No. 781,028. PATENTED JAN. 31, 1905.

F. V. SMITH & R. ROSS.

ROTARY ENGINE.

APPLICATION FILED JULY 15, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

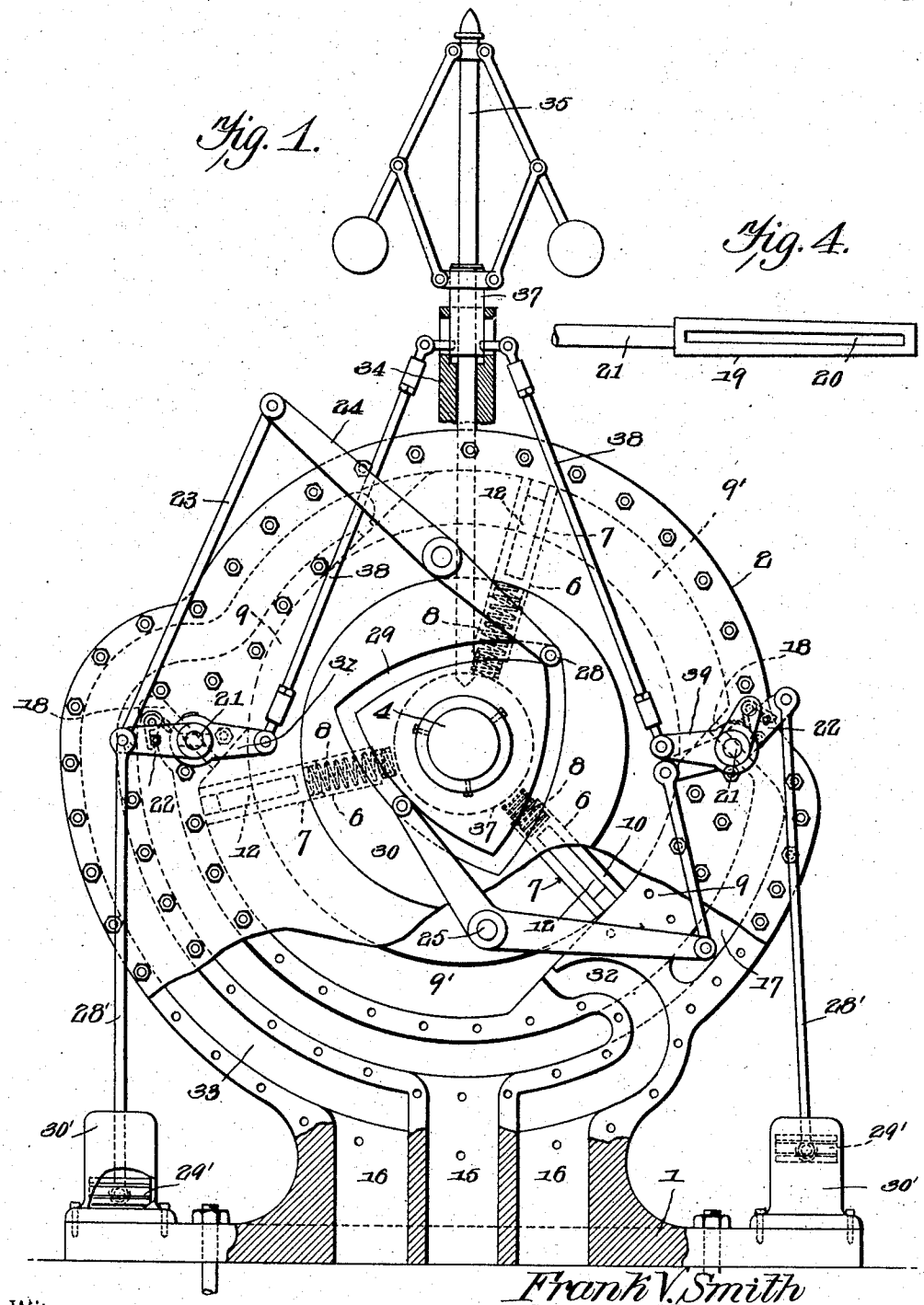


Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 2.

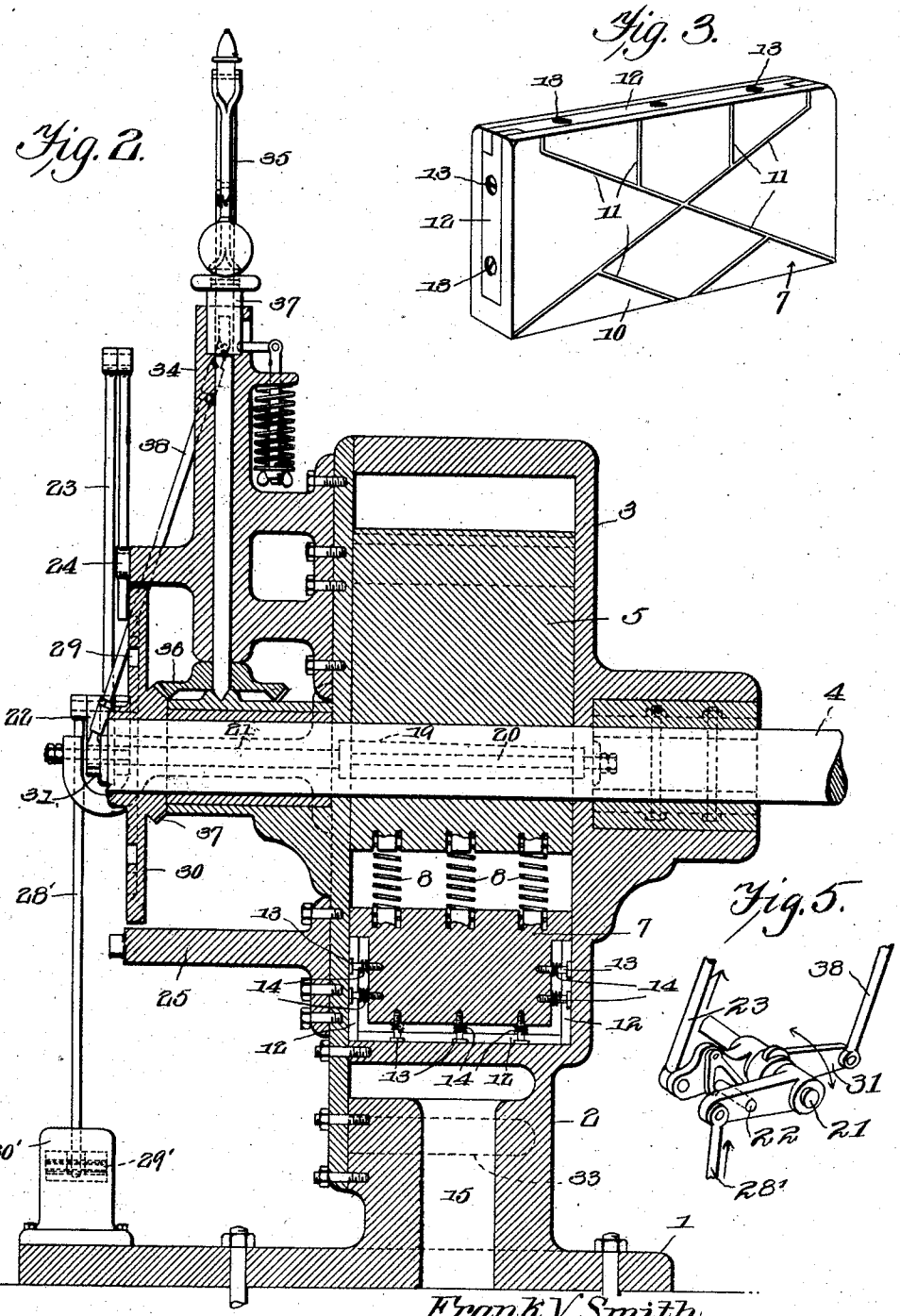


Fig. 3.

Fig. 5.

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No. 781,028. Patented January 31, 1905.

UNITED STATES PATENT OFFICE.

FRANK V. SMITH AND ROBERT ROSS, OF NEODESHA, KANSAS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 781,028, dated January 31, 1905.

Application filed July 15, 1904. Serial No. 216,707.

To all whom it may concern:

Be it known that we, FRANK V. SMITH and ROBERT ROSS, citizens of the United States, residing at Neodesha, in the county of Wilson and State of Kansas, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to improvements in rotary engines, and has for one of its objects to provide a novel form of engine in which perfect balance is obtained by the application of pressure at the same time on the opposite sides of the piston-drum, so that undue wear on one side of the shaft or bearings may be avoided.

A further object of the invention is to construct a rotary engine in which provision is made for cutting off the inflow of steam early in the stroke and using the steam expansively during the remaining portion of the stroke.

A still further object of the invention is to provide a rotary engine with oscillatory valves of somewhat the same kind as those employed in Corliss engines and to provide means whereby such valves are placed under the control of a governor.

A still further object of the invention is to provide a novel form of piston-wing packing.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in the novel construction and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is an elevation of a rotary engine constructed in accordance with the invention, parts being broken away in order to more clearly illustrate the construction. Fig. 2 is a transverse sectional elevation of the same. Fig. 3 is a detail perspective view of one of the piston-wings. Fig. 4 is a detail view of one of the cut-off valves. Fig. 5 is a detail perspective view of a portion of one of the valve-operating mechanisms.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The working parts of the engine are carried by a suitable bed-plate 1, that is formed integral with or secured to a cylinder 2, at the opposite sides of which are heads 3, one of the heads being formed integral with the main cylinder-casting, if desired. These cylinder-heads have bearings for the reception of a shaft 4, that extends through the cylinder and is provided with a balance-wheel of any preferred weight.

At a point within the cylinder is arranged a piston-drum 5, that is cylindrical in form and is provided with a number of radially-disposed recesses 6, three in the present instance, each of which receives a piston-wing 7, that is moved outward into engagement with the inner curved wall of the cylinder by means of suitable springs 8. The cylinder is provided with a pair of diametrically-opposed abutments 9, that fit snugly against the periphery of the cylinder and form two separate steam-spaces 9′, in which the piston-wings 7 operate. The opposite ends of both abutments are arranged on inclined lines, forming cam-surfaces for governing the reciprocatory movement of the piston-wings.

Each of the piston-wings 7 comprises a main plate 10, the opposite sides of which are provided with a large number of communicating grooves 11 for the reception of the lubricant, and the outer edge and both the side edges of the wing are grooved for the reception of packing-strips 12, that fit snugly within the grooves and are provided with overlapping end portions which will prevent the passage of steam. These packing-strips are held in place by means of screws 13 and are normally projected by small compression-springs 14, arranged between the strips and the edges of the piston-wings, and in operation the packing-strips will follow closely the curvature of the wall of the cylinder and the side walls of the cylinder-heads and prevent any leakage of steam.

Steam is supplied to the piston through a main inlet-pipe 15 and exhausts through pipes 16, all of these pipes leading, preferably, down

through the bed-plate of the engine and the pipe structure, forming practically a support for the cylinder, while the area of the exhaust-pipes is so much in excess of the inlet-pipe that all danger of back pressure from this cause is avoided. In the wall of the cylinder is formed an approximately semicircular steam-port 17, the lower portion of which communicates with the pipe 15, and this port leads upward to a pair of valve-chambers 18, through which the steam is allowed to pass to the steam-spaces 9′. Each of the valve-chambers is cylindrical in form and receives an oscillatory valve 19, having a port 20. To one end of the valve is secured a stem 21, which projects out through a suitable stuffing-box in one of the cylinder-heads, and on the outer end of said stem is a loosely-mounted rocker-arm 22, that is connected by a link 23 to a rocking lever 24. Each of the rocking levers is mounted at a point intermediate of its length on a stud 25, carried by a bracket projecting from one of the cylinder-heads, and the opposite arm of each lever carries an antifriction roller or pin 28, that fits within an approximately triangular cam 29, carried by a cam-disk 30. The cam-disk is rigidly secured to the main shaft and rotates therewith, while the cam-groove acts on the several rocker-levers to open the valves, each of said valves being opened three times during each complete rotative movement of the piston, or the number of times the valve is opened may be increased or diminished in accordance with the number of piston-wings carried by the piston-drum. To each stem is secured a rocker-arm 22^a, carrying a projecting lug or pin 22^b, with which engages a hook 22^c, that is pivoted on the arm 22, and at each movement of said arm 22 the hook engages with the projecting pin and rocks the arm 22^a, thus causing a partial rotative movement of the valve-stem and valve and permitting the flow of steam to the steam-space of the cylinder. Each arm 22^a is connected by a link 28′ to the piston 29′ of a dash-pot 30, which serves to close the valve as soon as the hook 22^c is disengaged from the lug 22^b. To effect this latter movement, the valve-stem carries a loosely-pivoted arm 31, having a cam 32 which is arranged in the path of movement of the hook 22^c. This arm 31 is under the control of the governor, and as the latter is operated the position of the cam is changed in order to alter the point of cut off in accordance with the speed of the engine, the mechanism being preferably of that type used in the Corliss engines, where the point of cut off is adjustable, so that the valve may be held open for any desired length of time in order to operate the engine and the boiler pressure and then closed to permit the steam to act expansively.

The inlet-ports are two in number and arranged at one end of the abutments, while at the opposite ends of said abutments are escape-ports 32, in communication with an approximately semicircular passage 33, that connects with the exhaust-pipes 16, all of the steam escaping freely after the exhaust-ports have been opened by the passage of the piston-wings.

To one of the cylinder-heads is secured a bracket 34, which forms a support for one of the rocking levers 24, and is further provided with a bearing for the reception of a vertically-disposed governor-shaft 35. The lower end of the governor-shaft carries a bevel-gear 36, intermeshing with a similar gear 37, that is secured to or formed integral with the cam-disk 30. The governor is of the ordinary type, and its vertically-movable collar 37 is connected by rods 38 to cam-carrying rocker-arms 39, which control the point of cut-off of the inlet-valves, so that when once adjusted the engine may be made to revolve at any desired speed.

With an engine constructed in accordance with this invention the pressure is applied simultaneously at different points and undue wear on the shaft or bearings by continuous pressure at one portion only of the piston-drum is prevented.

A further advantage obtained in the construction in the present instance is that the exhaust-steam pipe and exhaust-steam ports either wholly or in part surround the main inlets and maintain the pressure and temperature of the live steam.

Having thus described the invention, what is claimed is—

1. In a rotary steam-engine, a cylinder, abutments arranged within the cylinder and dividing the latter into a plurality of steam-spaces, a piston-drum in the cylinder, a plurality of slidable piston-wings carried by the drum, an exhaust-passage arranged within the outer portion of the cylinder and in communication with both of the steam-spaces, and a steam-supply passage having valved communication with the steam-spaces, said steam-supply passage being disposed between the exhaust-passage and the inner wall of the cylinder.

2. The combination in a rotary engine, of a cylinder, a pair of abutments dividing the cylinder into two steam-spaces, a piston-drum disposed in the cylinder, slidable piston-wings carried by the drum, and steam inlet and exhaust passages formed in the walls of the cylinder, the steam-inlet passages being arranged between the exhaust-passages and the steam-space of the cylinder.

3. The combination in a rotary engine, of a cylinder, a pair of abutments arranged within the cylinder and dividing the same into a plurality of steam-spaces, a shaft extending through the opposite heads of the cylinder, a piston-drum mounted on said shaft, a plurality of slidable piston-wings carried by the drum, steam inlet and exhaust passages formed in the body of the cylinder, the inlet-passage being disposed between the exhaust-passages and the steam-spaces of the cylinder,

a pair of valves for controlling the passage of steam from the inlet-passages to the steam-spaces, brackets carried by one of the cylinder-heads, rocking levers fulcrumed on said brackets, stems connected to the inlet-valve and projecting beyond the head of the cylinder, rocker-arms carried by the stems and connected to said rocking levers, a cam-disk mounted on the shaft and engaging said rocking levers, dash-pots for moving the valves to closed position, an upright governor-shaft, gearing connections between the main shaft and the governor-shaft, and a governor on the governor-shaft for varying the point of cut-off.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

FRANK V. SMITH.
ROBERT ROSS.

Witnesses:
C. L. SQUIRES,
B. H. HILL.