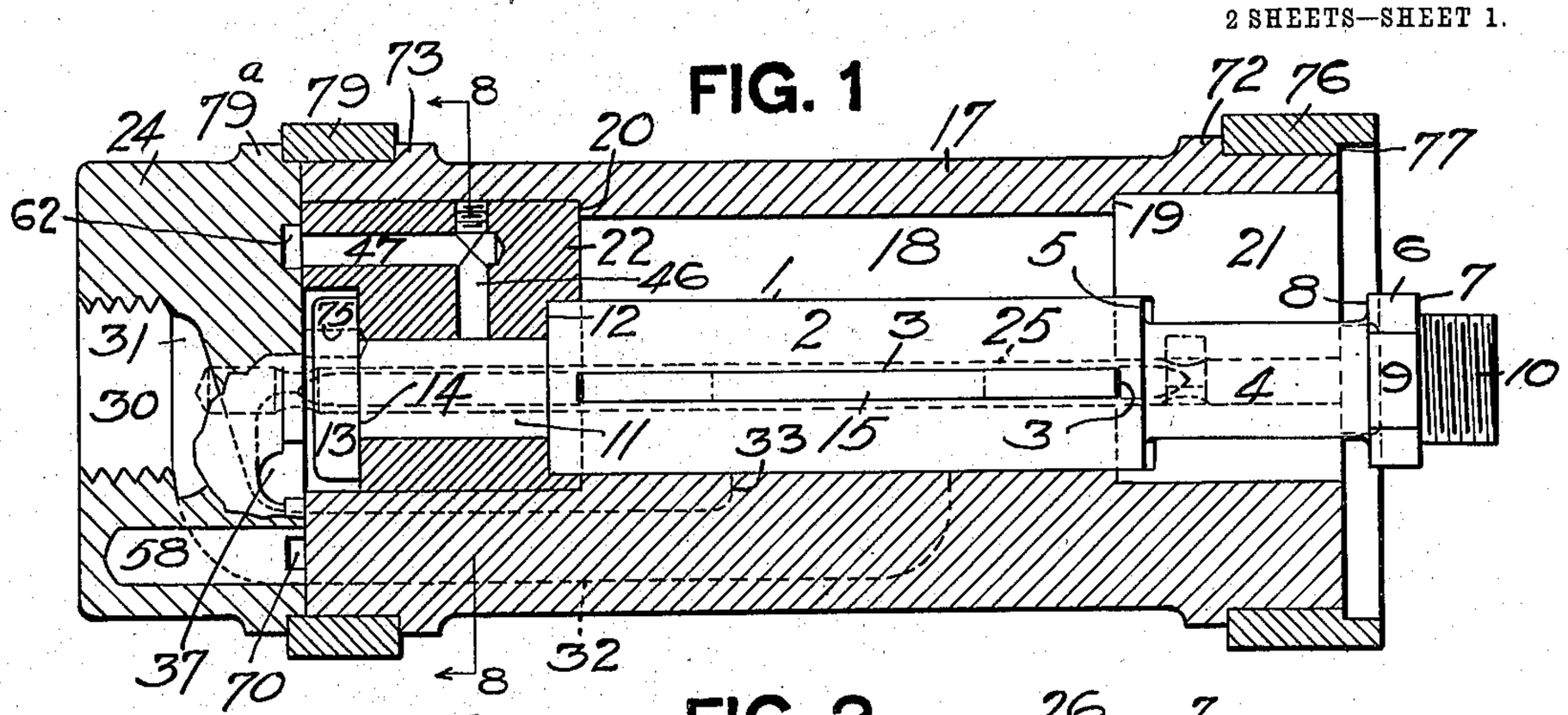


FIG. 2

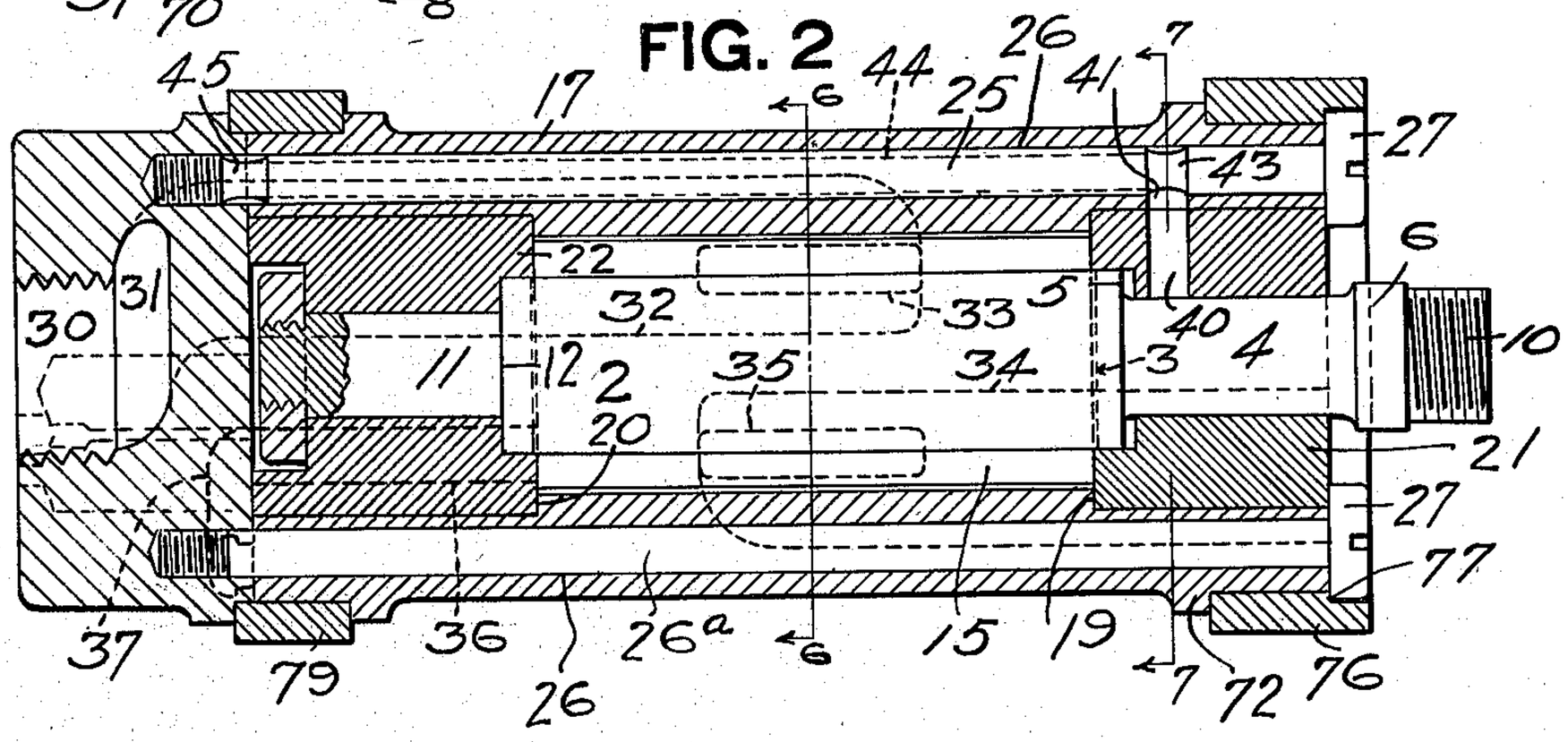


FIG. 3

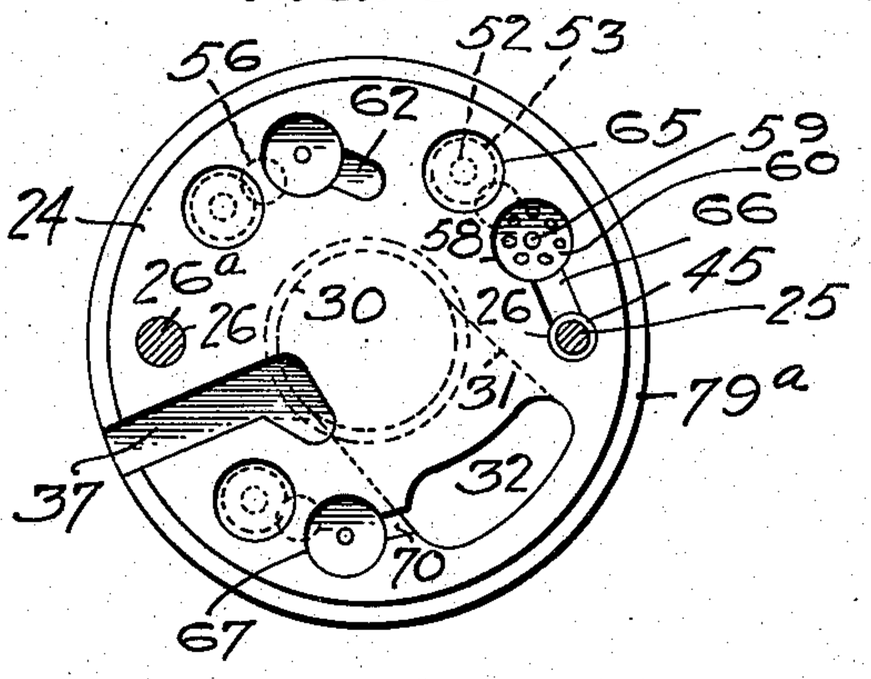
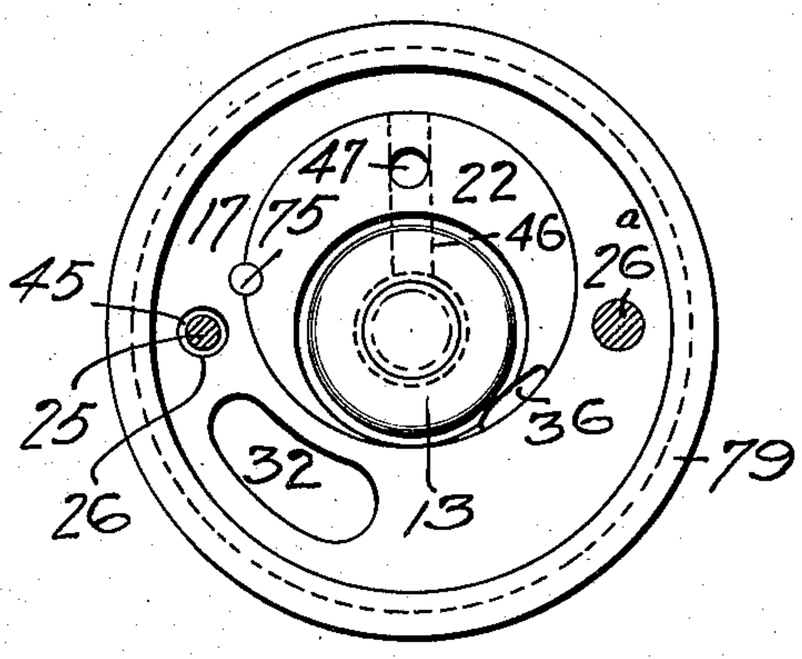


FIG. 4



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2 SHEETS—SHEET 2.

FIG. 5

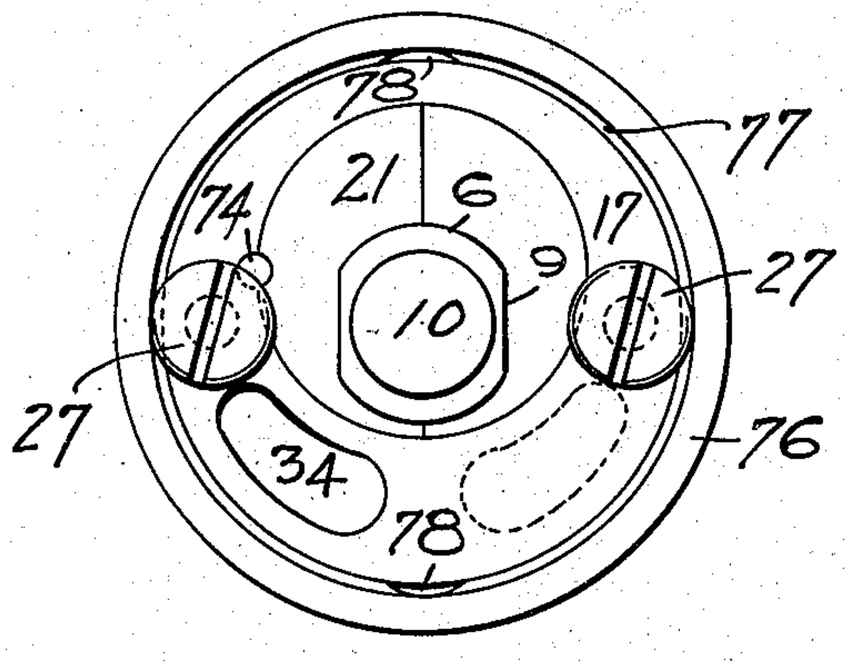


FIG. 6

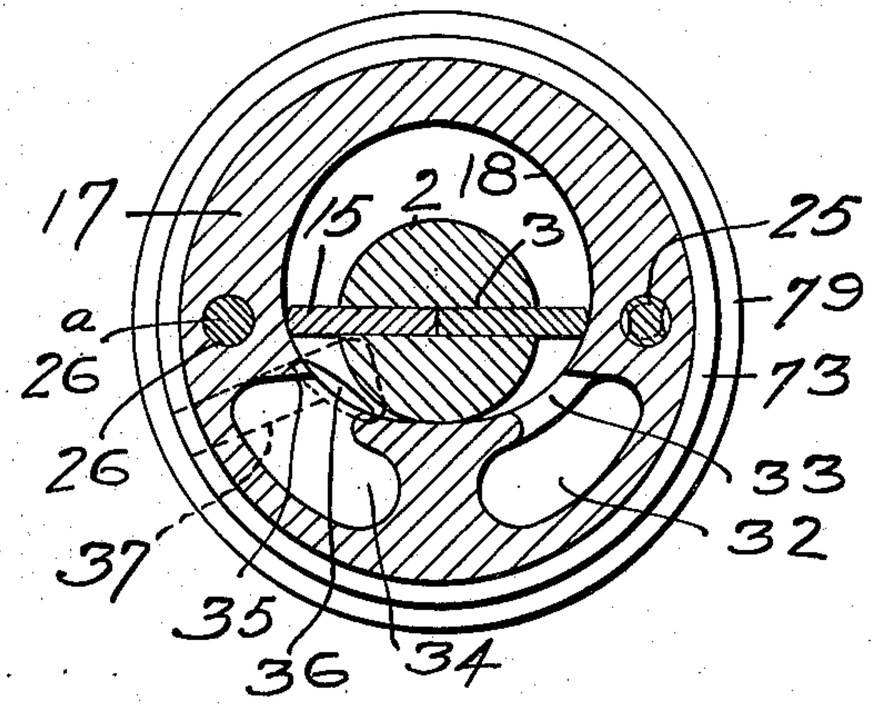


FIG. 7

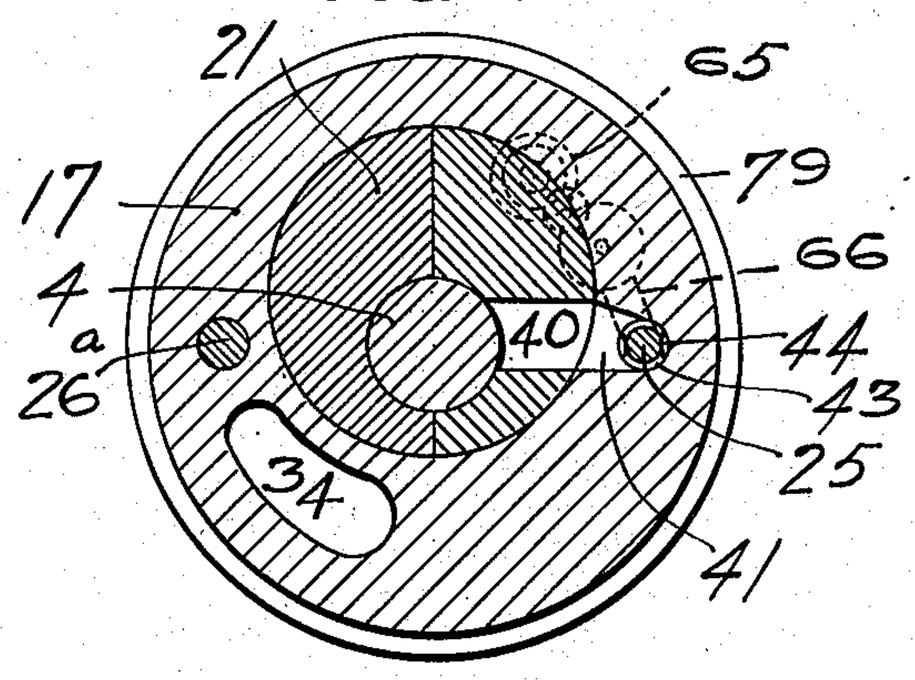


FIG. 8

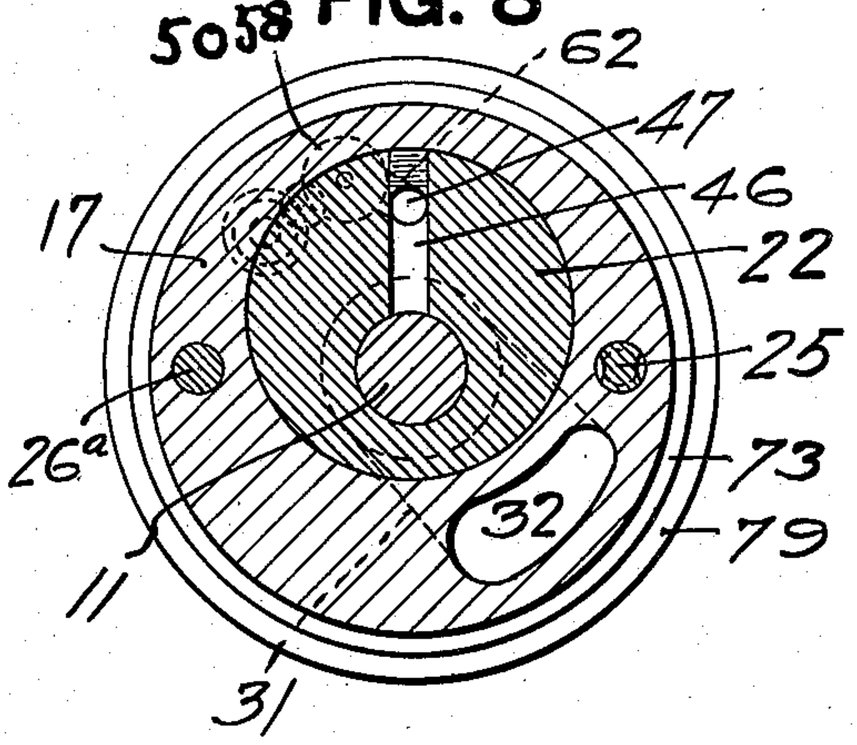


FIG. 9

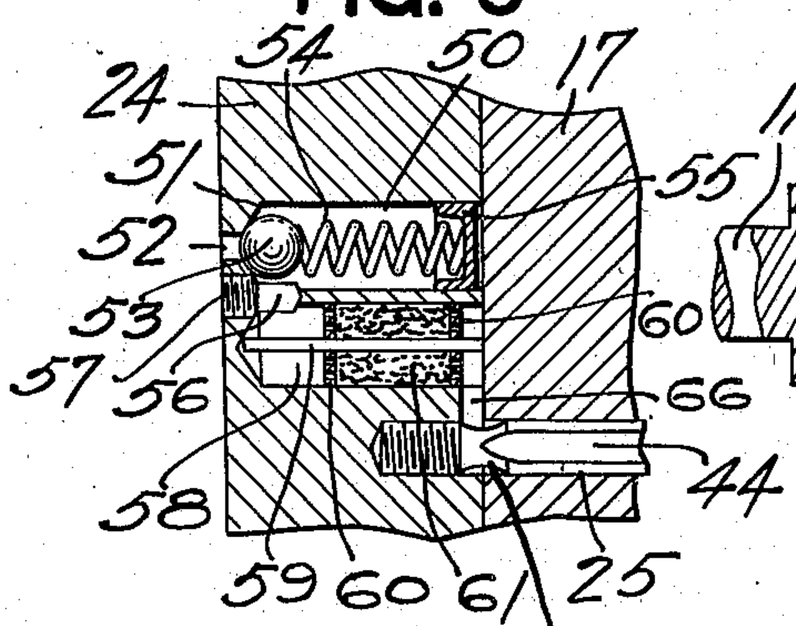
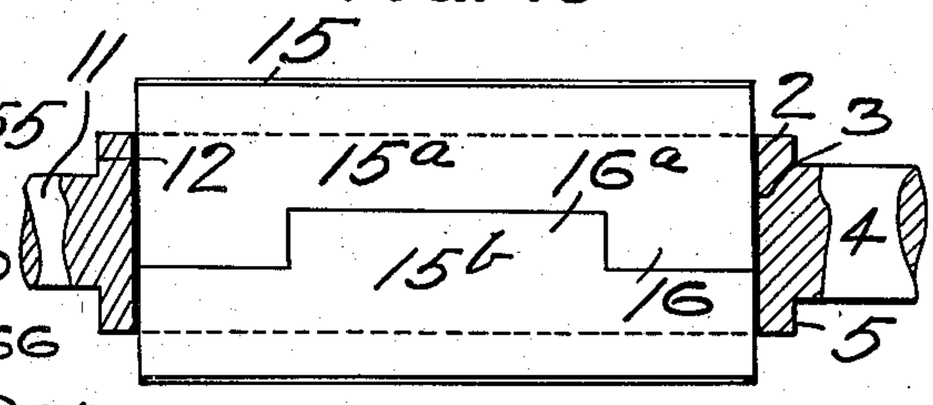


FIG. 10



WITNESSES.

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UNITED STATES PATENT OFFICE.

PHILIP J. DARLINGTON, OF PITTSBURG, PENNSYLVANIA.

ROTARY MOTOR.

No. 885,732. Specification of Letters Patent. Patented April 28, 1908.

Application filed January 20, 1908. Serial No. 411,632.

To all whom it may concern:

Be it known that I, PHILIP J. DARLINGTON, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rotary Motors; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to motors, and more particularly to motors arranged to be passed through boiler tubes and the like for the purpose of driving tools to remove the scale therefrom, although it may be used for various other purposes.

The particular object of the invention is to provide a motor which is capable of operation by compressed air, which is powerful, compact, simple and cheap of construction, and easily repaired.

With these and other objects in view the invention consists in the novel construction, arrangement and combination of parts as hereinafter described and claimed.

In the accompanying drawings Figure 1 is a longitudinal section through a motor embodying my invention; Fig. 2 is a similar section taken at right angles to the section of Fig. 1; Fig. 3 is a view looking at the inner face of the rear head; Fig. 4 is a view looking at the rear end of the motor with the rear head removed; Fig. 5 is a view looking at the front end of the motor; Figs. 6, 7 and 8 are transverse sections taken respectively on the lines 6—6, 7—7 and 8—8 of Figs. 1 and 2; Fig. 9 is a section longitudinally of the motor through one of the oiling devices in the rear head, and Fig. 10 is a detail view of the piston blade.

In the drawing 1 designates the rotary piston which has the central rotary cylindrical portion 2 provided with a diametric slot 3 therethrough, which slot extends lengthwise nearly to the ends of the cylindrical body portion of the piston. Said piston is provided with the front journal portion 4 of reduced size and forming a shoulder 5 with the body portion and having an enlarged end portion 6 providing front and rear shoulders 7 and 8 and being provided with flat faces 9 to receive a holding wrench, and having beyond said enlarged portion a reduced threaded portion 10 for the attachment of a tool. The piston also has a reduced rear journal portion 11 forming a shoulder 12 with the cylindrical body portion and having an enlarged rear end portion 13 forming a shoulder 14 with the journal portion. In the diametric slot of the piston is seated a flat piston blade 15 of a width exceeding the diameter of the piston and having its longitudinal edges of semi-circular contour in cross section. This blade is split or divided longitudinally into two portions 15^a and 15^b, which are provided on their meeting edges with projections 16 and 16^a fitting loosely together. This construction permits the two sections of the blade to separate and move outwardly slightly to compensate for wear on their edges and maintain contact with the wall of the cylinder, while by having the inter-fitting projections on their meeting edges the blade sections are more deeply seated and securely supported in the slot of the piston than would be the case if their meeting edges were straight.

17 is a cylinder provided eccentrically therein with the bore or chamber 18 and having the piston located eccentrically in said chamber but concentric in the cylinder regarding its exterior, and contacting with the wall of the cylinder along a line. The chamber is of cylindrical form and bounds the space swept by the blade 15 while revolving around its own central longitudinal axis, while that axis revolves around another axis parallel thereto and at double the angular velocity, this parallel axis being so located that both edges of the blade will keep in contact continuously with the cylinder wall during the rotation of the piston.

Both ends of the cylinder are counterbored concentric with the interior of the cylinder to provide internal shoulders 19 and 20, respectively. Fitted in the counter-bore in the front end of the cylinder and abutting against the internal shoulder 19 is a split bushing 21 provided with an eccentric bore to receive the front journal portion of the piston 1 and being counter-bored at its inner end to receive the end of the cylindrical body portion of said piston, the latter extending into said counter-bore up to the front end of the slot 3. Similarly seated in the counter-bore in the rear end of the cylinder is a bushing 22 abutting against the internal shoulder 20 and likewise having an eccentric bore adapted to receive the rear journal portion of the piston, said split bushing being counter-bored eccentrically at its forward end to receive the rear end of the body portion of the piston up to the slot 3 therein, and forming a thrust bear-

ing with the rear shoulder 12 of said body portion. The bushing 22 is also counter-bored eccentrically in its rear face to receive the rear enlarged end portion 13 of the piston and form a thrust bearing with the front face or shoulder 14 of said enlarged portion. The bushing 22 is not split, and the enlarged portion 13 is threaded onto the end of the journal 11.

At the rear end of the cylinder is a head 24 which is secured in place by means of a pair of long screws 25 extending through holes 26 in the cylinder and provided at their forward ends with shouldered heads 27 and being threaded into the rear head 24. This rear head is provided with a central threaded opening 30 for the attachment of a hose, said opening communicating through a passage 31 with a longitudinal admission port 32 formed in the cylinder and communicating with a cross admission port 33 which opens into the cylinder chamber or bore.

34 is a longitudinal exhaust port opening through the front end of the cylinder and communicating with an exhaust cross port 35 which opens into the inside of the cylinder at a point on the opposite side of the line of contact of the piston with the wall of the cylinder from the admission cross port 33.

The rear bushing 22 is formed with an air balance passage 36 running from its front face to its rear counter-bore and forming a communication from the space at the end of the piston to the inside of the cylinder chamber at a point axially in line with the exhaust cross port 35. The head 24 is provided with a groove 37 leading from its exterior toward its center and at its inner end communicating with the counter-bore in the rear end of bushing 22, said groove 37 forming a relief vent to relieve air pressure behind the piston in the chamber formed by said counter-bore.

The front bushing is provided with a transverse oil passage 40 for lubricating the front journal of the piston. This oil passage at the outer face of the bushing communicates with an oil passage 41 in the cylinder wall, the latter communicating with an annular groove 43 in bolt 25. The bolt is also provided with a longitudinal passage or groove 44 communicating with an annular groove 45 near the rear end of said bolt. The rear bushing is provided with the cross oil port 46 communicating with its bore and with a longitudinal oil port 47 opening through the rear face of said bushing.

The head 24 is furnished with three sets of oil supply pockets or reservoirs, one set for supplying oil to the passage 47 in the bushing 22, another for supplying oil to the longitudinal groove of bolt 25, and another for supplying oil to the longitudinal admission port 32 of the cylinder. As these are substantially similar, a description of one will suffice for all. Fig. 3 shows the arrangement of these various groups of oiling devices, while Fig. 9 shows the detail of construction of one thereof, and is as follows: A bore 50 is formed in the head 24 from its front face and ends in a conical shoulder 51 and is continued as a smaller hole 52 leading out through the rear face of the head. A ball valve 53 of a diameter less than bore 50 and larger than the hole 52 is normally held against said conical shoulder by means of the spiral spring 54, which at its forward end bears against a cap or cup 55 which is tightly driven into the bore 50 and prevents the spring and ball from falling out when the head 24 is removed from the cylinder. This ball normally closes the hole 52. 56 is another bore closed at its rear end by plug 57 and forming a passage between the bore 50 and a bore 58 extending from the front face of the head and being closed at the rear. In the bore 58 is a bobbin formed by the stem 59 and perforated disks or flanges 60 thereon. Said stem projects beyond the disks as shown so as to space the same from the end walls of the bore. Surrounding said stem between said disks or flanges is a coil 61 of lamp wick or other absorbent material, loosely filling the space between the disks and acting as an absorbent of the oil and preventing the same from suddenly flowing into the machine but causing the same to flow slowly and gradually thereinto. The forward end of chamber 58 communicates through a groove 62 with the longitudinal oil port 47 in the bushing 22. Similarly the group of oiling devices designated 65 communicates through a groove 66 with the annular groove 45 of bolt 25, while the group of oiling devices designated 67 communicates through a groove 70 with the longitudinal admission port 32.

The cylinder 17 externally has the central cylindrical portion concentric with the piston and is provided with front and rear flanges 72 and 73 respectively. A front dowel pin 74 and a rear dowel pin 75 are each set half in the cylinder and half in the front and rear bushings 21 and 22 respectively and serve to hold said bushings against rotation. A front removable shoe ring 76 of larger diameter than the cylinder is fitted onto the front reduced portion thereof against the shoulder formed by the flange 72 and extends axially beyond the front face of the cylinder and is counter-bored from its front to an internal shoulder 77 flush with the end face of the cylinder. Two diametrically opposite semicircular grooves 78 are formed in the internal surface of this ring from the shoulder 77 to its rear face, and of such radius as to clear the heads of the bolts 25 and 26 when brought into alinement therewith, so as to allow the removal of the ring 76 without removing the bolts. When assembled the shouldered heads of the bolts bear simultaneously on the front face of the bushing 22,

on the dowel pin 74, and on the internal shoulder 77 of the front shoe ring and hold all of these parts in position.

79 designates a rear removable shoe ring also of larger diameter than the cylinder and fitted onto the rear reduced end thereof against the shoulder formed by the flange 73 and also extending axially beyond the rear face of the cylinder. The rear head 24 is concentric with the cylinder and is provided with a seat fitting inside of the axial extension of the rear shoe ring and bearing against the rear face of the cylinder, being provided with an external flange 79[a] providing a shoulder bearing against the rear face of the rear shoe ring, thus holding the latter in place.

The operation is as follows: Air under pressure enters from a hose or the like into the rear opening 30 and thence through the longitudinal admission port 32 to the inside of the cylinder behind the blade, thereby rotating the piston, and escapes through the exhaust ports 34 and 36. The absorbent coil 61 retards the flow of the oil and distributes it over a considerable time, thereby preventing the oil from quickly flowing into the bearings and being quickly blown away leaving the bearings dry. The front shoe ring 76 can be very readily removed and replaced when worn by a new one, or replaced by one of larger size. This permits the boiler to be rough cleaned with one tool, and then by replacing the shoe ring with a slightly larger one the tubes can be finished with another suitable tool.

The motor is compact, durable, simple and easily inspected and repaired.

What I claim is:

1. A rotary motor comprising a cylinder, a piston therein, a bearing for said piston closing the front end of the cylinder, a head at the rear end of the cylinder, and headed bolts extending longitudinally through the cylinder into the rear head and having their heads overlying the front face of the bearing.

2. A rotary motor comprising a cylinder open at both ends and counterbored from the ends to form shoulders, a piston in said cylinder, bushings in the counterbores and seating against the shoulders in the cylinder, a head fitting against the rear end of the cylinder, and headed bolts extending through the cylinder into the rear head and having their heads overlying the front face of the front bushing.

3. A rotary motor comprising a cylinder, a piston therein, a bushing fitting in the front end of the cylinder, a dowel fitting in alining grooves in the cylinder and bushing, a head fitting against the rear end of the cylinder, and headed bolts extending longitudinally through the cylinder and into the rear head and having their heads overlying the front face of the bushing and the dowel.

4. A rotary motor comprising a cylinder open at both ends, a piston in said cylinder, bearings fitting in the ends of said cylinder, dowels or keys fitting in alining grooves in the cylinder and said bearings, a head fitting against the rear end of the cylinder, and headed bolts extending longitudinally through the cylinder and into the rear head and having their heads overlying the front face of the front bearing and the dowel.

5. In a rotary motor a cylinder having externally shouldered portions at its ends, shoe rings fitting said shouldered portions, a head fitting one end of the cylinder and bearing against one shoe ring, and headed bolts extending through the cylinder radially internal to said shoe rings and into said head and having their heads overlapping a portion of the other shoe ring.

6. A rotary motor comprising a cylinder having its end shouldered exteriorly, a shoe ring fitting said end and counterbored internally to a shoulder, and headed screws extended into the cylinder radially internal to said shoe ring and having the heads bearing against said shoulder of the shoe ring.

7. A rotary motor comprising a cylinder having its end shouldered on the exterior, a shoe ring fitting said shouldered portion of the cylinder and counterbored internally to a shoulder, headed screws extending into the cylinder and having the heads overlapping said shoulder of the shoe ring, said shoe ring being cut away on the interior to a radius greater than that of the heads of the screws.

8. A rotary motor comprising a cylinder, a piston therein provided with a journal having an enlarged head on its rear end, a bushing forming a bearing for said journal and counterbored from its rear face to form a chamber for the journal head, and a head secured against the end of said cylinder and provided on its inner face with a radial vent groove communicating with said chamber.

9. A rotary motor comprising a cylinder, a piston therein having a reduced journal and an enlarged head at the end of said journal, a bushing in said cylinder forming a bearing for the journal and counterbored in front and rear faces to receive respectively the body of the piston and said journal head, said bushing having in addition to its journal bore a passage connecting its two end faces, and a head at the end of the cylinder closing the rear counterbore of said bushing and provided on its inner face with a radial vent groove communicating with the rear counterbore of the bushing.

10. A rotary motor comprising a cylinder, a piston therein, a bearing in the front end of said cylinder having a cross port, a head fitted to the rear end of the cylinder and provided with an oil reservoir, and a screw extending longitudinally through the cylinder and into the rear head and provided with a

portion of reduced section communicating with the oil reservoir in said head and with the cross port in the bearing.

11. A rotary motor comprising a cylinder, a piston therein, a front bearing for said piston provided with a cross port, a head fitted to the rear end of the cylinder and provided with an oil reservoir, and a screw extending longitudinally through the cylinder into said head and provided with an annular groove communicating with said cross port, another annular groove communicating with the oil reservoir and a reduced section connecting said annular grooves.

12. In a rotary motor, an oil reservoir, a passage leading from the same to a piston bearing, a bobbin in said passage comprising a reduced central portion and perforated disks, and a coil of absorbent material between said disks.

13. A rotary motor comprising an externally cylindrical casing having an eccentric bore with a counterbore from the end thereof to an internal shoulder, an eccentric bushing seated in said counterbore against said shoulder, and a rotary piston journaled in said bushing and contacting along a line with the bore of the casing.

14. A rotary motor comprising a casing having a cylindrical external form and a cylindrical internal seat eccentric to said external form, an eccentric bushing fitted in said seat, a rotary piston journaled in said bushing, headed screws supported in said casing radially external to said bushing, and having heads overlying and engaging the end face of said bushing.

15. A rotary motor comprising a cylindrical casing having an eccentric cylindrical end bore and a port or passage extending longitudinally from an end face of said casing axially past and radially outside of said end bore and communicating with the interior of said casing, a bushing seated in said end bore, and a rotary piston journaled in said bushing and contacting along a line with the internal wall of said casing.

16. A rotary motor comprising a cylindrical casing having an eccentric bore and an eccentric end counterbore forming an internal shoulder, a bushing seated in said counterbore against said shoulder and having a cylindrical pocket or counterbore in its outer face, a rotary piston journaled in said bushing and having an enlarged end collar in said pocket or counterbore and forming a thrust bearing with the end wall thereof, and a head secured to the end of said casing and closing the open end of said pocket in said bushing.

17. In a rotary motor, a cylindrical casing, a bushing seated in the end of said casing, a rotary shaft journaled in said bushing and extending the greater part of the distance therethrough, and a head detachably secured to said casing closing the end of said bushing, a balance port or passage communicating between the space behind the end of said shaft within said bushing and the interior of said casing.

18. A rotary motor comprising a cylindrical casing having an eccentric bore, a front and a rear end bushing seated in said eccentric bore, a rotary piston journaled in said bushings concentric with said casing, a rear end head bearing simultaneously on the rear face of said casing and on the rear face of the rear bushing, long screws passing through said casing and having engagement with said head and having heads overlying and bearing upon said front bushing to hold together and in place said casing, end head and bushings.

19. A rotary motor comprising a cylinder, a bushing seated in the front end of said cylinder, a ported head bearing on the rear face of said cylinder, and long screws passing through said cylinder into said head at a radius beyond the outer surface of said bushing and furnished with enlarged heads overlying and bearing upon the front face of said bushing to hold it in place.

20. A rotary motor comprising a rotary slotted piston, a flat blade free to slide in the slot of said piston, a cylinder having an exhaust port and an admission port and having a bore contacting with said piston between said admission and exhaust ports, a bushing rotatably supporting said piston, and a head detachably secured to said cylinder and closing the end of said bushing and forming therewith a chamber at the end of said piston, said bushing being formed with a port or passage communicating from said chamber to the interior of the cylinder axially opposite the exhaust port.

21. A rotary motor comprising a rotary piston having a body portion with a longitudinal slot extending near to each end thereof and having a reduced journal portion and an enlarged end thrust collar, and a bushing externally eccentric to said piston and mounting said journal portion thereof and counterbored from one face to receive the end of said body portion to said slot, and counterbored from the other face to receive said thrust collar forming a thrust bearing therewith.

22. A rotary motor comprising a cylinder, an external ring fitted over the end of said cylinder, and a screw mounted in said cylinder inside said ring and having a head overlying and bearing upon the outer face of said ring to keep it from coming off.

23. A rotary motor comprising a cylinder, an external ring, a rotary piston, a bushing seated in the bore of said cylinder and journaling said piston, and a screw mounted in said cylinder radially between said bushing and said ring and having a head overlying

and engaging said ring and said bushing to hold both axially in place.

24. A rotary motor comprising a cylinder with a hole from end to end thereof, a rear head furnished with an oil pocket communicating with said hole, a screw seated in said hole having engagement with said cylinder and with said rear head to hold them together, said screw being reduced in section to pass oil along it from said pocket to an oil passage in the front end of said cylinder.

In testimony whereof, I the said PHILIP J. DARLINGTON have hereunto set my hand.

PHILIP J. DARLINGTON.

Witnesses:
JOHN H. VOORHEES,
HATTIE CLEAVES.