

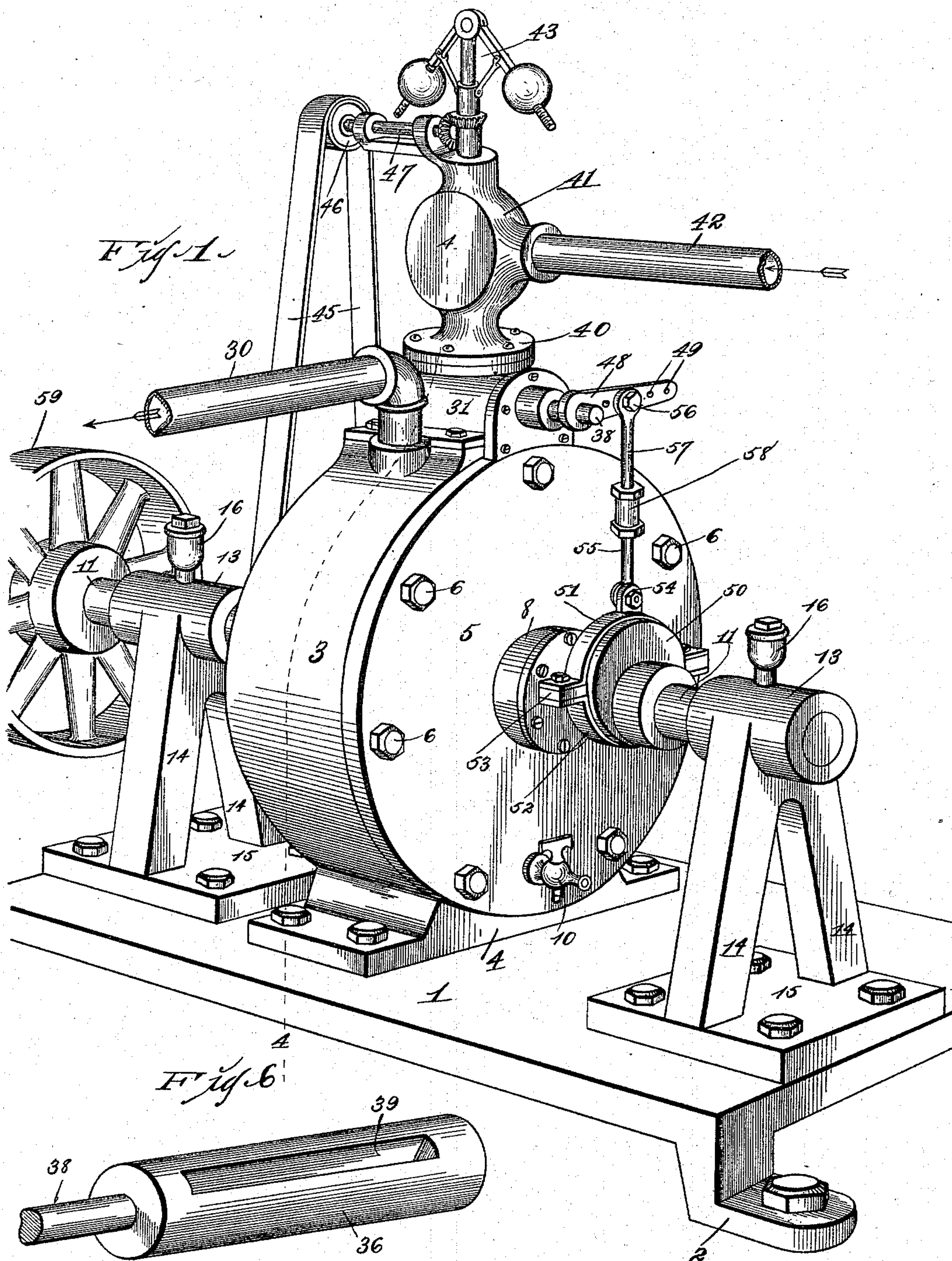
(No Model.)

3 Sheets—Sheet 1.

T. B. BOYLE.  
ROTARY ENGINE.

No. 527,933.

Patented Oct. 23, 1894.



Attest  
W. P. Smith,  
A. A. Blankenship, by Higdon & Higdon & Longan  
Attys.

Inventor:  
Thomas B. Boyle



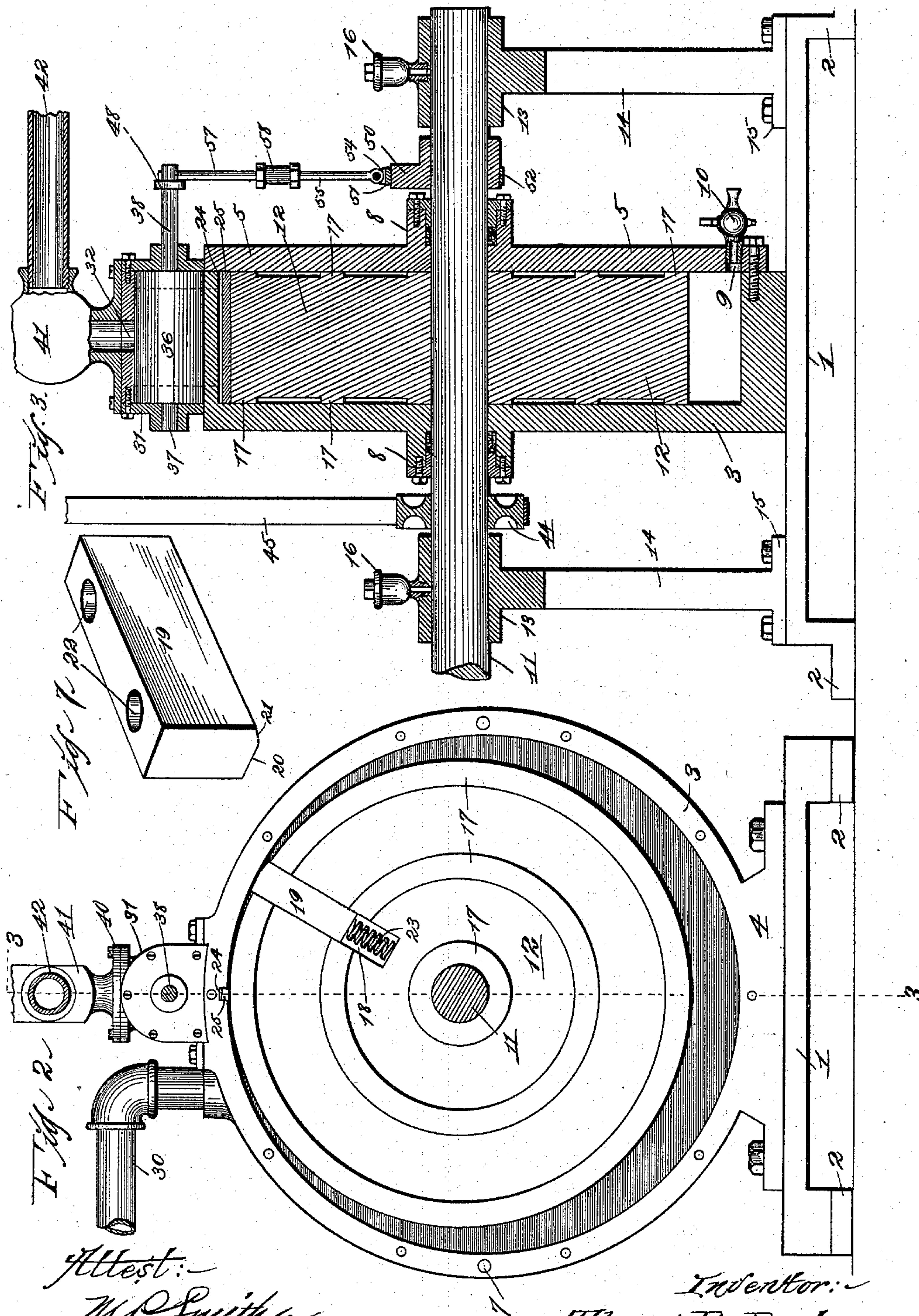
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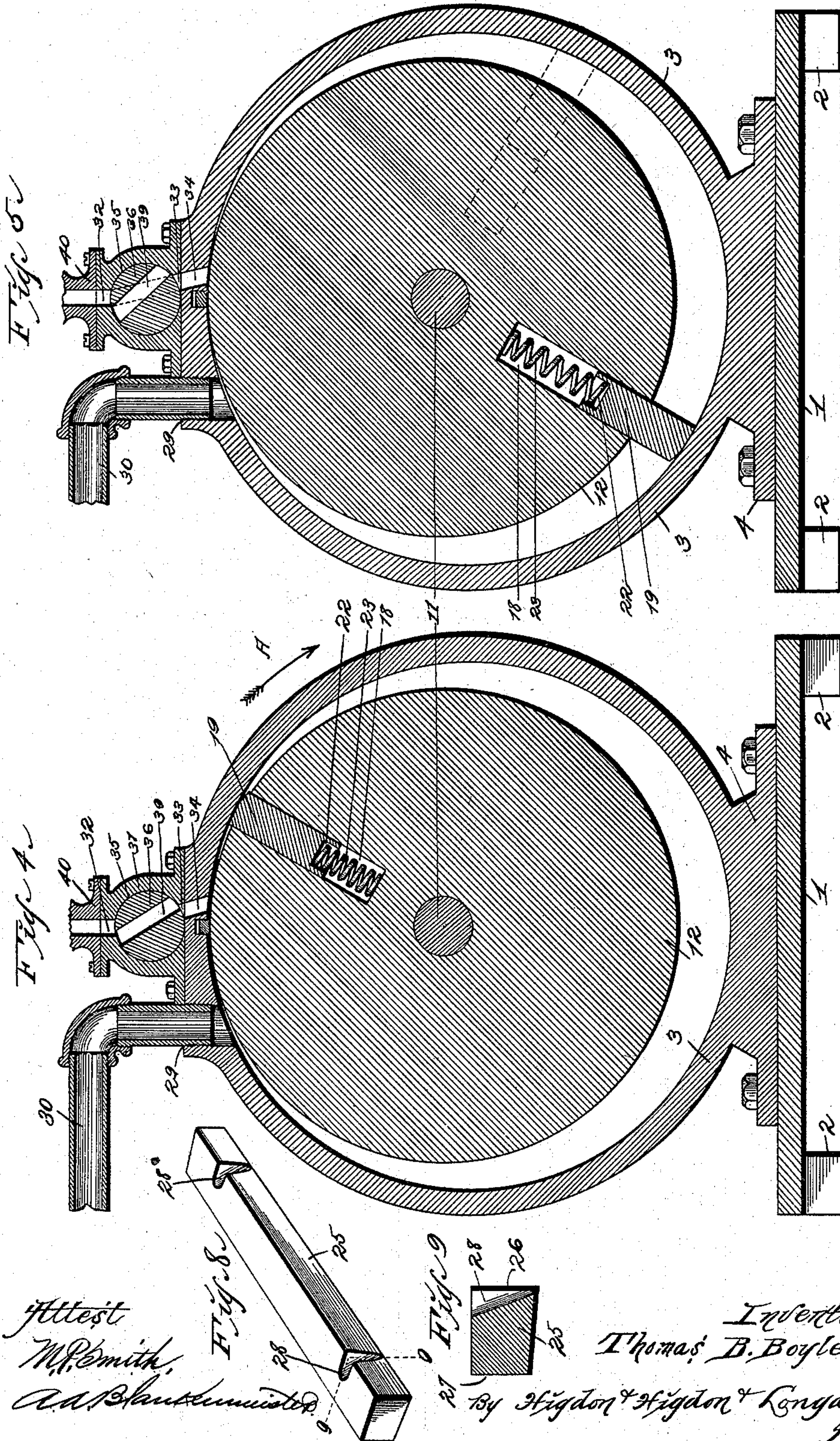
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# UNITED STATES PATENT OFFICE.

THOMAS BAILY BOYLE, OF HOUSTON, ILLINOIS, ASSIGNOR OF ONE-HALF TO  
WILLIAM D. BOYLE, OF SAME PLACE.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 527,933, dated October 23, 1894.

Application filed June 18, 1894. Serial No. 514,847. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS BAILY BOYLE, of the city of Houston, Randolph county, State of Illinois, have invented certain new and useful Improvements in Rotary Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to that class of rotary engines in which a revolving piston carrying a sliding piston-plate occupies an eccentric position within the engine cylinder, and relative the center thereof.

The object of my invention is to construct such a rotary engine that will possess superior advantages in point of simplicity, durability and general efficiency.

A further object of my invention is to so construct an engine that will be compact in form and of minimum cost in the manufacture thereof.

I attain these objects by the novel features of construction shown in the accompanying drawings, in which—

Figure 1 is a perspective view of a completed engine constructed in accordance with my invention, set up as required for practical use. Fig. 2 is a side elevation of my engine, the front plate being removed to more clearly illustrate the piston and sliding piston-plate. Fig. 3 is a vertical sectional view taken on the indicated line 3—3 of Fig. 2. Fig. 4 is a longitudinal sectional view of my improved engine taken approximately on the line 4—4 of Fig. 1, showing the cut-off valve and sliding piston-plate in the position they occupy at the commencement of a flow of steam to the interior of the engine cylinder. Fig. 5 is a longitudinal sectional view taken on the line 4—4 of Fig. 1, and showing the cut-off valve and sliding piston-plate in the position they occupy immediately after the flow of steam has been cut off to the interior of the engine cylinder. Fig. 6 is a perspective view of the form of cut-off valve I use in connection with my engine. Fig. 7 is a perspective view of the sliding piston-plate employed in carrying out my invention. Fig. 8 is a perspective view of a self-adjusting packing-plate used in connection with my improved

engine, Fig. 9 being a cross-sectional view on the indicated line 9—9 of Fig. 8.

Referring by numerals to the accompanying drawings, 1 indicates a suitable base-plate, the same being rectangular in form, preferably of cast metal, and provided with depending feet 2, by means of which said plate is securely bolted to the floor.

3 indicates the engine cylinder which is of ordinary construction, and provided with the base 4, by means of which it is bolted to the base-plate 1. A circular plate 5 of a similar diameter to that of the cylinder 3 is bolted to the face of said cylinder 3, by means of screw-bolts 6. This plate 5 is correctly positioned upon the cylinder 3 by means of dowel pins (not shown) entering suitable bores, or apertures 7. Stuffing-boxes 8 of ordinary construction are formed on the outside of the cylinder 3 and the plate 5. Passing through the lower portion of the plate 5 and communicating with the interior of the cylinder is an aperture 9, the interior of which is screw-threaded and adapted to receive a waste-cock 10.

Extending horizontally through the cylinder 3 and plate 1, and resting in the bearings formed by the stuffing-boxes 8, and at a point slightly above the center of the cylinder 3 and plate 5, is the main shaft 11, on which and on the interior of the cylinder 3 is rigidly mounted the piston 12. The ends of this shaft 11 extend outwardly from the cylinder and are adapted to enter the bearings 13, provided with the downwardly extending legs 14 having formed integral therewith the bases 15, by means of which said bearings are bolted to the base plate 1. These bearings are provided with suitably positioned oil cups 16.

The sides, or faces, of the piston 12 are provided with a series of concentric raised portions 17, said concentric portions bearing directly against the inner faces of the cylinder 3 and plate 5. By this construction the friction between these aforesaid faces is reduced to a minimum, and any blowing through, or waste of steam, is entirely precluded.

Extending from the periphery to a point a slight distance from the center of the piston 12 is a rectangular cutaway portion 18, said



cutaway portion 18 being for the reception of the sliding piston-plate 19. This piston-plate 19 is rectangular in form and of a length corresponding to that of the piston 12, the greater portion of its face 20 being curved or formed so as to fit and bear against the interior face of the cylinder 3. The edge, or corner, formed by the curved face 20 and the side of the piston-plate 19 is rounded, or cutaway, as indicated by the numeral 21, for a purpose that will be hereinafter shown. Spring-pockets 22 are formed in the base of this piston-plate 19, and are for the reception of coil-springs 23, the lower ends of said coil-springs 23 bearing against the lower face of the cutaway portion 18.

Formed in the wall of the cylinder 3, and directly above the center thereof and extending from the plate 5 to the rear of the cylinder 3, is a rectangular cutaway portion 24 which is for the reception of the self-adjusting plate 25. This plate 25 is adapted to partially fill the cutaway portion 24, and has its forward face 26 made wider than the rear face 27. Inclined grooves, or slots, 28 extend upwardly and rearwardly from the lower front edge of this plate 25.

A circular aperture 29, interiorly screw-threaded, communicates with the interior of the cylinder 3, and when provided with a suitable pipe 30 forms the exhaust port for my improved engine.

Bolted to the top of the cylinder 3 and directly above the center thereof, is a valve-casing 31, said valve-casing being provided with the longitudinally extending passages or ports 32 and 33. When the valve-casing 31 is in position upon the cylinder 3, the passage 33 registers and communicates with a passage 34 formed in the wall of the cylinder 3 and directly in front of the plate 25. The longitudinal bore 35 formed in this valve-casing 31 is for the reception of the cut-off valve 36, said valve 36 being provided with the horizontally extending shafts 37 and 38. Passing diametrically through this cut-off valve 36, and out of a vertical line, is a passage 39, said passage 39 being of a similar width and length as that of the passages 32 and 33.

Bolted to the top of the valve-casing 31 is the base 40 of the governor valve-casing 41. A pipe 42 enters this casing 41 and forms an inlet for the steam through the governor valve (not shown) within the valve-casing 41. Any of the usual forms of governors with their valves may be used in connection with my engine.

The governor here shown is designated by the numeral 43.

A belt-wheel 44 rigidly mounted upon the shaft 11 is connected by a belt 45 to a smaller belt-wheel 46 on a shaft 47, thereby operating the governor 43.

Rigidly mounted upon the shaft 38, and extending at right angles therefrom, is an arm

48, the same being provided with a series of apertures 49.

Rigidly mounted upon the shaft 11, and upon the opposite side of the cylinder from the belt-wheel 44, is an eccentric 50. Semi-circular bands 51 and 52 having suitable blocks 53 interposed between their meeting ends are bolted together in such a manner as to occupy the desired position upon the periphery of the eccentric 50. A lug 54 extends upwardly from the band 51. To this lug 54 is bolted the lower end of a rod 55. By means of a bolt 56, the upper end of a rod 57 is securely held to the horizontally extending arm 48.

A double nut, or turn-buckle, the same having interiorly right and left-hand screw-threads, is adapted to engage the meeting ends of the rods 55 and 57, the same being screw-threaded. Thus an adjustable connection is formed between the arm 48 and the bands 51 and 52 surrounding the eccentric 50.

A belt-wheel 59 may be positioned on the outer end of the shaft 11.

The operation is as follows: The piston and piston-plate being in the position as shown in Figs. 2 and 4, live steam passes through the supply pipe 42, governor valve 43 within the valve-casing 41, through the passage 32 in the upper part of the valve-casing 31, through the passage 39 in the cut-off valve 36, the same just commencing to open by action of the eccentric; thence through the passages 33 and 34 to the interior of the cylinder. The natural tendency of said steam will be in the direction of, and to bear against, the sliding piston-plate 19. Some of the steam, however, will pass rearwardly toward the packing-plate 25, this plate normally bearing against the periphery of the piston 12. The steam that thus passes rearwardly will enter the inclined slots 28, and into the chamber or cutaway portion 24 above the plate 25. As said steam expands, it will tend to more firmly press said plate 25 against the periphery of the piston 12, thereby forming a complete packing and preventing any blowing through of the steam from one side of the piston to the other. This packing being formed all of the live steam will pass forward and bear directly upon the sliding piston-plate 19. This will cause the piston carrying the sliding piston-plate to move in the direction of the arrow "A" (Fig. 4). As said piston revolves, the valve 36 will be gradually opened, thereby gradually increasing the flow of steam into the cylinder and upon the sliding piston-plate 19. When the piston-plate 19 has reached the position as shown by dotted lines in Fig. 5, the valve 36 will, by reason of the action of the eccentric 50, be at its fullest stroke, or open to its fullest extent. As the plate moves from this point, the valve by action of the eccentric commences to close until the plate has reached the position shown by solid lines in Fig. 5. At this point the valve is entirely



closed and the inlet of live steam entirely cut off. The steam now within the cylinder between the piston-plate and the passage 34 expands, and, pressing against said piston-plate, 5 moves it to a point beyond the exhaust, or outlet, 29. From this point to a point just beyond the passage 34, the piston-plate and piston are carried by momentum. The steam having thus been used, and there being no 10 resistance offered, is free to exhaust through the port 29 and pipe 30. Thus it is seen that the piston 12 completes half a revolution by the introduction of live steam, and the other half by reason of expansion of said steam and 15 momentum.

By positioning the rod 57 at different points along the arm 48, a longer or quicker stroke of the cut-off valve 36 may be obtained.

By rounding or cutting away the edge 21 20 of the sliding piston-plate 19, said plate will pass the packing-plate 25, and said packing-plate 25 being beveled on its lower side will offer no resistance to said sliding piston-plate.

By so constructing an engine and positioning of the various parts, the "head surface" 25 within the cylinder is gradually increased as the flow of steam to the interior of said cylinder is increased, and said "head surface" gradually diminishes as the expansive force of the steam diminishes after the half stroke. 30

What I claim is—

In a rotary engine, the combination of a cylinder, a piston eccentrically mounted within said cylinder, and a metallic packing plate located within a cutaway portion in the cylinder, said packing plate being provided with 35 a series of inclined grooves or cutaway portions communicating with the steam chamber between the piston and cylinder.

In testimony whereof I affix my signature in 40 presence of two witnesses.

THOMAS BAILY BOYLE.

Witnesses:

CHAS. J. KELLER,  
WILLIAM PEEL.