J. C. BENDIXSON.

COMPOUND ROTARY ENGINE.

APPLICATION FILED OCT. 2, 1912.

1,054,898.

Patented Mar. 4, 1913.

2 SHEETS—SHEET 1.

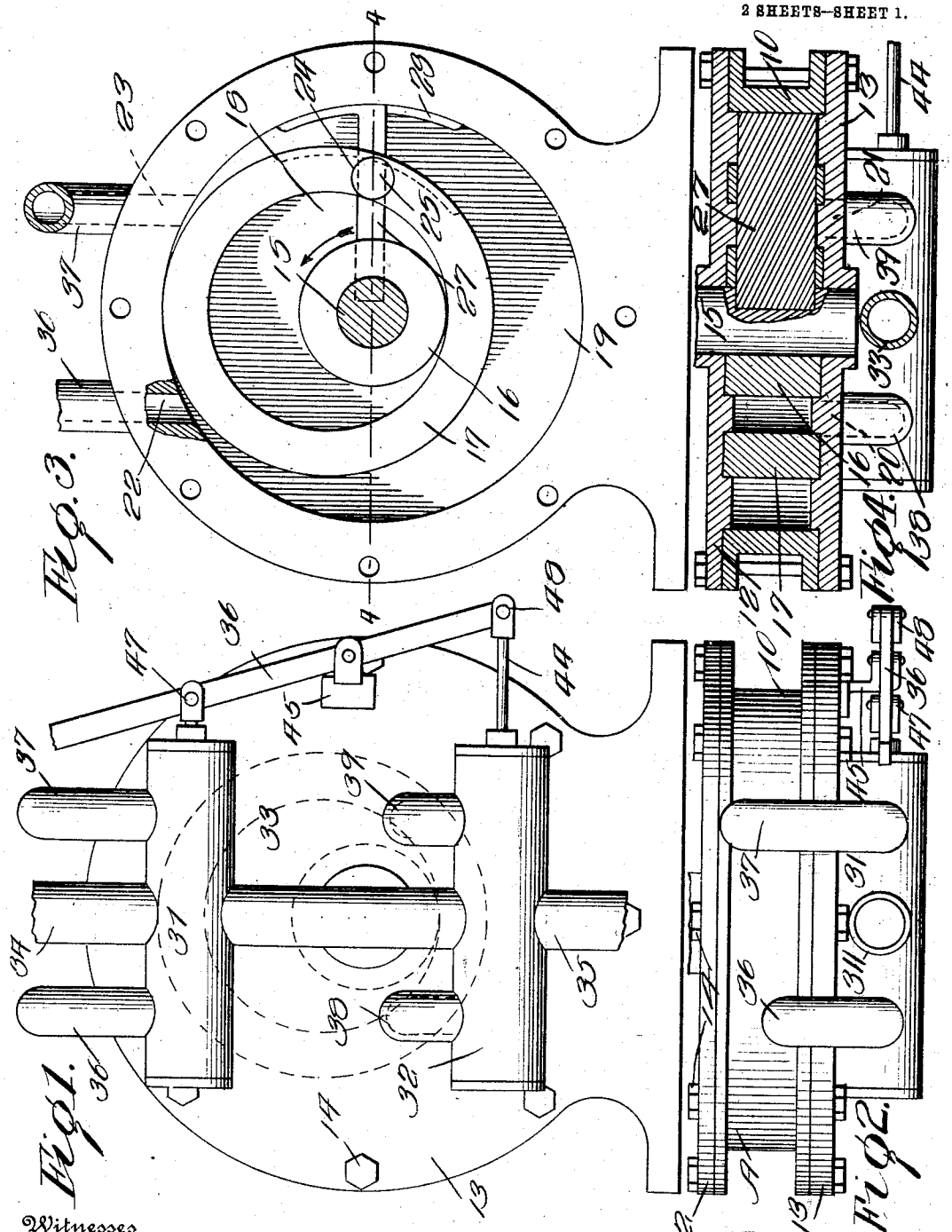

Fig. 3.

Fig. 4.

Fig. 1.

Fig. 2.

Witnesses

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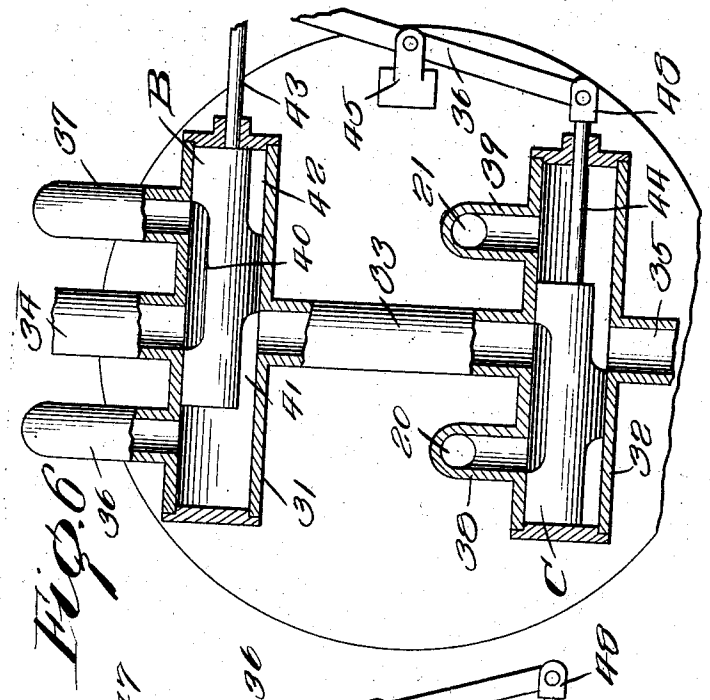

Fig. 6.

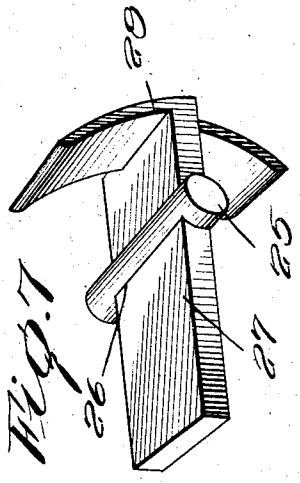

Fig. 7.

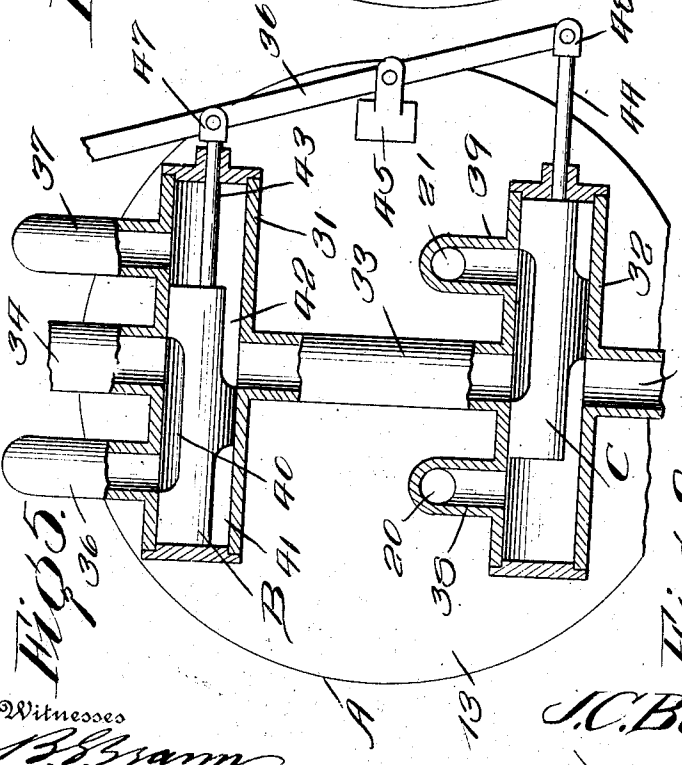

Fig. 5.

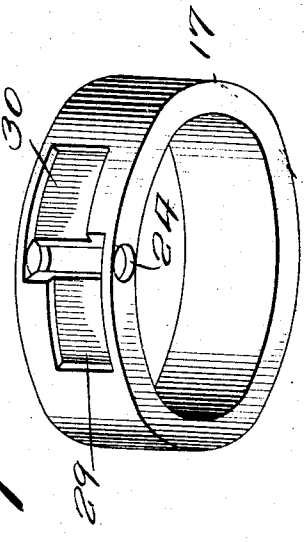

Fig. 8.

Witnesses

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COMPOUND ROTARY ENGINE.

1,054,898. Specification of Letters Patent. Patented Mar. 4, 1913.

Application filed October 2, 1912. Serial No. 723,536.

To all whom it may concern:

Be it known that I, JACOB C. BENDIXSON, a citizen of the United States, residing at Stady, in the county of Divide, State of North Dakota, have invented certain new and useful Improvements in Compound Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to rotary engines and particularly those of the compound type.

The object of the invention resides in the provision of a rotary engine of the compound type which will embody few parts and which will be efficient in operation and which may be manufactured at a comparatively small cost.

With the above and other objects in view the invention consists in the details of construction and in the arrangement and combination of parts to be hereinafter more fully described and particularly pointed out in the appended claim.

In describing the invention in detail reference will be had to the accompanying drawings, wherein like characters of reference denote corresponding parts in the several views, and in which—

Figure 1 is a view in elevation of a rotary engine constructed in accordance with the invention. Fig. 2 a plan view of what is shown in Fig. 1. Fig. 3, a side elevation with the end member of the engine casing removed, the cylindrical wall of the casing being partly in section. Fig. 4 a section on the line 4—4 of Fig. 3. Fig. 5 is a view similar to Fig. 1, showing the reversing gear in section. Fig. 6 a view similar to Fig. 5 showing the reversing gear in the extreme position from that disclosed in Fig. 5. Fig. 7 a detail perspective view of the piston and its associated bearing, and Fig. 8 a detail perspective view of the rotatable ring which divides the interior of the engine casing into inner and outer steam expansion chambers.

Referring to the drawings, the engine is shown as comprising a casing A which includes a cylindrical side wall formed of a tubular member 10 and end walls 12 and 13 which close the ends of the tubular member 10 and are detachably secured to the latter by means of bolts 14. Rotatably mounted in the end walls 12 and 13 is a drive shaft 15 which has fixed thereon within the casing A a sleeve 16. Rotatably mounted in corresponding grooves in the end walls 12 and 13 eccentric to the shaft 15 is a ring 17 which divides the interior of the casing A into an inner steam expansion chamber 18 and an outer steam expansion chamber 19, the volume of the latter being considerably in excess of the volume of the former. Steam is adapted to be supplied to and exhausted from the chamber 18 through ports 20 and 21 formed in the end wall 13, and likewise steam is adapted to be supplied to and exhausted from the chamber 19 through ports 22 and 23 formed in the side wall of the casing. The ring 17 is provided with an opening 24 in which is rotatably disposed a bearing 25. This bearing is provided with an opening 26 in which is adapted to slide a piston 27 the inner end of which is rigidly secured to the shaft 15 and sleeve 16 so that the rotation of said piston will effect a rotation of the shaft 15. The outer end of the piston 27 terminates in an arcuate cross head 28 which bears against the inner wall of the tubular member 10 of the casing and is adapted during the movement of the piston to cover and uncover the ports 22 and 23.

It will be noted that the eccentric relation of the ring 17 to the sleeve 16 is such that a portion of the latter engages the inner wall of the ring 17 during the rotation of the sleeve and ring under the influence of the movement of the piston 27. It will also be noted in this connection that the outer wall of the ring 17 engages the inner wall of the tubular member 10 of the casing at a point diametrically opposite from the engagement of the sleeve 16 with the inner wall of said ring, the ports 20 and 21 being arranged on opposite sides of the point of engagement between the ring 17 and sleeve 16 while the ports 22 and 23 are arranged on opposite sides of the point of engagement between the tubular member 10 and the ring 17.

The outer face of the ring 17 is provided on opposite sides of the opening 24 with recesses 29 and 30 arranged in staggered relation and adapted to receive the cross head 28 as the piston 27 passes between the ports 22 and 23 as will be apparent.

Mounted exteriorly of the casing A upon the end wall 13 are horizontally disposed upper and lower cylindrical casings 31 and 32 respectively. The interiors of the casings 31 and 32 are connected by a vertical pipe

33. Also communicating with the interior of the cylindrical casing 31 and disposed substantially in alinement with the pipe 33 is an exhaust pipe 34, while a steam supply pipe 35 communicates with the interior of the cylindrical casing 32 at a point diametrically opposite from the connection of said casing with the pipe 33. The port 22 is connected with the interior of the casing 31 by means of a pipe 36, while the port 23 is connected with the interior of the casing 31 by a pipe 37. Likewise the port 20 is connected to the interior of the casing 32 by means of a pipe 38, while the port 21 is connected with the interior of casing 32 by means of a pipe 39.

Slidably mounted in the casing 31 is a valve B which is provided with a by-pass 40 whereby said valve may be moved longitudinally of the casing 31 so as to afford communication between the exhaust pipe 34 and the pipe 37 or between the exhaust pipe 34 and the pipe 36. The valve B is further provided at each end and at diametrically opposite points from the by-pass 40 with longitudinal grooves 41 and 42 which are adapted to establish communication between the pipe 33 and the pipe 37 and also between the pipe 33 and the pipe 36, the position of the valve B in the casing 31 determining which communication is established. Slidably mounted in the casing 32 is a valve C which is constructed similar to the valve B and is adapted to control communication between the pipe 33 and pipe 39 and between the pipe 33 and pipe 38, and also between the steam supply pipe 35 and the pipes 38 and 39. The valve B is provided with a stem 43, while the valve C is provided with a stem 44, said stems 43 and 44 being slidably arranged through corresponding ends of respective casings 31 and 32. Pivotally mounted upon a bracket 45 carried by the casing A is a valve operating lever 36, said lever being connected by a link 47 to the stem 43, and by a link 48 to the stem 44, it being noted that the connection between the lever and the stem 43 is on one side of the pivot of said lever, while the connection between the lever and the stem 44 is on the other side of the pivot of said lever. By this construction it will be apparent that the valves B and C will always be maintained in opposite positions in the casings 31 and 32 respectively.

Assuming that it is desired to rotate the shaft 15 in the direction indicated by the arrow in Fig. 3 the valves B and C are moved through the medium of the lever 46 to the position shown in Fig. 5. Steam will then pass through the supply pipe 35 into the casing 32 and thence through the pipe 39 and port 21 into the chamber 18 and expand against the piston 27 so as to effect the rotation of the shaft 15. As soon as the piston 27 passes the port 20 the steam behind same will discharge through said port, pipe 38, by-pass of the valve C, pipe 33, groove 42 of the valve B, pipe 36, port 22 and thence into the chamber 19 where it will again expand and act upon the piston 27 to effect the rotation thereof. As soon as the cross head 28 of the piston 27 has passed clear of the port 23 the steam in the chamber 19 behind the piston 27 will exhaust through the pipe 37 by-pass 40 and pipe 34. If it is desired to reverse the rotation of the shaft 15 it is only necessary to shift the positions of the valves B and C from that shown in Fig. 5 to that shown in Fig. 6.

What I claim is:—

A compound rotary engine comprising a cylindrical casing, a shaft rotatably mounted in the end walls of said casing, a ring rotatably mounted in the end walls of said casing eccentrically to said shaft and having its outer and inner walls in engagement with the inner wall of the side of the casing and with the periphery of said shaft at diametrically opposite points respectively and dividing the interior of the casing into inner and outer steam expansion chambers, said casing having its side wall provided with ports opening into the outer steam expansion chamber on opposite sides of its point of engagement with said ring and one of its end walls provided with ports opening into the inner steam chamber on opposite sides of the point of engagement between the ring and shaft, a radial piston having one end fixed to the shaft and slidably arranged through said ring, a pair of valve casings mounted on the wall of the engine casing a pipe connection between said valve casings, a steam supply pipe communicating with one of said valve casings, pipe connections between the ports of the outer steam chamber and said last named valve casing, pipe connections between the other valve casing and the ports of the inner steam chamber, an exhaust pipe leading from last named valve casing, valves slidably mounted in said valve casings respectively, and means for simultaneously and reversely sliding said valves.

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

JACOB C. BENDIXSON.

Witnesses:
H. H. LANDRO,
S. H. ROBINSON.