No. 701,404. Patented June 3, 1902.

S. C. SHEPARD.

ROTARY ENGINE.

(Application filed Feb. 24, 1902.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

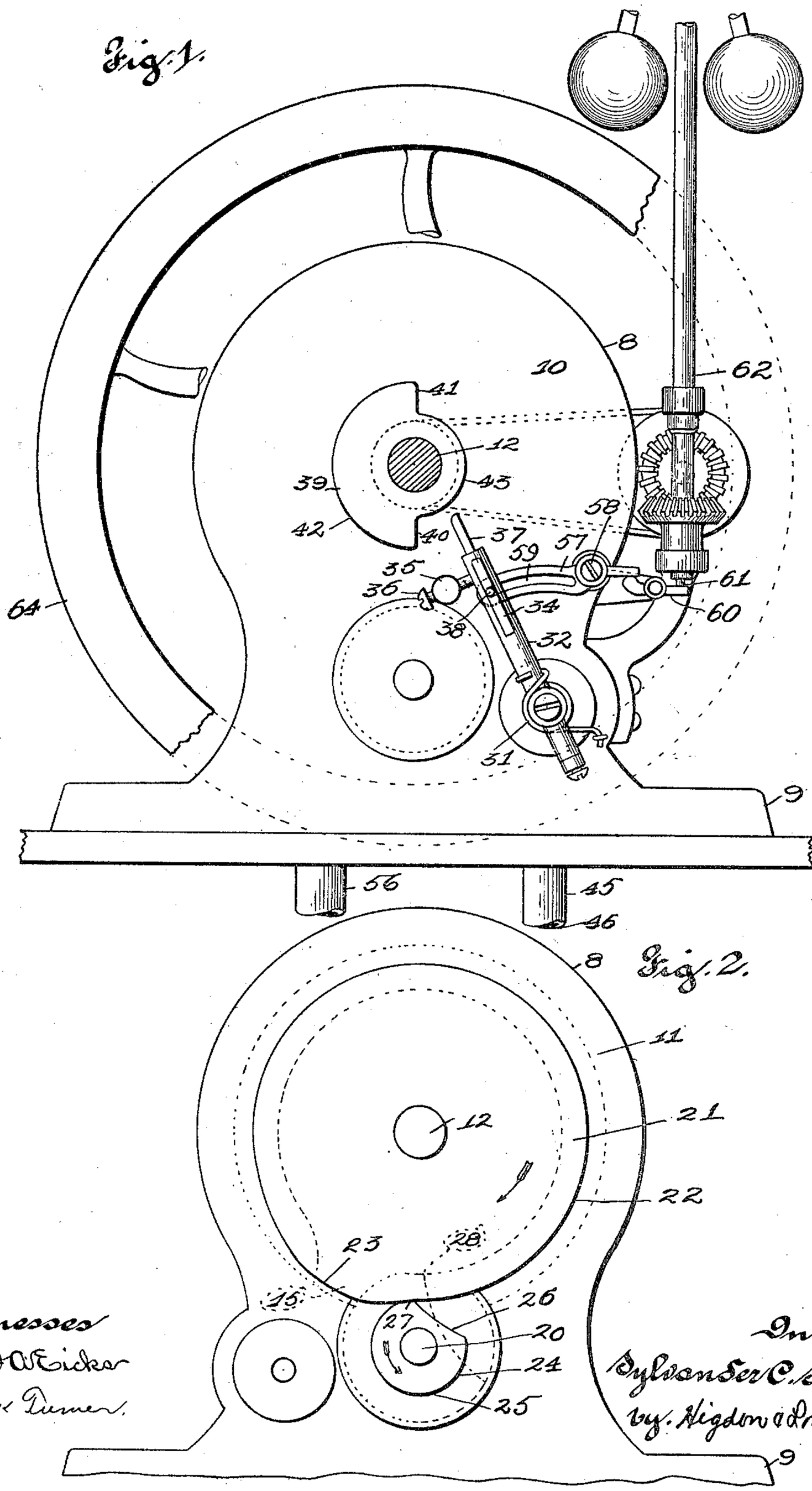

Fig. 2.

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3 Sheets—Sheet 2.

Fig. 3

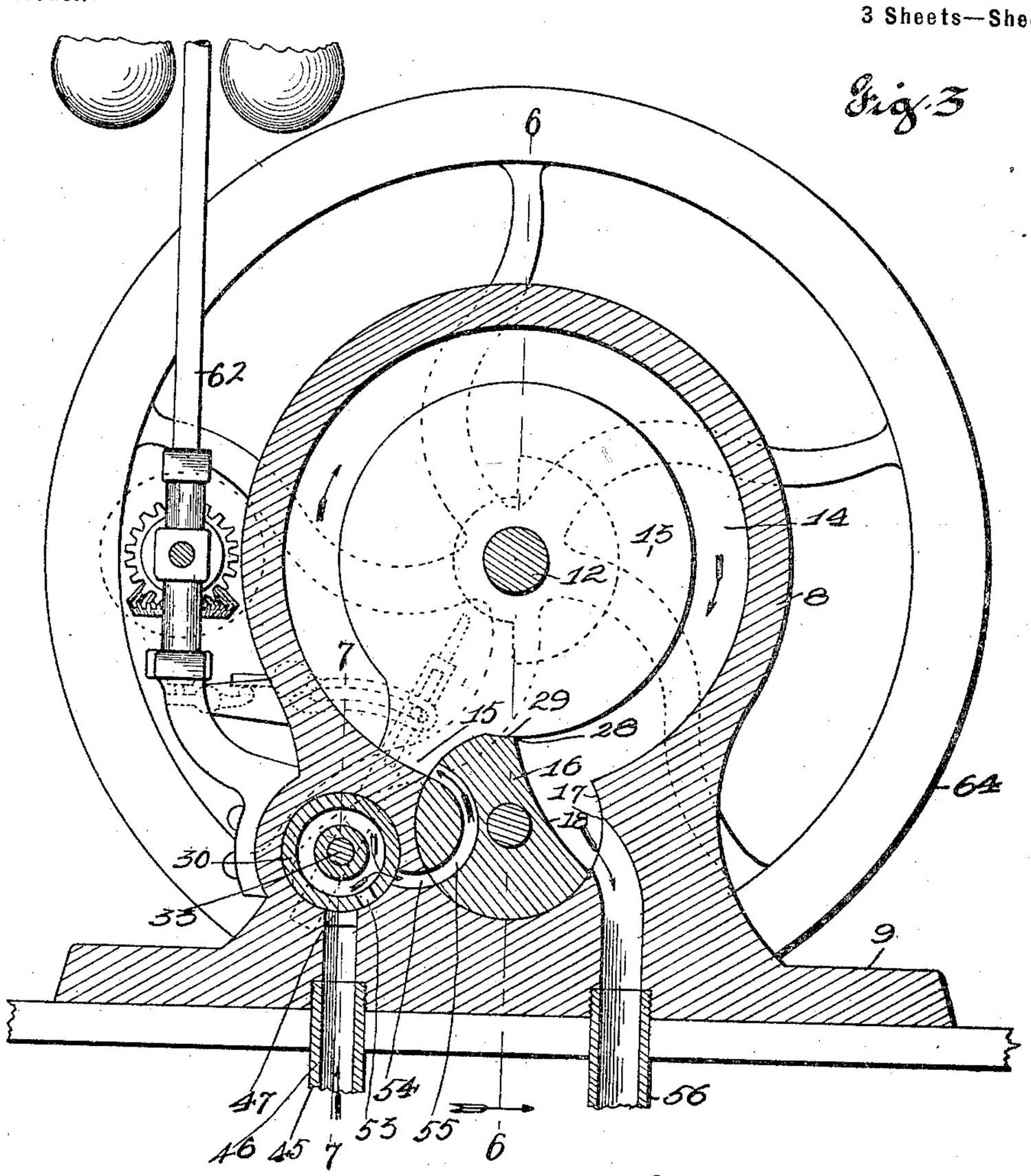

Fig. 4.

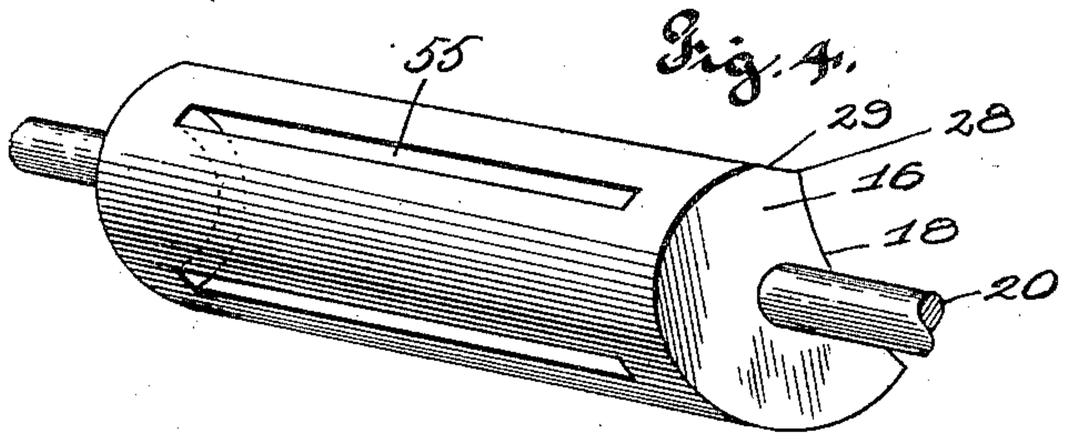

Fig. 5.

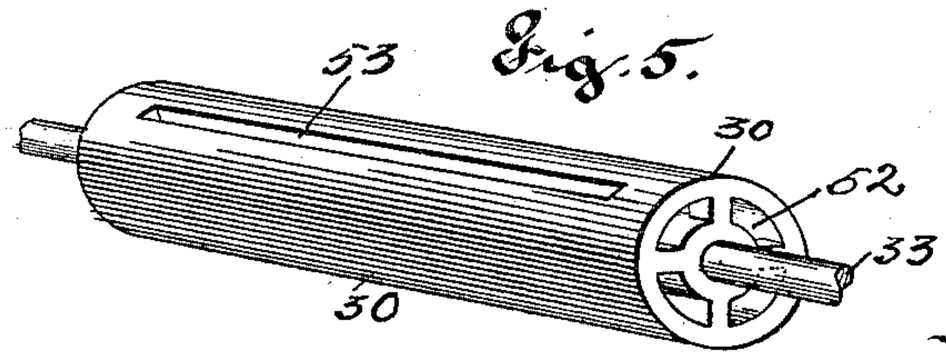

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Fig. 6.

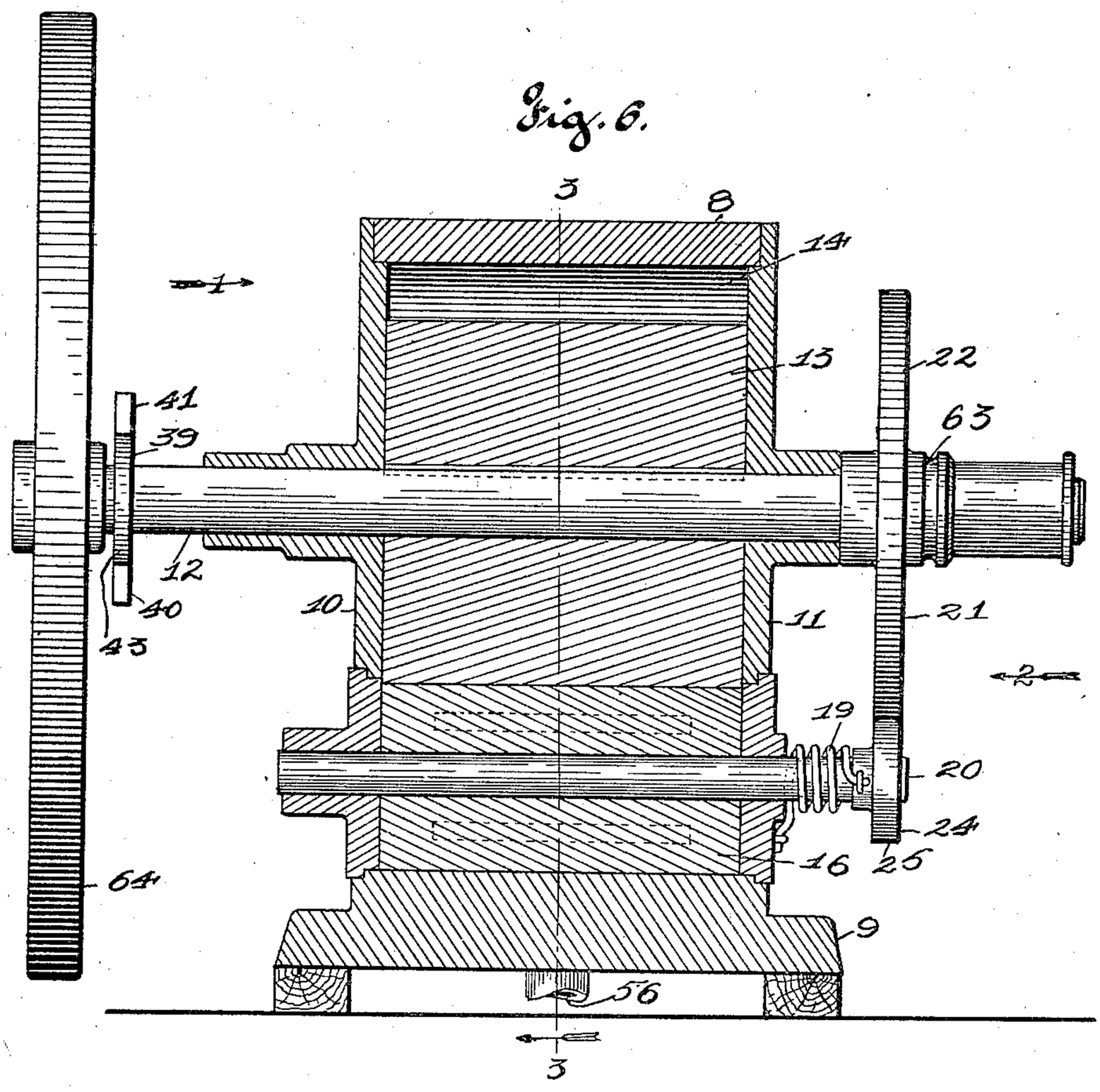
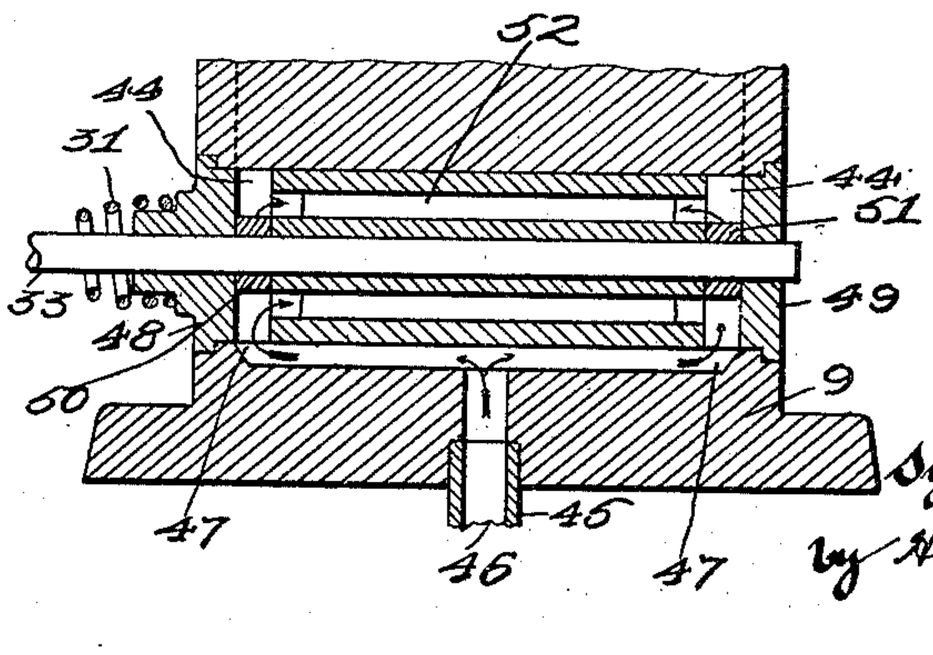


Fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

SYLVANDER C. SHEPARD, OF HANNIBAL, MISSOURI.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 701,404, dated June 3, 1902.

Application filed February 24, 1902. Serial No. 95,243. (No model.)

To all whom it may concern:

Be it known that I, SYLVANDER C. SHEPARD, of the city of Hannibal, Marion county, State of Missouri, 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 rotary engines; and it consists of the novel construction, combination, and arrangement of parts hereinafter shown, described, and claimed.

My object is to construct a rotary engine in which the supply of steam is automatically cut off and regulated by a governor; and my invention consists of a suitable cylinder or casing, a shaft mounted in the heads of said cylinder, a cylindrical rotary piston mounted in said cylinder on said shaft, there being a space between the periphery of said piston and the inner face of said cylinder to form a steam expansion-chamber, a wing carried by said piston and engaging the inner surface of said cylinder as required to divide the steam-chamber, a rocking abutment mounted in the base of said cylinder and projecting into the steam-chamber and engaging the periphery of said piston, one side of said abutment being cut away to allow said wing to pass when the abutment is rocked, a valve mounted in the base of said cylinder and adapted to cut off the steam when the valve is rocked in the proper direction, a spring attached to said valve, the tension of said spring being exerted to hold the valve normally closed with the steam cut off, a sliding arm extending from said valve, a cam fixed upon the shaft to engage the sliding arm as required to rock the valve and admit steam to the cylinder, and a governor attached to said sliding arm as required to regulate the length of time that the valve will remain open by the engagement of said cam.

Figure 1 is a side elevation of a rotary engine constructed in accordance with the principles of my invention as seen looking in the direction indicated by the arrow 1 in Fig. 6, parts being broken away to better show the construction. Fig. 2 is a side elevation from the opposite end, as indicated by the arrow 2 in Fig. 6. Fig. 3 is a vertical central cross-section on the line 3 3 of Fig. 6 and looking in the direction indicated by the arrow. Fig. 4 is a perspective of the rocking abutment. Fig. 5 is a perspective of the rocking valve. Fig. 6 is a vertical central longitudinal section on the line 6 6 of Fig. 3 and looking in the direction indicated by the arrow. Fig. 7 is a vertical longitudinal section on the line 7 7 of Fig. 3.

Referring to the drawings in detail, a cylinder-casing 8 is mounted upon or formed integral with the base 9, and the ends of the casing are closed by the heads 10 and 11. The shaft 12 is mounted in bearings at the centers of the heads 10 and 11, and the piston 13 is mounted upon the shaft within the casing 8, between the heads 10 and 11, the periphery of said piston being concentric and there being a space between the periphery of the piston and the inner face of the cylinder to form the steam-chamber 14. The wing 15 is formed integral with the piston 13 and extends outwardly and engages the inner face of the casing 8, as required to divide the chamber 14. The rocking abutment 16 is mounted in a cylindrical opening 17 in the base 9 and extends into the chamber 14 and engages the periphery of the piston 13, one side 18 of said abutment being cut away so as to allow the wing 15 to pass when the abutment is rocked to bring the side 18 into a horizontal position. The spring 19 is attached to the shaft 20, which carries the abutment 16, and to the frame, the tension of said spring being exerted to hold the abutment in engagement with the periphery of the piston 13, as shown in Fig. 3.

The cam-wheel 21 is fixed upon the outer end of the shaft 12, the larger portion 22 of the periphery of said wheel being concentric, and a small portion 23 of the periphery of said wheel projecting beyond the portion 22. A cam-wheel 24 is fixed upon the end of the shaft 20 in vertical alinement with the wheel 21, the periphery 25 of said wheel being concentric and there being a cut-away portion 26 to allow the portion 23 of the wheel 21 to pass.

When the piston is rotated in the direction indicated by the arrow in Fig. 3, the cam-wheel 21 will be rotated in the direction indicated by the arrow in Fig. 2, and just as the wing 15 approaches the abutment 16 the enlargement 23 on the wheel 21 will strike

the corner 27 on the wheel 24 and rotate said wheel in the direction indicated by the arrow, thus rocking the abutment 16 and moving the corner 28 of said abutment out of the way of the wing 15. Then as soon as the wing 15 has passed the corner 28 the projection 23 will pass the corner 27 and the spring 19 will rock the abutment back to its normal position. The corner 28 on the abutment is slightly nearer to the center than the periphery of the abutment, said corner being concaved to form the bearing-surface 29, which presses against the periphery of the piston 13 and forms a stop to resist the tension of the spring 19, and it is obvious that as the parts wear the spring will force the abutment farther in the proper direction to keep a tight joint between said surface 29 and the periphery of the piston.

The rocking valve 30 is mounted in the base 9 near to and parallel with the rocking abutment 16, and a spring 31 connects one end of the valve to the frame, the tension of said spring being exerted to hold the valve closed and the steam cut off. A tubular arm 32 is rigidly fixed upon the outer end of the shaft 33 of the valve 30, the upper end of said arm having transverse slots 34. A post 35 extends outwardly from the cylinder and carries a set-screw 36, the end of said set-screw serving as a stop to limit the backward motion of the arm 32. A slide 37 operates in the upper end of the tubular arm 32, and a pin 38 extends outwardly from said slide through the slots 34. A cam-wheel 39 is fixed upon the end of the shaft 12 and has a shoulder 40 to engage the outer end of the slide 37 and a second shoulder 41 to release said slide, the periphery 42 of said cam-wheel being concentric and extending into the plane of the outer end of the slide 37, so that when the shoulder 40 strikes the slide 37 the arm 32 will be removed in the direction indicated by the arrow, thus rocking the valve and opening the steam-port to admit steam to the chamber 14, and the outer end of said slide 37 will ride upon the periphery 42 until the shoulder 40 is reached. Then the arm 32 will be released and the tension of the spring 31 will return the valve to its normally closed position, the periphery 43 of said cam-wheel being small and out of the plane of the slide 37.

The valve 30 is cylindrical and is mounted in a cylindrical opening 14 in the base 9. The steam-pipe 45 is tapped into the base, and an opening 46 leads from the steam-pipe to the chamber 47, said chamber being in communication with the cylindrical opening 44. The opening 44 is closed by the heads 48 and 49, and the shaft 33 is rotatably mounted in said heads. The valve 30 is mounted upon the shaft 33 in the opening 44, there being washers 50 and 51 at the ends of the valve inside of the heads 48 and 49. The valve 30 is cored to form the passage 52, said passage extending from one end to the other of the valve and communicating with the chamber 47 through the spaces formed at the ends of the valve by the washers 50 and 51. A slot 53 is formed in the periphery of the valve 30 and communicates with the passage 52.

A port 54 leads through the base 9 from the opening 44 to the opening 17, and a port 55, formed in the rocking abutment 16, leads from the port 54 through the rocking abutment to the chamber 14. When the arm 32 is in its normal position, as shown in Fig. 1, and the slide 37 is out of engagement with the cam 39, the slot 53 is in the position shown in Fig. 3 and does not communicate with the port 54 and the steam is cut off. When the slide 37 is in engagement with the periphery 42 of the cam 39, then the slot 53 registers with the port 54 and steam will pass through the valve and through the abutment to the steam-chamber 14 until the projection 23 engages the cam-wheel 24 and rocks the abutment to allow the wing 15 to pass. During this operation the port 55 is out of connection with the port 54 and the steam is cut off. When the rocking abutment is in its normal position, as shown in Fig. 3, the exhaust from the chamber 14 will pass through the cut-away portion 18 to the exhaust-pipe 56.

A lever 57 is pivotally attached to the cylinder by means of the screw 58, one end of said lever having a slot 59 to receive the pin 38. A second lever 60 is mounted in position to engage the short end of the lever 57, and the sliding bolt 61 of the governor 62 engages the lever 60. The governor mechanism is of the ordinary construction and is driven from the belt-wheel 63 on the shaft 12. When the engine runs too fast, the sliding bolt 61 will be depressed, thus operating the lever 60 and the lever 57, swinging the long end of the lever 57 downwardly and shortening the slide 37. It is obvious that if the slide 37 is withdrawn, so that it will not engage the periphery 42 of the cam-wheel, the valve 30 will remain closed and no steam will be admitted to the cylinder, and that the length of the slide 37 will regulate the time that the valve 30 is open to admit steam to the cylinder and that the length of the slide 37 is regulated by the operation of the governor.

When it is desired to start the engine, the throttle-valve is opened to admit steam through the pipe 45. Then the fly-wheel 64 is manually rotated until the shoulder 41 strikes the slide 37 and opens the valve to admit steam into the steam-chamber. Then the steam passing through the port 55 will strike the wing 15 and the expansion of the steam between the wing 15 and the abutment 16 will cause the piston to rotate until the wing 15 approaches the opposite side of the abutment. Then the abutment will be rocked out of the way of the wing 15, and during this operation steam is shut off until the wing 15 passes the abutment, and the operation is repeated.

I claim—

1. In a rotary engine, a casing; heads closing the ends of the casing; a shaft mounted

in said heads; a piston mounted upon said shaft between said heads and forming a steam-chamber; a wing extending from said piston and engaging the inner surface of said casing; a rocking abutment of cylindrical form mounted in a cylindrical opening and extending into said chamber and engaging the periphery of said piston; a cam on the outer end of said shaft; a second cam on the outer end of the abutment-shaft, there being a projection on the first-mentioned cam and a cut-away portion of the second-mentioned cam, so that when the piston rotates, the abutment will be rocked out of the way of said wing; and a spring for returning said abutment to its normal position; substantially as specified.

2. In a rotary engine, a casing; heads closing the ends of the casing; a shaft mounted in said heads; a piston mounted upon said shaft between said heads and forming a steam-chamber; a wing extending from said piston and engaging the inner surface of the casing; a rocking abutment mounted in a cylindrical opening and extending into said chamber and engaging the periphery of said piston, said rocking abutment having a cut-away portion to allow said wing to pass, and said rocking abutment having a cut-away portion to form a bearing-surface to engage the periphery of the piston and form a stop to limit the backward motion of the abutment; a cam on the outer end of said shaft; a second cam on the outer end of the abutment-shaft, there being a projection on the first-mentioned cam, and a cut-away portion on the second-mentioned cam, so that when the piston rotates, the abutment will be rocked out of the way of said wing; and a spring for returning said abutment to its normal position with said bearing-surface against the periphery of the piston, substantially as specified.

3. In a rotary engine, a casing; heads closing the ends of the casing; a shaft mounted in said heads; a piston mounted upon said shaft between said heads and forming a steam-chamber; a wing extending from said piston and engaging the inner surface of the casing; a rocking abutment extending into said steam-chamber and engaging the periphery of the piston; means of rocking said abutment out of the way of said wing; a rocking valve for admitting steam to said chamber; a spring connecting one end of the valve to the frame, the tension of said spring being exerted to hold the valve closed; a tubular arm rigidly fixed upon the outer end of the shaft of the valve, the upper end of said arm being transversely slotted; an adjustable stop projecting from the frame and engaging said arm to resist the tension of said spring; a slide mounted in said tubular arm; a pin extending outwardly from said slide through said slots; a cam-wheel fixed upon the end of the shaft and having a shoulder to engage the outer end of said slide, and a second shoulder to release said slide so that when said cam-wheel strikes said slide, the valve will be opened; a lever pivotally attached to the frame and having a slot in one end to receive said pin; a second lever pivotally mounted in position to engage the opposite end of the first-mentioned lever; and a governor mounted in position to have its sliding bolt engage said second lever as required to move said slide in and out in said tubular arm by the action of the governor, thus regulating the valve, substantially as specified.

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

SYLVANDER C. SHEPARD.

Witnesses:
ALFRED A. EICKS,
JOHN C. HIGDON.