

F. C. FRANCISCO.
ROTARY ENGINE.

APPLICATION FILED MAY 23, 1904.

NO MODEL.

2 SHEETS—SHEET 1.

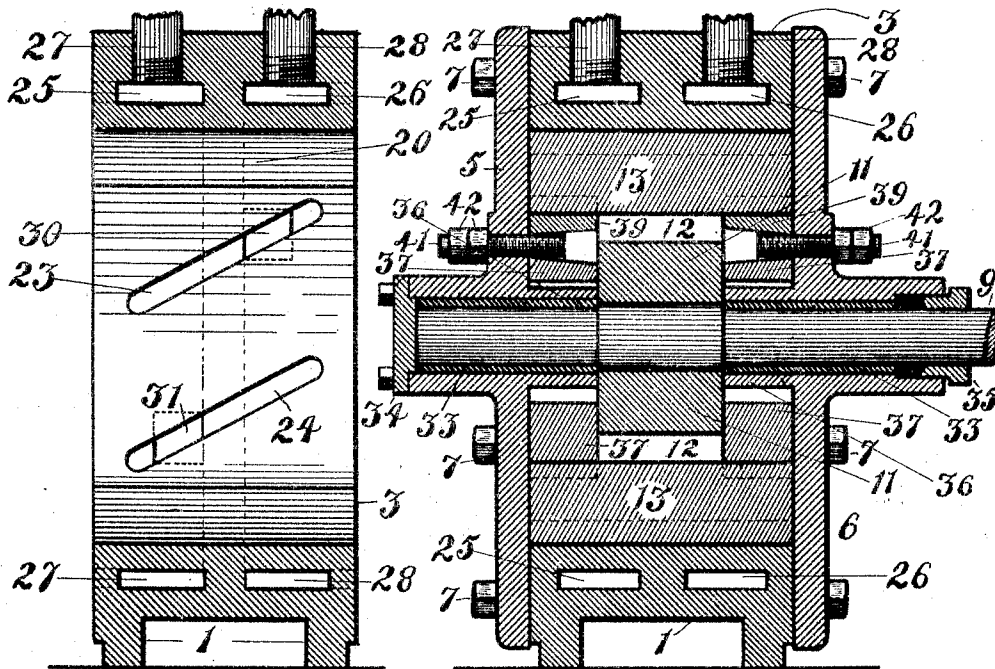


Fig. 1.

Fig. 2.

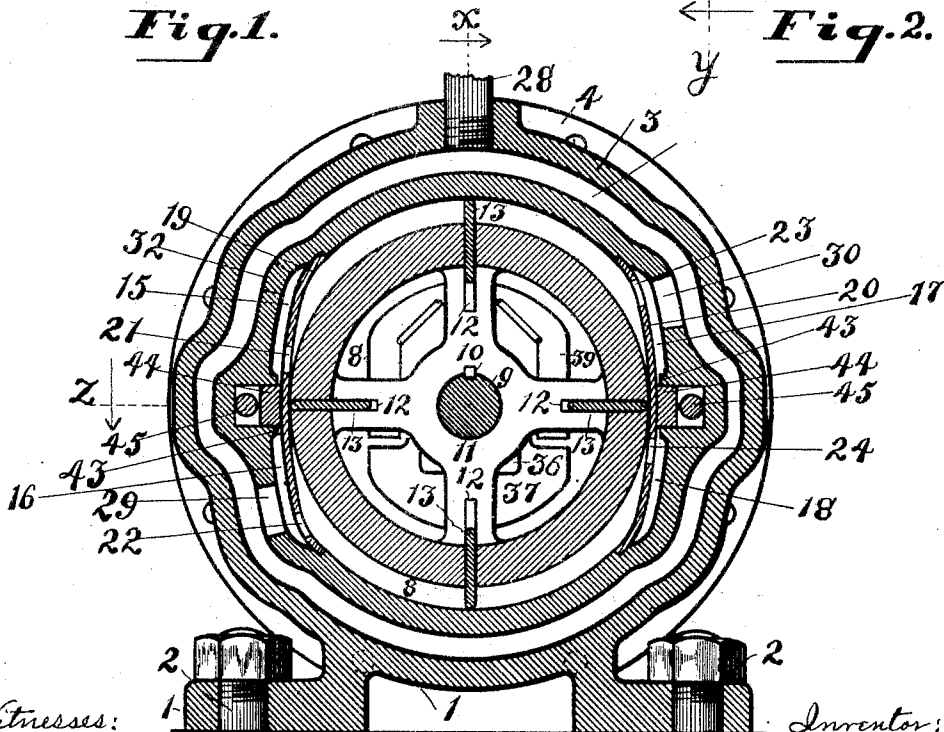


Fig. 3.

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2 SHEETS—SHEET 2.

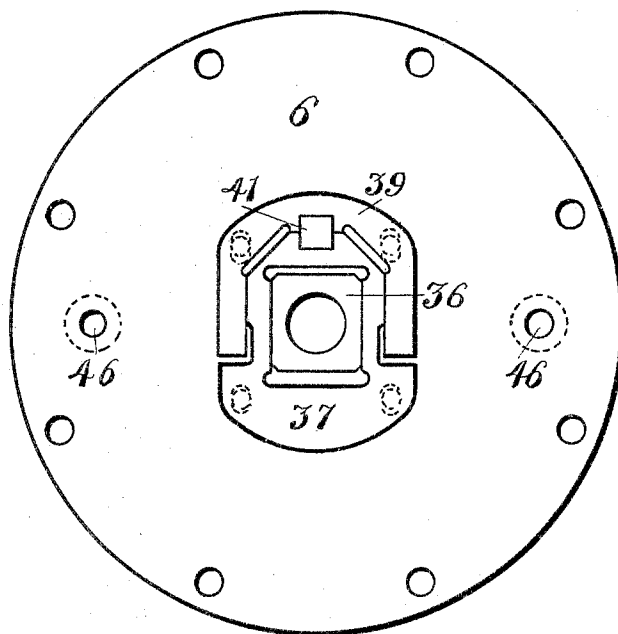


Fig. 4.

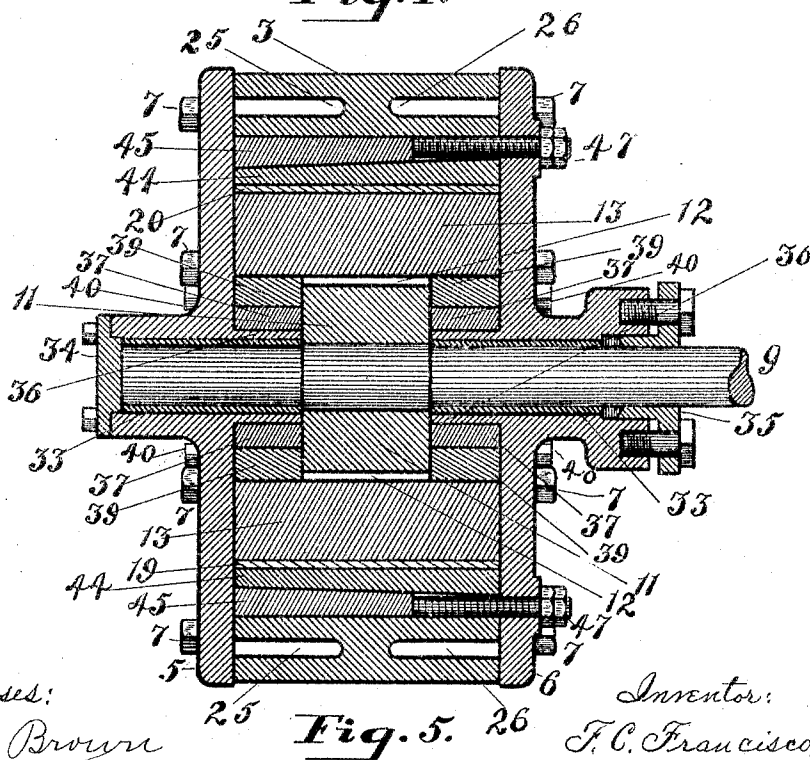


Fig. 5.

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UNITED STATES PATENT OFFICE.

FRED C. FRANCISCO, OF CUYAHOGA FALLS, OHIO.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 776,658, dated December 6, 1904.

Application filed May 23, 1904. Serial No. 209,204. (No model.)

To all whom it may concern:

Be it known that I, FRED C. FRANCISCO, a citizen of the United States, residing at Cuyahoga Falls, in the county of Summit and State of Ohio, have invented a certain new and useful Improvement in Rotary Engines, of which the following is a specification.

My invention has relation to rotary engines using a fluid under pressure as a motive power.

The objects of my invention are to make a rotary engine of great simplicity of construction and economy in the consumption of the fluid employed as a power and to provide in connection with said engine certain peculiar devices for taking up or compensating for the wear incident to its operation, so as to prevent loss of operative fluid and power in the device after becoming slightly worn from use and to so construct these devices that they can be operated or shifted at any desired time and without the necessity of dismantling the engine.

To the accomplishment of the aforesaid objects my invention consists in the new and peculiar construction, arrangement, and combination of the various parts hereinafter described, reference being had to the accompanying drawings, forming a part hereof.

In the accompanying drawings, in which similar reference numerals indicate like parts in the different figures, Figure 1 is a vertical central section of the cylinder portion of my improved engine with the piston removed; Fig. 2, a vertical section of the entire engine at the line X of Fig. 3; Fig. 3, a section at the line Y of Fig. 2; Fig. 4, an elevation of one of the end heads used on the engine, and Fig. 5 a section at the line Z of Fig. 3.

In the drawings, 1 is the base of the engine, which is generally fastened to some suitable support by bolts 2, and rising from this base 1 and integral therewith is the main cylinder portion 3 of the device, which consists in a short round body of metal provided at both sides or ends with flanges 4, to which are fastened the closing ends or heads 5 and 6 by bolts 7. The central portion of the body 3 is hollowed out either by coring or boring into an opening 8, and through the exact center of which is a horizontal transverse shaft 9, on the

outer free end of which it is designed to place a pulley, gear, or sprocket wheel to afford a means to convey power to selected machinery; but this has nothing to do with the understanding of the device, and hence is not shown. Fastened on this shaft 9 by a key 10 centrally between the sides of the body 3 is a heavy-rimmed wheel 11, the width of which is equal to the thickness of the cylinder 3. At certain equidistant points in the rim of this wheel 11 are cut radial slots 12, extending through the rim and down into the spokes or web which connects the rim with the hub, and in these slots 12 are blades 13, whose width is slightly less than the distance from the bottom of the slots 12 to the outer boundary of the opening 8 and of a length sufficient to extend to the end plates 5 and 6. The shell or wall 14 of the cylinder-body, which incloses and forms the opening 8, is cut out or enlarged on either side of the longitudinal horizontal center of the opening 8, so as to leave four pockets 15, 16, 17, and 18, and the outer ends of these pockets terminate in abrupt shoulders where they meet the normal surface of the opening 8. To cover these pockets and afford guides for the radial blades 13, there is placed across the pockets 15 and 16, with its center immediately in front of ridge 43, formed between the pockets and just touching the rim of the wheel 11, a spring-plate 19, and a similar plate 20 is placed across the pockets 17 and 18. The ends of these spring-plates 19 and 20 fit nicely into the shouldered ends of the pockets, and as they are of a thickness equal to the depth of the shoulder they offer no resistance or obstruction to the passage over them of the blades 13, and being of a width equal to the wheel 11 they extend to the end plates 5 and 6.

Through the spring-plate 19 are cut oblique slots 21 and 22 and through the plate 20 openings 23 24. These openings or slots are all similar in shape, and preferably parallel with each other, the slots 21 and 23 being cut in their respective plates 19 and 20 opposite the pockets 15 and 17 and the slots 22 and 24 opposite the pockets 16 and 18. Around the shell or wall 14 of the cylinder-body 3 are cored two parallel cavities 25 and 26, having

a configuration similar to the shell 14, independent of each other and provided at the top of the device with pipes 27 and 28, respectively. The cavity 26 communicates with the pocket 16 by port 29 and with the pocket 17 by a port 30, and the cavity 25 communicates with the pocket 18 by a port 31 (see Fig. 1) and with pocket 15 by a port 32. (Indicated by dotted lines in Fig. 3.)

The shaft 9 is supported by long sleeve-bearings in the heads 5 and 6 and are provided with replaceable antifriction-bushings 33. The sleeve on the head 5 is provided with a cap 34 to prevent end motion of the shaft and any leakage of the operative fluid, and the end of the sleeve on the head 6 has a stuffing-box 35 to also prevent leakage at that end.

Projecting inwardly from each of the heads 5 and 6 are integral sleeves 36, having a rectangular exterior, and over these are placed the lower halves 37 of cams whose operation will be described hereinafter. The upper halves 39 of these cams are made in the shape of a letter U, the legs of which nicely fit and slide on the outer faces of the lower halves 37, and sufficient material is cut from both halves to allow a slight vertical motion of each, and the openings in the lower halves for the sleeves 36 are sufficiently long vertically to permit their movement in that direction. The tops and bottoms of both halves are concentric with the center of the shaft 9 and are just far enough removed therefrom to permit the passage edgewise of the blades 13 between their edges and the outer face of the opening 8. The two halves of the cams are each held to their respective heads by bolts 40, (see Fig. 5,) and the openings in the heads 5 and 6 for their passage is vertically elongated, as indicated by dotted lines in Fig. 4, to allow the movement of the bolts 40 and the halves 37 and 39. The sides of the cams are vertical, joining their tops and bottoms by easy curves, and the sides are such a distance from the center of the shaft 9 that when the edges of the blades 13 ride over their outer sides the opposite edges of the blades will be flush with the outer periphery of the wheel 11. To adjust the relative positions vertically of the halves of the cams, there is cut in their only horizontal abutting faces registering grooves the tops and bottoms of which incline toward each other and away from the center of the device. In these grooves are placed bolts 41 with wedge-shaped heads and with long threaded shanks which extend through appropriately-bored openings in the heads 5 and 6 and are held in place and moved by nuts 42. It will be seen that by drawing outward the bolts 41 by the nuts 42 after releasing the set-bolts 40 the space between the halves may be increased at pleasure, and then after tightening the set-bolts 40 the cams are locked firmly in place, and this may be done

at any time without removing the heads 5 and 6.

In order to keep the center of the spring-plates 19 and 20 gently but firmly in contact with the rim of the wheel 11, there are cut across the ridges 43, which exist between the pockets 15 16 and 17 18, transverse grooves, with their open sides toward the shaft 9. In these grooves are placed bars 44, having three straight faces and one inclined one and of a length equal to the width of the cylinder and are designed to be held in place by the heads 5 and 6. The bars 44 are placed in the grooves with their inclined faces away from the center of the shaft 9 and their opposite straight faces touching the rear of the central portion of the springs 19 and 20. The balance of the space in the grooves is occupied by bolts 45, having long heads with one inclined face which is placed against the inclined face of the bars 44, and the shanks of these bolts 45 are threaded and project through holes 46 in one of the heads 5 or 6. On the outer ends of these bolts 45 are nuts 47, by which the position of the heads of the bolts may be adjusted and maintained. If at any time on account of wear or other cause the inner central portions of the springs 19 and 20 do not touch and make a fairly-good fluid-tight joint with the outer periphery of the rim of the wheel 11, the bolts 45 are drawn outward by means of the nuts 47, which press the bars 44 inward against the springs 19 and 20 and causes them to bend inward until they encounter the wheel 11.

The operation of the device is as follows: Using the fluid-cavity 26 as an illustration, because it more clearly shows in the drawings, a fluid under pressure is admitted by the pipe 28 into the cavity 26, from whence it simultaneously enters the space 8 by ports 29 and 30 and slots 22 and 23 in the spring-plates 19 and 20, and as it cannot escape sideways by reason of the heads 5 and 6 nor backward by reason of the contact of the rim of the wheel 11, springs 19 and 20, and bars 44 in the ridges 43 it acts on the two vertical blades 13 in Fig. 3, which extend from the outer wall of the opening 8 to the cams on the heads 5 and 6 and, driving them forward, revolve the wheel and shaft 9. When the vertical blades 13 pass the slots 21 and 24 in the spring-plates 19 and 20, the fluid escapes into the pockets 15 and 18 and from thence by ports 31 and 32 into the cavity 25 to the outlet-pipe 27. It will be obvious that by introducing the operative fluid into pipe 27 and using the pipe 28 as an outlet the motion of the engine will be reversed.

What I claim is—

1. The combination in a device of the class described, of a cylinder-body having a central opening and fluid-conducting cavities in said body about said central opening, portions of the wall of said central opening being con-

centric with the center of the piston-shaft of the device, pockets in the body opening into said central opening, ports to connect said pockets and fluid-conducting cavities, a suitably-mounted rotary piston in said central opening, radially-movable blades in said piston, slotted spring-plates to cover the pockets hereinbefore referred to, and wedge-shaped bars and bolts mounted transversely in the wall of said cylinder-body and bearing against said spring-plates and capable of adjustment outside of said cylinder by means of nuts to keep said spring-plates against said rotary piston.

2. The combination in a device of the class designated, of a cylinder-body having a main central opening and fluid-conducting cavities

in said body about said central opening and connecting therewith and a suitably-mounted rotary piston in said central opening, heads provided with integral sleeves to close the end openings in said cylinder, two-part cams mounted on said sleeves, the parts of said cams being adjustable with relation to each other, and forming with the wall of said central opening a race for the radial blades mounted in said piston.

In testimony that I claim the above I hereunto set my hand in the presence of two subscribing witnesses.

FRED C. FRANCISCO.

Witnesses:

C. E. HUMPHREY,
GLENARA FOX.