

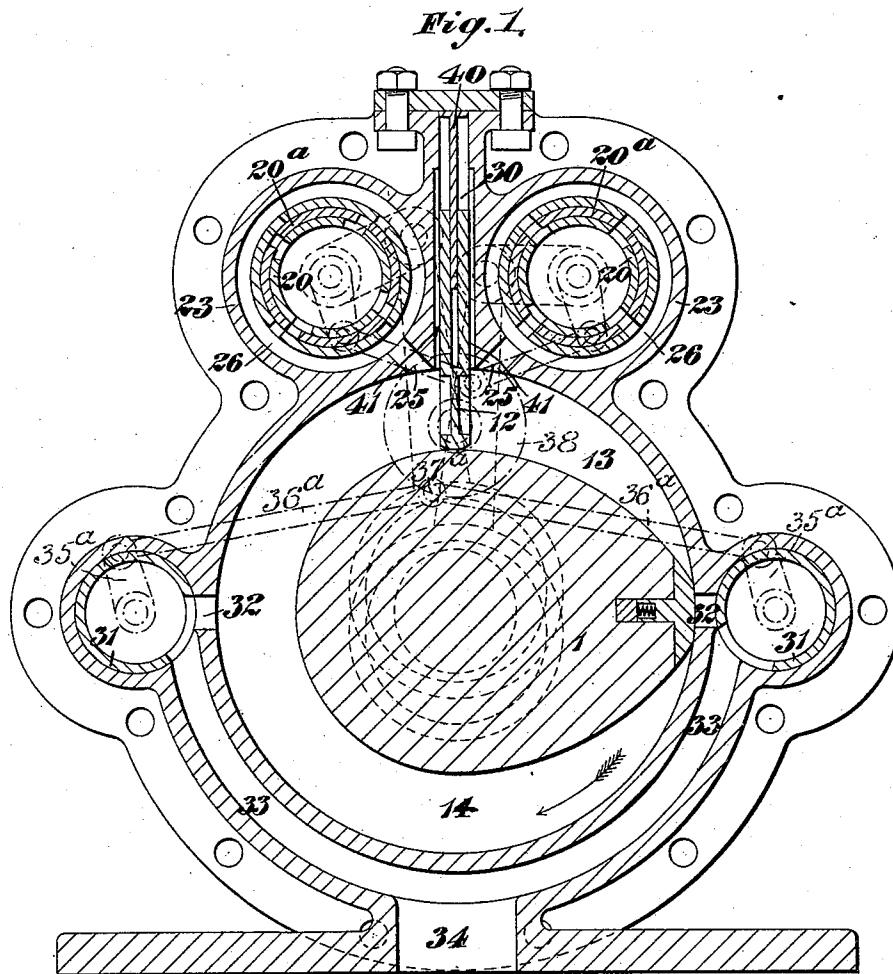
(No Model.)

9 Sheets—Sheet 1.

E. TOWLSON.
ROTARY ENGINE.

No. 483,027.

Patented Sept. 20, 1892.



Witnesses
Gilbert B. Bennett.
Joseph J. W. Corbridge

Inventor
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(No Model.)

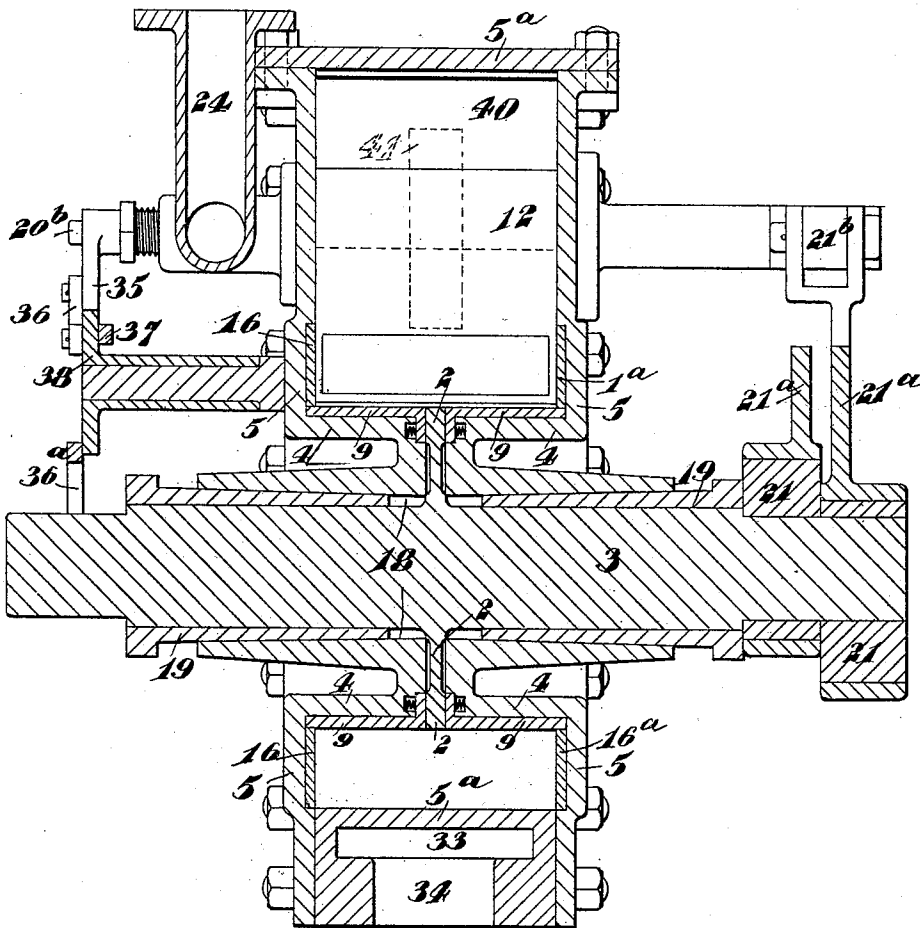
E. TOWLSON.
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9 Sheets—Sheet 2.

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Fig. 2.



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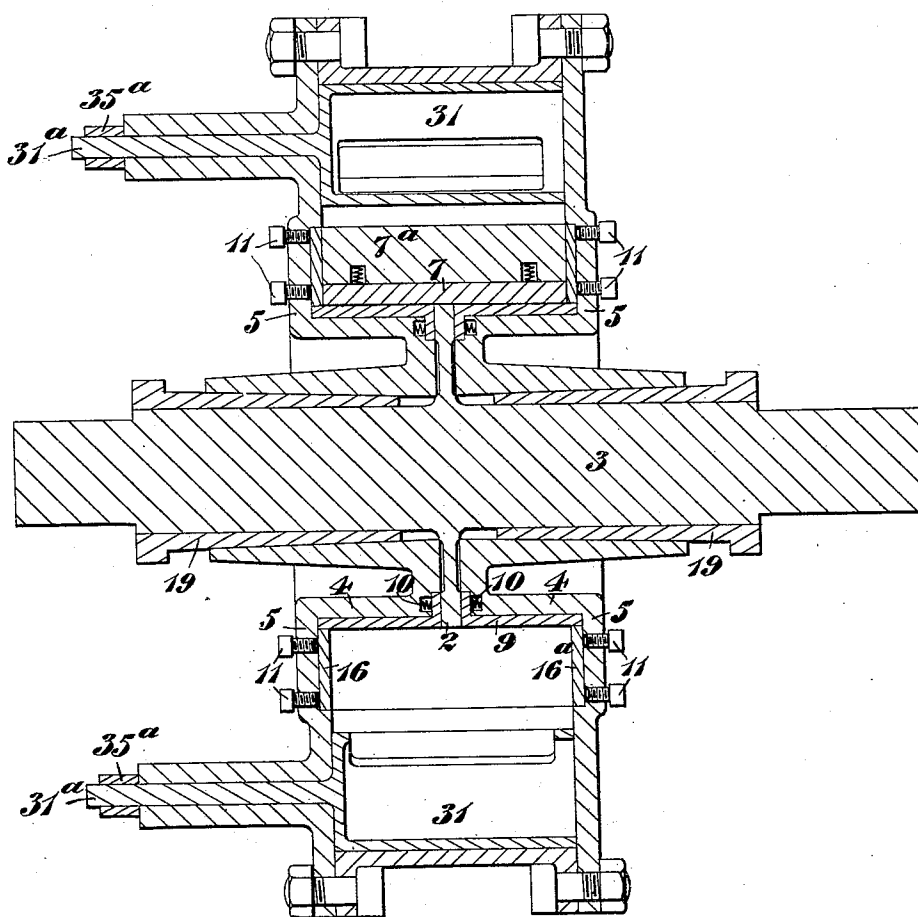
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Fig. 3.



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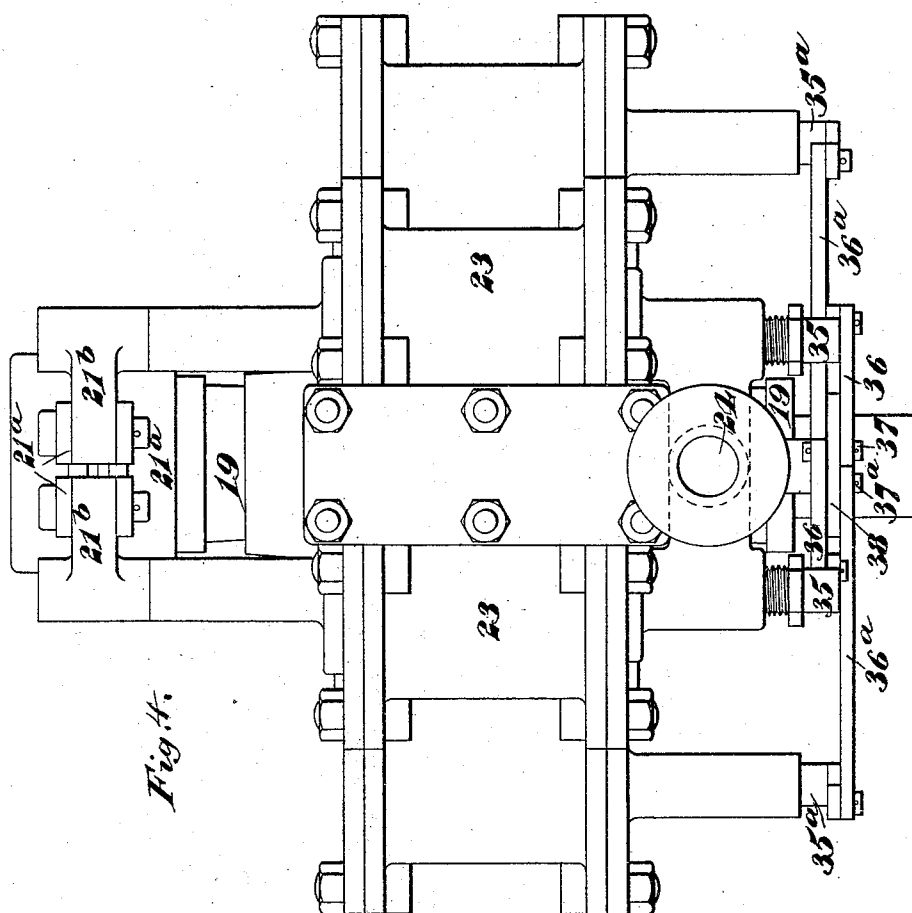


Fig. 4.

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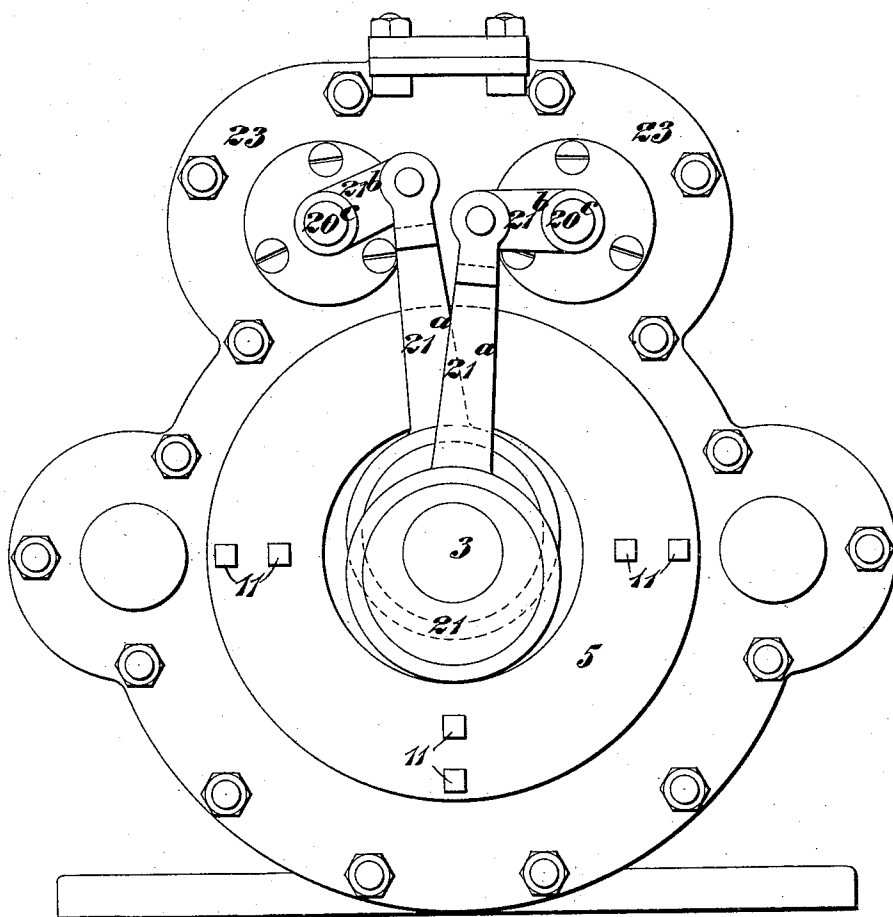
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Fig. 5.



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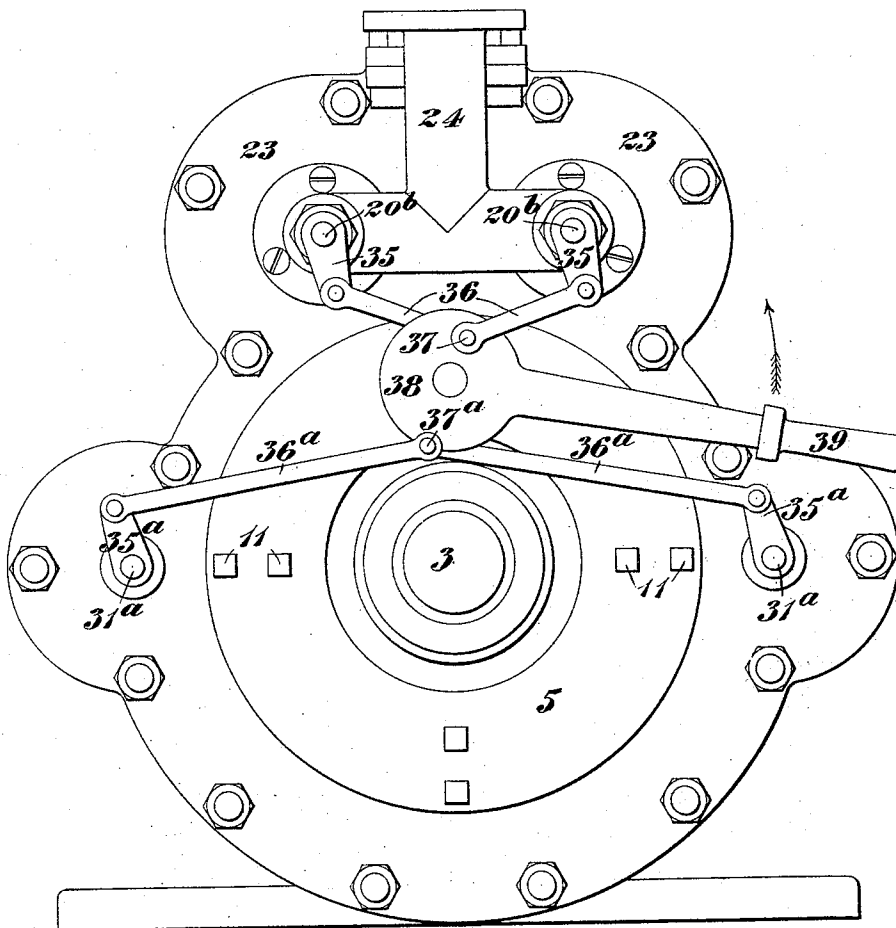
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Fig. 6.



Witnesses
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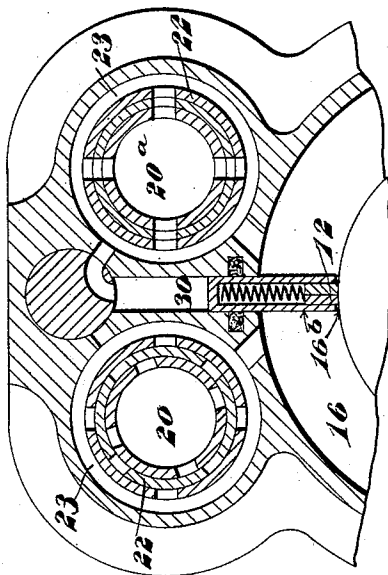
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Fig. 7.



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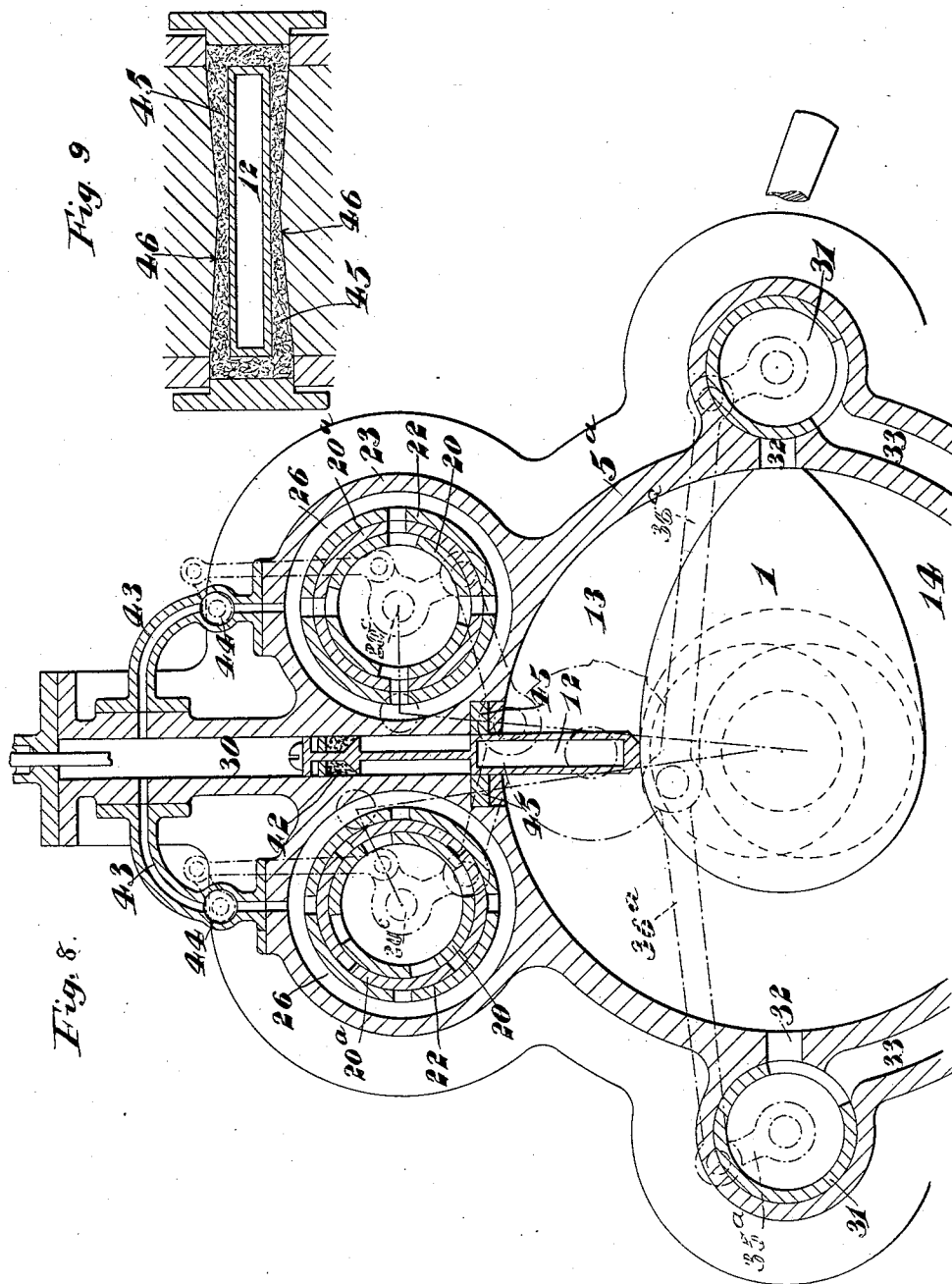
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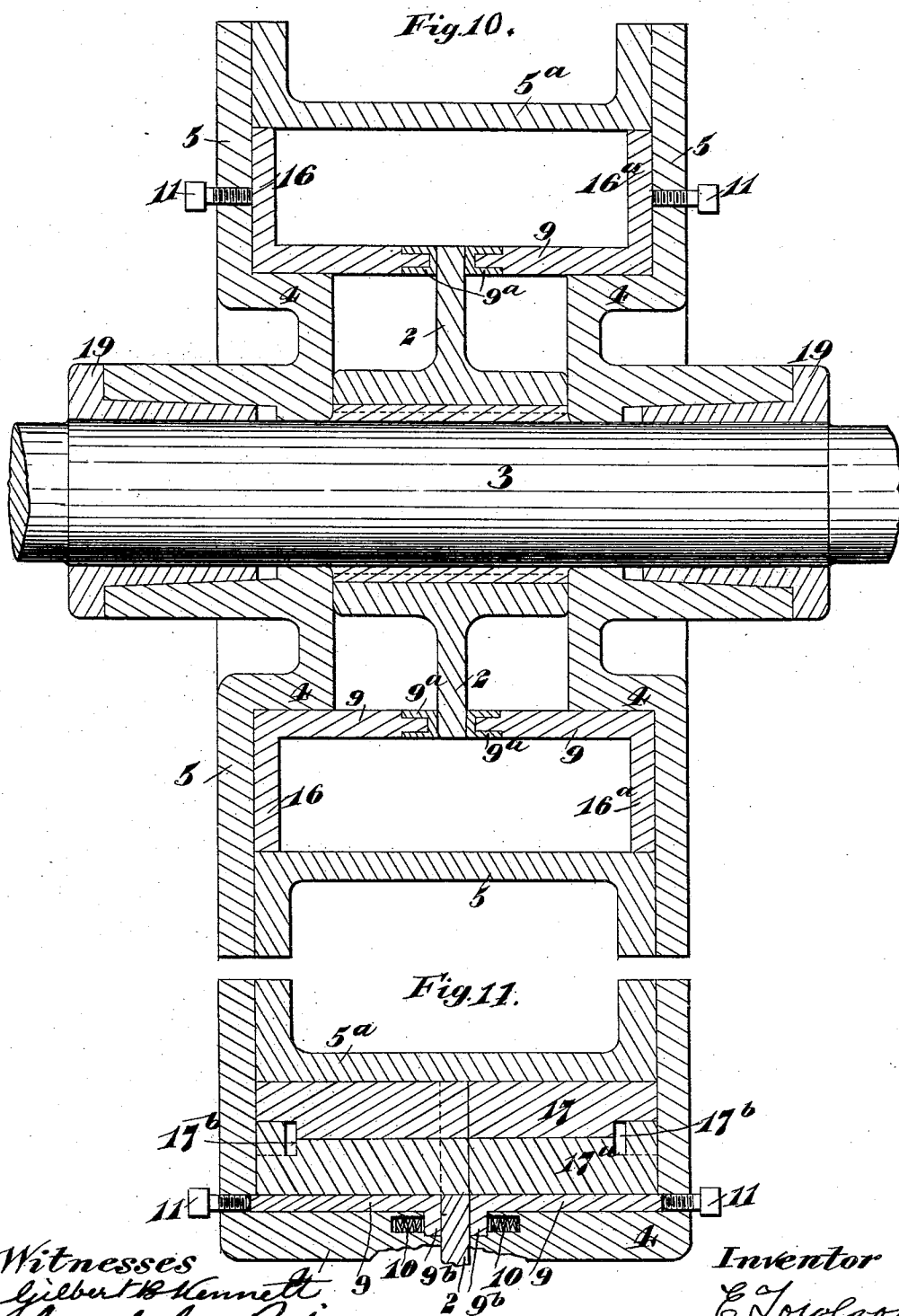
Witnesses
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E. TOWLSON.
ROTARY ENGINE.

No. 483,027.

Patented Sept. 20, 1892.



UNITED STATES PATENT OFFICE.

EDWARD TOWLSON, OF NORWICH, ENGLAND, ASSIGNOR TO WILLIAM TOMKINS STURGESS AND EDWARD TOWLSON, OF SAME PLACE.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 483,027, dated September 20, 1892.

Application filed September 18, 1891. Serial No. 406,133. (No model.) Patented in France March 18, 1892, No. 220,242, and in Belgium March 19, 1892, No. 98,897.

To all whom it may concern:

Be it known that I, EDWARD TOWLSON, a subject of the Queen of Great Britain and Ireland, residing at Norwich, in the county of Norfolk, England, have invented Improvements in Fluid-Pressure Rotary Engines, applicable also as pumps, (for which patents have been granted to the Rotary Engine Syndicate, Limited, in the countries of France, No. 220,242, dated March 18, 1892, and of Belgium, No. 98,897, dated March 19, 1892,) of which the following is a specification.

This invention has reference to improvements in fluid-pressure rotary engines, applicable also as pumps, and has for objects to improve the working and increase the efficiency of such engines, and likewise to render them reversible.

In order that the nature of my said invention may be fully understood and readily carried into effect, I will proceed to describe the same with reference to the accompanying drawings, in which—

Figures 1, 2, 3, and 4 are respectively a transverse section, a longitudinal section, a horizontal section, and a plan of a reversible expansive rotary engine constructed according to this invention. Figs. 5 and 6 are elevations of opposite ends of the same. Figs. 7, 8, 9, 10, and 11 are sectional views illustrating further modified constructions.

In an engine according to this invention the piston 1 1^a (see Figs. 1 to 4, inclusive) is carried by a web or collar, (hereinafter called a "collar") on the driving-shaft 3 and rotates around hollow bosses 4, encircling the driving-shaft at each side of the collar and extending from the inner sides of the cylinder ends or covers 5.

Between the parts 1 1^a of the piston at each side of the collar and the fixed bosses are steam-spaces 6, that are each divided longitudinally by a division or plate 7, radially movable in a slot 8 in the piston, the arrangement being such that part of the steam admitted to one side of the piston will enter the said steam-spaces and counterbalance, or nearly so, that component of the fluid-pressure on the piston that acts in a direction to-

ward and at right angles to the axis of the driving-shaft. By this means the friction of the driving-shaft in its bearings, due to the action of this component of the fluid-pressure on the piston that usually obtains in rotary engines as heretofore constructed, is very considerably reduced. Each boss 4 may advantageously be surrounded by a longitudinally-adjustable packing ring or tube 9, the inner end of which is caused by suitable means, such as springs 10, Figs. 2 and 3, or screws 11, Fig. 14, or both, to bear either directly, as in Figs. 2, 3, and 11, or indirectly through a narrower ring 9^a, as in Fig. 10, against the annular collar 2, and form therewith a fluid-tight joint. When the inner end of the packing ring or tube bears against the collar, it may be formed with a projecting flange 9^b, as in Figs. 2, 3, 7, and 11, to afford an increased annular surface to prevent escape of steam.

12 is an abutment that divides the steam-space 13 at one side of the piston from the exhaust-space 14 at the other side thereof. This abutment is so arranged as to bear during a considerable part of each rotation of the piston upon the fixed bosses 4 or the rings or tubes 9 surrounding them, thereby obviating a considerable part of the friction that is usually produced by contact of the abutment with the moving piston during the whole of each rotation thereof.

16 16^a are two adjustable annular packing-plates that serve to form a fluid-tight joint at the sides of the piston. These plates can, if desired, be each made in one with the adjustable packing ring or tube 9 surrounding the fixed boss 4 at the corresponding end of the cylinder, as shown in Fig. 10. These annular packing-rings can, however, be dispensed with. When this is done, the piston is provided with overlapping packing-plates 17 17^a, as shown in Fig. 11, acted upon by springs 17^c, arranged in the chambers 17^b to compensate for wear of the piston and to insure tight-fluid joint between the piston and the interior of the cylinder 5 5^a. The abutment 12 may be also provided with similar packing-plates.

Between the bosses and driving-shaft may be an annular space 18, closed at the ends by taper bushes 19.

The piston is provided with a radial packing-plate 7^a, pressed outward by a spring to compensate for wear and insure a fluid-tight joint between the piston and the inner periphery of the cylinder.

The abutment 12 is arranged to work radially in a chamber 30, into which part of the steam admitted to the cylinder passes, so as to act upon the upper or outer end of the abutment and keep the same in close contact with the fixed bosses and piston alternately during the rotation of the latter. This abutment at its ends may be arranged to work in guides 16^b, Fig. 7, formed in the annular packing-plates 16 16^a or in the cylinder ends or covers 5, these guides serving to support the abutment while subjected to pressure of steam at one side thereof.

To make an engine of the kind hereinbefore described reversible, there is provided at each side of the abutment-chamber 30 a valve-chamber 23, each provided with concentric oscillating perforated cut-off valves and reversing-valves 20^a, carried by the perforated valve-seat 22, and at opposite sides of the cylinder are oscillating exhaust-valves 31, controlling exhaust-ports 32, and exhaust-passages 33, having a common outlet 34.

Steam is admitted to each valve-chamber by a pipe 34. Ports 25 serve for the passage of steam from the annular steam-space 26 in each valve-chamber 23 to the interior of the cylinder.

The spindles 20^b of the reversing-valves 20^a are each provided with a lever-arm 35, connected by a link 36 to a crank-pin 37 on a disk or plate 38, provided with a hand-lever 39, and the spindles 31^a of the exhaust-valves 31 are each similarly provided with a lever-arm 35^a, connected by a link 36^a to another crank 37^a on the said disk or plate 38, the arrangement being such that by means of the hand-lever the positions of the several valves can be simultaneously reversed or altered, so that the piston can be caused to rotate in either direction at will. With the lever-arms and connecting-rods in the positions shown the piston will rotate in the direction of the arrow, Fig. 5.

The cut-off valves 20 are independently operated each by an eccentric 21, fixed on the driving-shaft and connected by an eccentric-rod 21^a to a lever-arm 21^b, fixed to the valve-spindle 20^b. In this construction the abutment 12 is shown as arranged to work in a chamber 30, that is divided into two compartments by a partition 40, and into one or other of which, according to the direction of rotation of the piston, steam is admitted from the cylinder by a passage 41 to keep the abutment up against the bosses 4 or packing rings or tubes 9 and piston alternately; or the outer end of the abutment 9 may be formed as shown in Fig. 8 and be suitably packed at 42 to work

in a chamber 30, to the upper and outer end of which steam is admitted from one or other of the valve-chests 23 through a pipe 43, controlled by a valve 44, operated from the spindle 20^c of the corresponding cut-off valve 20.

Asbestos packing 45, arranged in taper recesses 46 around the lower end of the abutment-chamber 30, as shown in Figs. 11 and 12, and set up by adjustable plates 47, serves to effectually pack the abutment 12 at the inner end of the abutment-chamber.

As will be obvious, rotary engines constructed according to this invention can be modified in various ways without departing from the essential features thereof. Thus there may be a fixed boss 4 at one side only of the annular collar 2 on the driving-shaft 3; but it is considered more advantageous to provide a fixed boss at each side of the annular collar, as in the construction shown; also, the collar 2 for carrying the piston may be carried by a hollow boss 2^a, keyed to the driving-shaft, as shown in Fig. 10.

What I claim is—

1. In a rotary engine, the combination of a cylinder, a driving-shaft and a piston carried thereby, an abutment arranged to work in close contact with said piston, a cut-off valve at each side of said abutment, a reversing-valve concentric with each cut-off valve, an exhaust-valve at each side of said cylinder, means for operating said reversing and exhaust valves simultaneously, and means for operating said cut-off valves, substantially as described, for the purpose specified.

2. In a rotary engine, the combination of a cylinder, hollow cylindrical bosses fixed therein, a driving-shaft having a collar extending between the inner ends of said bosses, a piston arranged to revolve around said bosses and carried by said collar, an abutment, a cut-off valve at each side of said abutment, a reversing-valve concentric with each cut-off valve, and means for operating said valves, substantially as described, for the purpose specified.

3. In a rotary engine, the combination of a cylinder, a driving-shaft, a rotary piston carried by said shaft, an abutment, a cut-off valve at each side of said abutment, a reversing-valve concentric with each cut-off valve, an exhaust-valve at each side of said cylinder, a pivoted plate provided with a handle and connected to said exhaust and reversing valves for operating the same simultaneously, and a pair of eccentrics on the driving-shaft for operating the cut-off valves, substantially as described.

4. In a rotary engine, the combination of a cylinder, a driving-shaft, a rotary piston carried by said shaft, an abutment arranged to slide in a steam-chamber and to act against said piston, one or more passages for admitting steam to said chamber to act against the outer end of said abutment, a reversing and a cut-off valve at each side of said abutment, an exhaust-valve on each side of said cylinder,

der, a wrist-plate connected to said exhaust and reversing valves for operating the same simultaneously, and a pair of eccentrics on the driving-shaft for operating the cut-off valves, substantially as described, for the purpose specified.

5 5. In a rotary engine, the combination of a cylinder, a driving-shaft, a rotary piston carried by said shaft, an abutment arranged to slide in a steam-chamber and to act against
10 said piston, a reversing and a cut-off valve at each side of said abutment, an exhaust-valve on each side of said cylinder, a wrist-plate connected to said exhaust and reversing
15 valves for operating the same simultaneously, a pair of eccentrics on the driving-shaft for operating the cut-off valves, steam-passages for connecting each of the cut-off-valve chambers with the steam-chamber in
20 which said abutment slides, cocks for controlling said steam-passages, and connections between said cocks and the mechanism for operating said reversing-valves, substantially
25 as described and shown, for the purpose specified.

6. In a rotary engine, the combination of a cylinder, a driving-shaft, a piston carried by said shaft, a sliding abutment, a reversing
30 and a cut-off valve on each side of said abutment, exhaust-valves on each side of said

cylinder, exhaust-passages, such as 33, concentric with said cylinder, having a common outlet and controlled by said exhaust-valves, and means for operating said reversing, cut-off, and exhaust valves, substantially as described, for the purpose specified. 35

7. In a rotary engine, the combination, with a cylinder having stationary bosses therein, a rotary piston, and an abutment, of two
40 independently-operated oscillating cut-off valves, two oscillating reversing-valves, each arranged concentrically with one of said cut-off valves, two oscillating exhaust-valves, and reversing mechanism comprising a plate provided with crank-pins connected by lever
45 mechanism to said reversing and exhaust valves and with a hand-lever, said valves and reversing mechanism being arranged substantially as described and shown, for the
50 purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD TOWLSON.

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