(No Model.) 3 Sheets—Sheet 1.

F. D. OWEN.

ROTARY ENGINE.

No. 409,800. Patented Aug. 27, 1889.

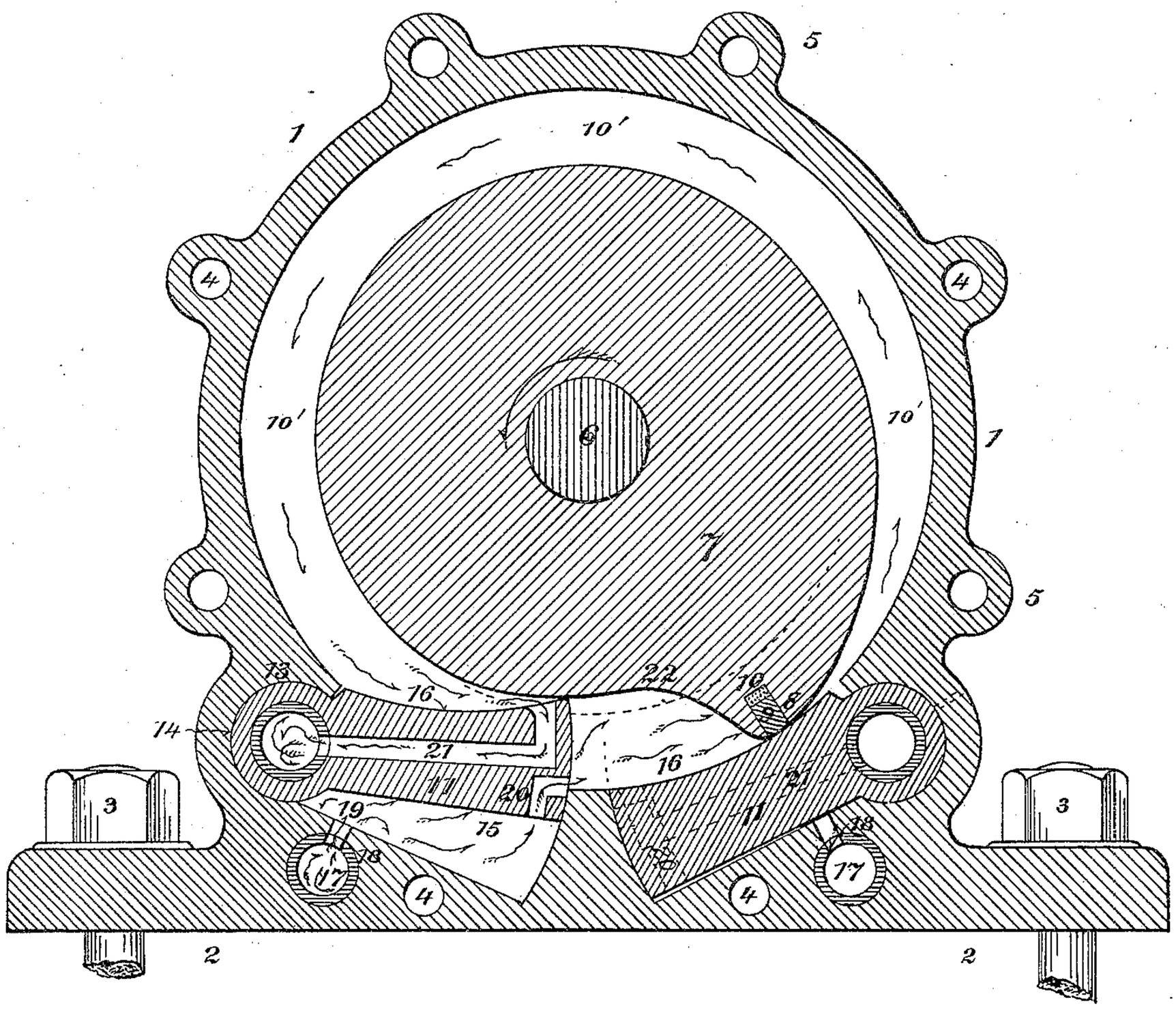

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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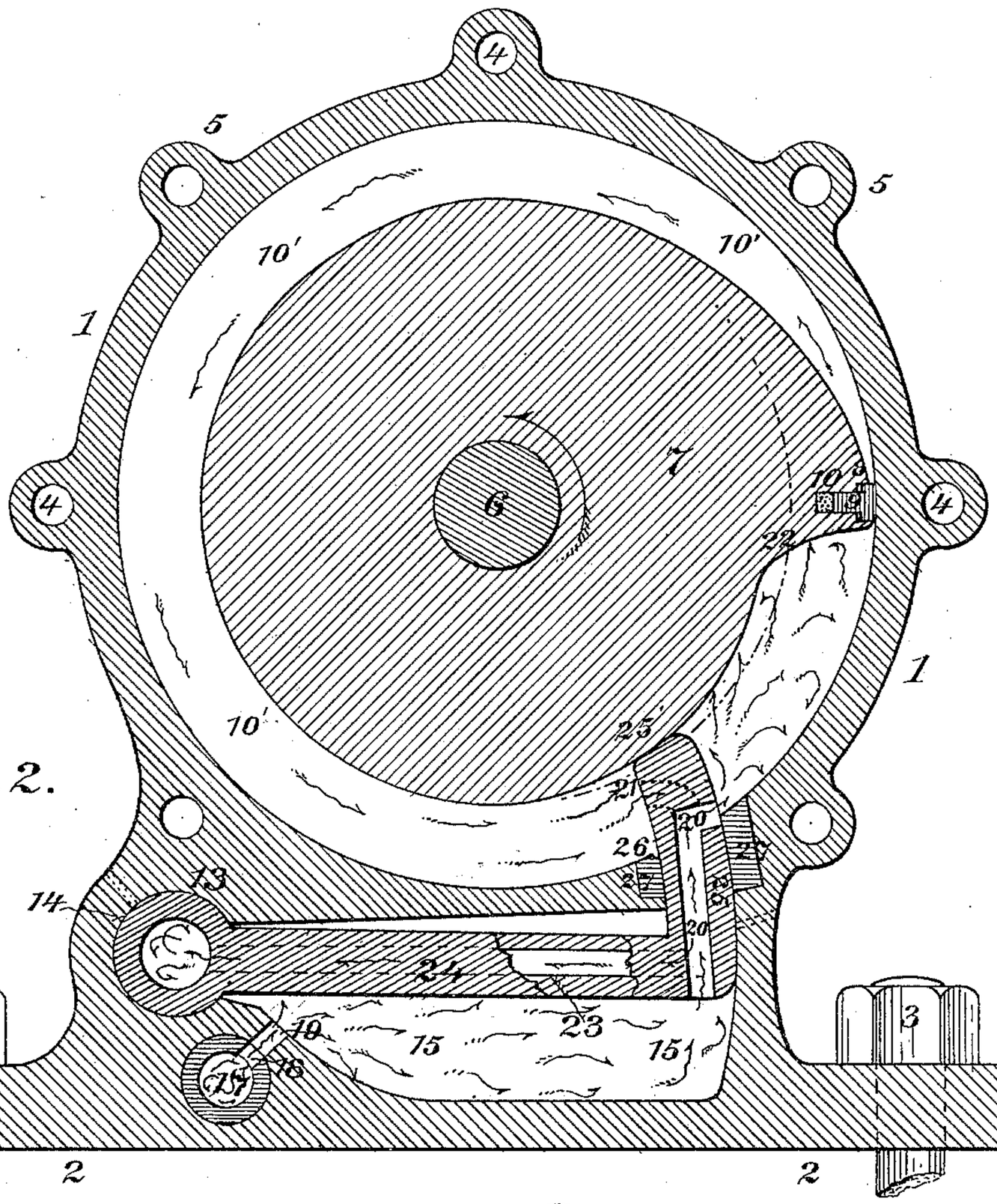

Fig. 2.

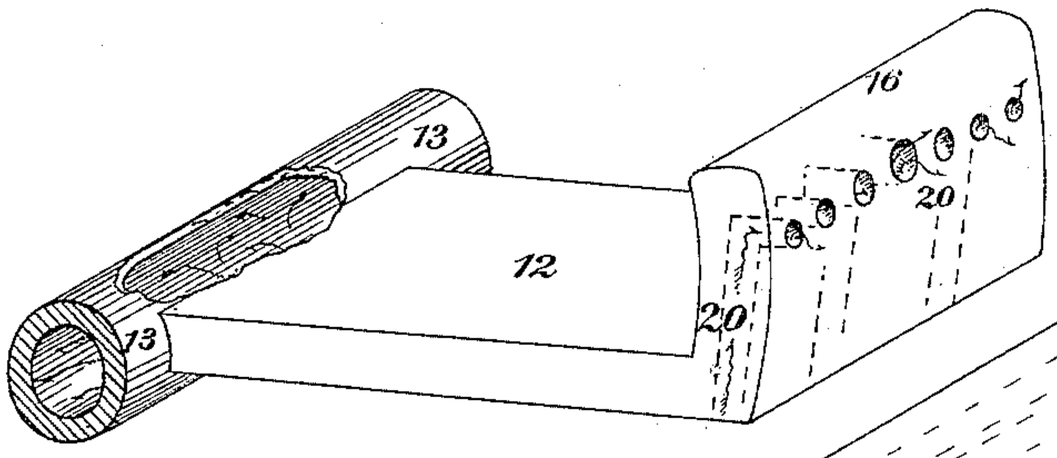

Fig. 3.

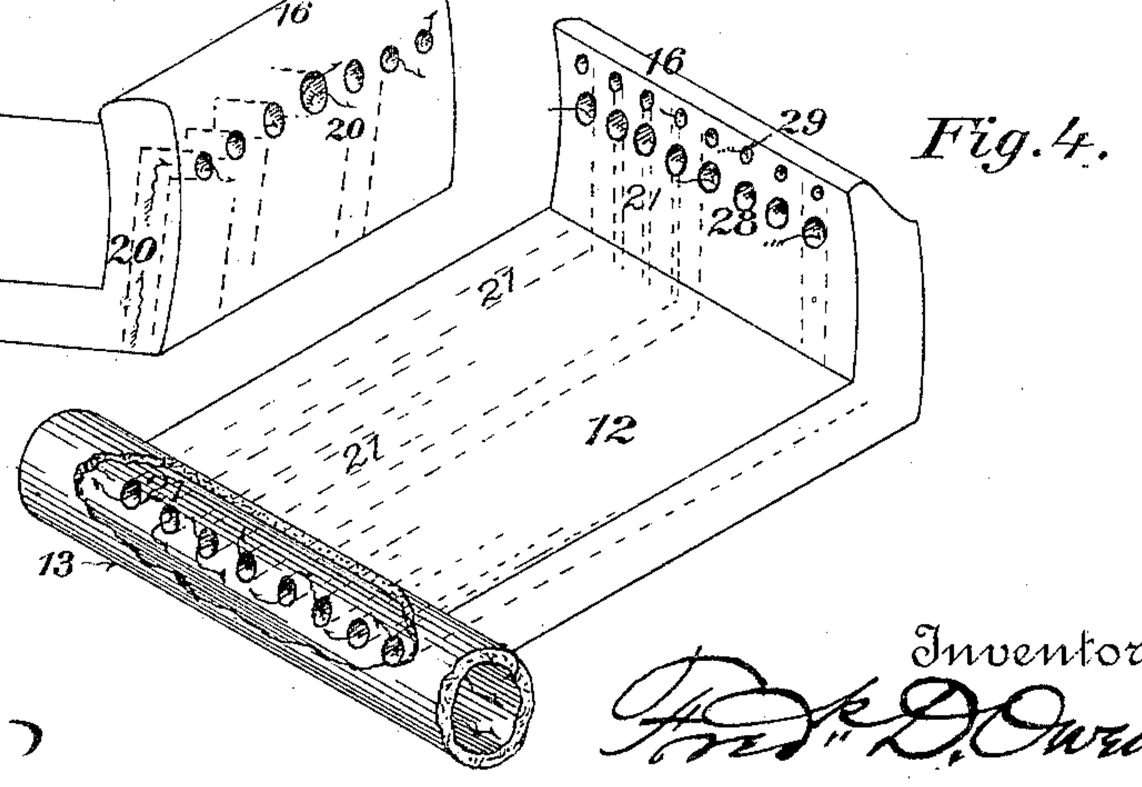

Fig. 4.

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ROTARY ENGINE.

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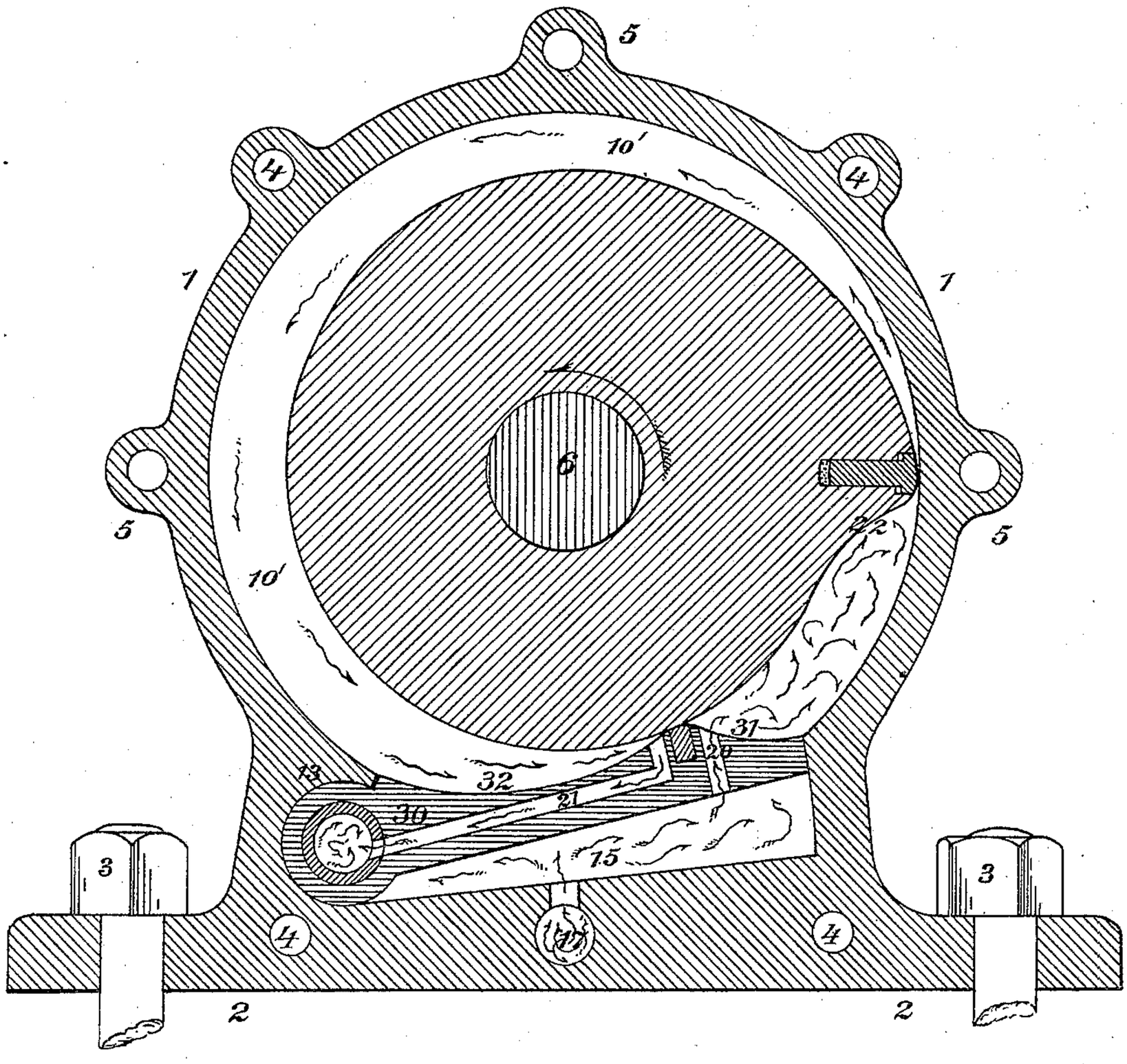

Fig. 5.

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UNITED STATES PATENT OFFICE.

FREDERICK D. OWEN, OF WASHINGTON, DISTRICT OF COLUMBIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 409,800, dated August 27, 1889.

Application filed October 12, 1888. Serial No. 287,963. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK D. OWEN, a citizen of the United States, and a resident of Washington, in the District of Columbia, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification.

This invention relates to rotary engines, and has for its object to provide a rotary engine which will be simple in construction, effective in operation, and durable.

The invention consists in a rotary engine constructed and arranged as hereinafter described and claimed.

Figure 1 is an end view in elevation with plate removed, showing the interior of a rotary engine constructed in accordance with this invention. Fig. 2 is a similar view of a modified form thereof. Fig. 3 is a perspective view of a detail thereof, partly broken away, showing the compound supply and discharge valve. Fig. 4 is another perspective view of the compound supply and discharge valve, partly broken away. Fig. 5 is a view of another modification of a rotary engine constructed in accordance with this invention, with end plate removed and showing the interior of the engine.

In the construction of this invention the cylinder 1 is preferably cast in a single piece with the base 2, which may be secured to a suitable foundation by bolts 3, or in any other suitable manner and to be of any desired length or width. The ends of the cylinder 1 are closed by plates, (not shown,) which are bolted thereto by bolts passing through bolt-holes 4 in the base 2 and in lugs 5 on the cylinder.

Within the cylinder 1 is mounted on the shaft 6, having its bearings in suitable stuffing-boxes, (not shown,) the rotary piston 7, having a rib or longitudinal projection 8, bearing against the interior longitudinal surface of the cylinder 1.

In order to form a tight steam-joint at the edge of rib 8, the latter is provided with an elastic or yielding packing 9, located in a groove 10 therein.

To provide for the passage of the steam in driving the piston 7, the latter is of such a diameter with reference to the diameter of the casing 1 as to form a chamber or steam-space 10′ between the periphery of the piston 7 and the interior wall of cylinder 1.

In carrying out this invention separate supply and discharge valves are dispensed with and a compound supply and discharge valve employed in lieu thereof. This valve is located in a valve-chamber in the wall of the cylinder and normally, or when in action, rests on a bed of steam, which affords a yielding and elastic bearing or cushion therefor.

In Fig. 1 two of these compound supply and discharge valves and valve-chambers are shown to form a reversible engine. In Figs. 2 and 5 but one compound valve and chamber is employed.

Referring to Fig. 1, 11 indicates a vibrating valve consisting of the strip or plate 12, having the rounded end 13, located in the circular recess 14 in the base 2 and forming a pivoted hinge-joint, the valve 11 being adapted to vibrate in the recess or valve-chamber 15, formed in the base or side 2 of the cylinder. The upper surface of the valve 11 is provided with the curved face 16, which forms a continuation of the interior surface or wall of cylinder 1 when valve 11 is closed in recess 15.

To simplify the valve mechanism and to provide a cushion of steam for the valve, steam is admitted through a tube 17 in the base 2 through an opening 18 in the tube 17 and an opening 19 in the base to the chamber 15 and beneath the valve 11, and thence through L-shaped passage-ways 20 in the end of valve 11, opening out of the end of the latter into the steam-space 10′ when the valve 11 is raised. Steam is discharged from the steam-space 10′ through L-shaped passage-ways 21, opening into the steam-space 10′ at the top of the valve 11 and extending back through the latter to the rounded end 13, which is hollow, and through which the steam passes off to a suitable condenser or otherwise. By this means when steam is admitted beneath the valve 11 the latter will be raised and will rest on a bed or cushion of steam, and the steam will pass through passage-ways 20 and escape through the ends of the same, which have been raised above the interior surface of the cylinder 1, into the steam-space 10′ behind the rib 8 of the piston 7. The steam, acting on the rib 8, causes the piston 7 to rotate, the rib 8 moving forward over the inte-

rior wall of the cylinder 1 until it reaches the rear of the valve 11, held up by the steam beneath it, when it rides over the curved surface 16 of the valve and presses it back into the recess 15. The variation of the curve of the piston 7 from the rib 8 for a short distance in the direction of its travel in the line indicated by the arrows in Fig. 1 is such that before the rib 8 in the rotation of piston 7 reaches the end of valve 11 the piston acts on the valve 11 to gradually move it into the recess 15, thereby at first cutting off the steam-supply to space 10′ by moving the open ends of passages 20 below the interior surface of cylinder 1, and then, as the rib 8 arrives at the end of valve 11, closing the outer ends of L-shaped passage-ways 21 and cutting off the discharge of steam. Immediately upon the rib 8 passing the end of valve 11 the latter is released and forced up by the steam from tube 17, which passes through passages 20 and out at their open outer ends, which have been raised above the interior surface of cylinder 1, into the steam-space 10′ behind rib 8, and again drives the piston forward. In the release and upward movement of the valve 11 its end rides over the surface 22 of the piston 7 in the rear of rib 8, and, owing to the gradual curvature or concavity of the surface 22, permits the valve 11 gradually to rise to an elevated position, where it rests upon the cushion of steam in recess 15 and bears at its outer end against the cam-piston 7 during the rotation of the latter. As the rib 8 passes the end of valve 11, the latter, being released from its chamber by the pressure of steam beneath it, is forced out against the concave surface 22 of the piston, allowing live steam to enter the cylinder behind the rib 8, forcing the piston forward until by the cam action of the piston on the valve 11 the latter is pressed sufficiently into its chamber 15 to cut off the steam-supply at a desired portion of the stroke, allowing the piston to finish the entire stroke by the natural expansion of the quantity of steam admitted. This latter feature is a very desirable feature in all new cut-offs of engines. By means of this construction and arrangement of parts a smooth, easy, and effective movement of the engine is obtained.

By having two compound supply and discharge valves 11, as shown in Fig. 1, the engine may be reversed, the valve shown raised in Fig. 1 dropping into its recess or chamber 15 and the other valve 11 being raised and steam supplied to steam-space 10′ and discharged against the rib 8 on the opposite side, so as to drive the piston 7 in the opposite direction from that indicated by the arrows.

In Fig. 2 is shown a modification of the engine in which only one compound supply and discharge valve is employed. In this construction a modified form of valve 23 is used, having a straight horizontal portion 24 with a vertical slightly-curved arm 25 at its end. In this instance the whole of the valve does not move into and out of the cylinder 1, but only its curved vertical arm 25, the cylinder being cast to have its interior wall nearly continuous, with an opening 26, through which projects and moves the arm 25. The end of the arm 25 has a curved surface 25′, which corresponds to the curvature of the interior surface of the cylinder, as well as the curved surface 6 of the valve 11 in Fig. 1.

The opening 26 is provided with bearing-strips or packing 27 to form a tight joint.

To aid and provide against wear in gradually cutting off the passage of steam in passages 20 and 21, the outer openings of the passages 20 and 21 in this instance, as well as in the construction in Fig. 1, are preferably arranged with a series of different-sized openings, as shown in Figs. 3 and 4, the outer openings of passages 20 gradually diminishing in size from the central one to the side passages and the passages 21 having large openings 28 and small openings 29 above them.

In the modification in Fig. 5 an engine with a single valve 30 is shown, the valve 30 being similar to valve 11, excepting that it is formed with the tapering surface 31 at its end extending downward to the outer open ends of passages 20. By means of this construction a vibrating compound supply and discharge valve is provided, formed with a curved surface 32 on one side in the shape of the arc of an ellipse or a parabola, which serves as a proper bearing-surface for the cam action of the piston, and by having the tapering surface 31 at its end being adapted to permit the engine to act reversely.

While this invention has been described as adapted to be used as a rotary engine driven by steam, it is to be understood that it may be driven by hot air, compressed air, water, or any other medium suitable for the purpose.

Simplicity of parts and smoothness of action are the main results obtained by this invention.

I claim—

1. In a rotary engine constructed with a cylinder and piston, a valve-chamber communicating with the cylinder and with a supply-pipe, an oscillating abutment-valve located within the valve-chamber and having supply-ports communicating with the valve-chamber and adapted to rest on a cushion of steam therein, and the cylinder and discharge-ports communicating with the cylinder and a discharge-pipe, substantially as shown and described.

2. A rotary engine constructed with a cylinder and piston, valve-chambers communicating with the cylinder and alternate supply-pipes, an oscillating abutment-valve located within each of the valve-chambers, said abutment-valve having alternate supply-ports communicating with each of the valve-chambers and the cylinder, and alternate discharge-

ports communicating with the cylinder and alternate discharge-pipes, substantially as shown and described.

3. A rotary engine constructed with a cylinder and piston having a rib bearing against the interior surface of the cylinder, a valve-chamber communicating with the interior of the cylinder, an oscillating abutment-valve located in the valve-chamber, and having a hollow hinge communicating with the discharge-pipe and through the valve with the cylinder, and supply-ports communicating with the cylinder and the valve-chamber, and a supply-pipe communicating with the valve-chamber, substantially as shown and described.

4. In a rotary engine, a piston constructed from a cylinder placed upon a shaft located within an outer cylinder or casing, with one portion enlarged longitudinally and carrying an expansive rib bearing against the interior wall of the outer casing, forming with said cylinder and the enlargement a convex longitudinal surface, and to the opposite side of said rib a concave longitudinal surface, in combination with an oscillating abutment-valve located within a chamber communicating with the cylinder in the wall of the outer casing, substantially as shown and described.

5. A rotary engine constructed with a cylinder and piston having a rib bearing against the interior surface of the cylinder, an inclosed valve-chamber opening into the cylinder with a supply-pipe, an oscillating abutment-valve located within the valve-chamber and having an upper curved surface exposed to the interior of the cylinder and forming a part of the interior surface of the cylinder, said abutment-valve having supply and discharge ports communicating, respectively, with the valve-chamber and cylinder and the cylinder and a discharge-pipe, substantially as shown and described.

6. A rotary engine constructed with a cylinder and piston with a rib bearing against the interior surface of the cylinder, a valve-chamber communicating with the interior of the cylinder, an oscillating abutment-valve located in the valve-chamber and having supply-ports in a face of the valve which is movable over the wall of the valve-chamber, the supply-ports communicating with the interior of the cylinder, and the valve-chamber having a supply-pipe and discharge-ports communicating with the interior of the cylinder and a discharge-pipe, the openings of the supply-ports being in a different plane in the valve from that of the openings of the discharge-ports, whereby the supply is cut off automatically before the discharge by the action of the piston, substantially as shown and described.

7. A rotary engine constructed with a cylinder and piston, a valve-chamber communicating with the interior of the cylinder, and an oscillating abutment-valve located in the valve-chamber and having supply-ports communicating with the interior of the cylinder and with the valve-chamber having a supply-pipe, and discharge-ports communicating with the interior of the cylinder and a discharge-pipe, the openings of the discharge-ports being in a different plane or height relative to the base of the cylinder from the openings of the supply-ports, whereby the supply is automatically cut off before the discharge by the piston moving the valve back in its chamber, substantially as shown and described.

8. In a rotary engine, a piston constructed upon a shaft with a longitudinal enlargement, carrying an expansive rib bearing against the interior wall of the outer casing or cylinder, said piston having to one side of said enlargement a longitudinal concave surface extending below and which is less than the radial distance from the shaft of the cylindrical or convex portion of said piston, in combination with an oscillating abutment-valve having supply and discharge ports and located within a chamber communicating with the cylinder in the wall of the outer casing, whereby an effective admission of steam is admitted and cut off before the finish of the stroke, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 2d day of October, 1888.

FREDERICK D. OWEN.

Witnesses:
W. W. KENT,
C. GRANT LA FARP.