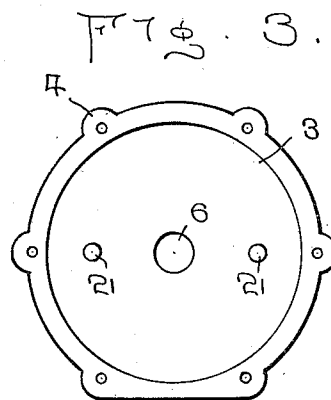
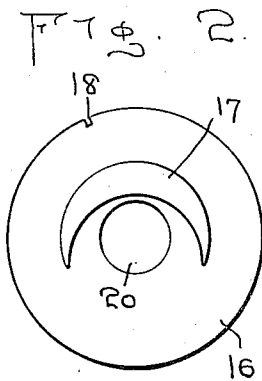
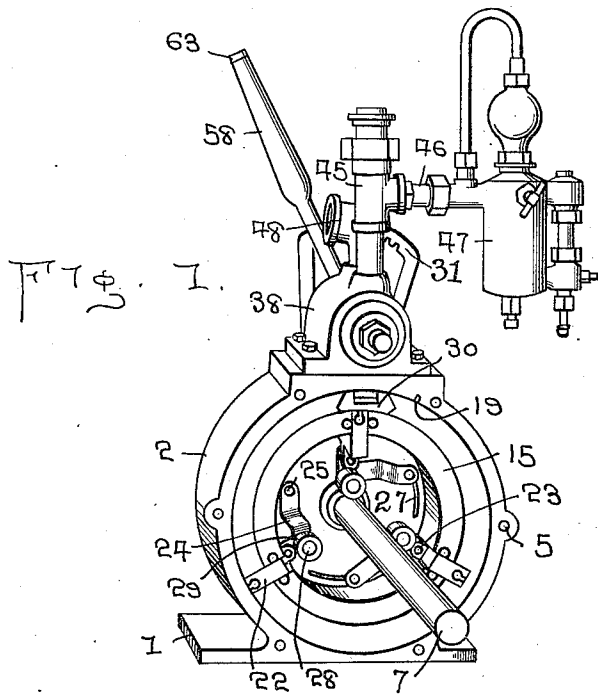


J. H. LINDELL.
 ROTARY ENGINE.
 APPLICATION FILED NOV. 29, 1911.

1,051,134.

Patented Jan. 21, 1913.

2 SHEETS-SHEET 1.



WITNESSES:

Thomas W. Riley
 M. Newcomb.

J. H. Lindell. INVENTOR

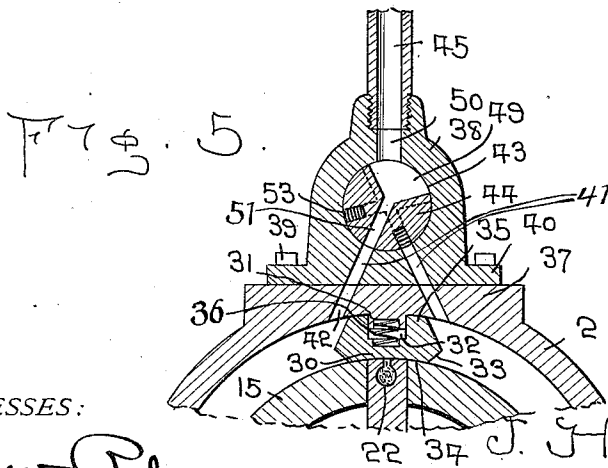
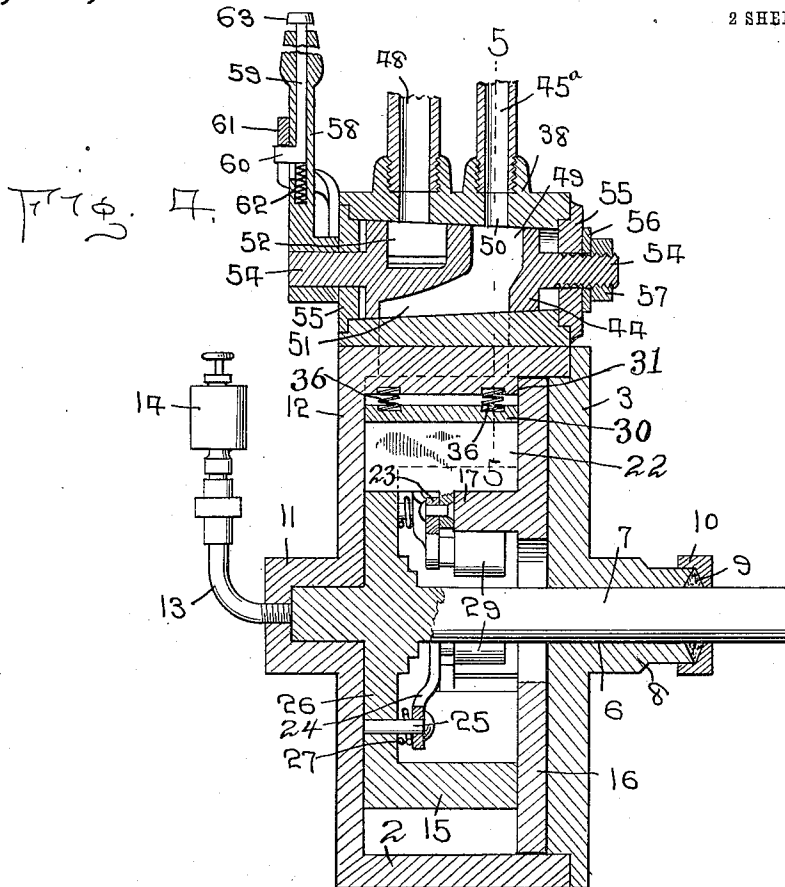
BY W. T. Fitzgerald & Co.
 Attorneys

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UNITED STATES PATENT OFFICE.

JOHN HJALMAR LINDELL, OF ASHTABULA HARBOR, OHIO.

ROTARY ENGINE.

1,051,134.

Specification of Letters Patent.

Patented Jan. 21, 1913.

Application filed November 29, 1911. Serial No. 663,107.

To all whom it may concern:

Be it known that I, JOHN HJALMAR LINDELL, a subject of the Government of Finland, residing at Ashtabula Harbor, in the county of Ashtabula and State of Ohio, have invented certain new and useful Improvements in 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 engines and more particularly to reversible rotary engines.

An object of the invention is to construct a rotary engine of the reversible type which will be of novel form and which may be operated at a high speed by a low pressure of steam.

Another object is to provide an improved reversible rotary engine adapted to be operated by steam, and to so construct the engine that the shaft thereof may be rotated rapidly under a low pressure of steam.

A further object is to generally improve the construction and operation of the various parts of the engine and to simplify the construction thereof.

Other objects and advantages will be hereinafter set forth and pointed out in the claim.

In the accompanying drawings which are made a part of this application, Figure 1, is a perspective view of the engine, the cylinder head and piston guide being removed, Fig. 2, is a detail view of the piston guide, Fig. 3, is a similar view of the cylinder head, Fig. 4, is a vertical cross sectional view, centrally through the complete engine, Fig. 5, is a sectional view on the line 5-5, Fig. 4, certain elements being omitted and the valve being in a shifted position.

Referring to these drawings, in which similar reference numerals designate corresponding parts throughout the several views, 1 designates the base upon which the substantially drum shaped stationary cylinder 2 is secured, said cylinder being secured upon its side to the base 1 or formed integrally therewith, as desired. The head 3 of the cylinder 2 may be secured in position upon the cylinder by any suitable means as by bolts (not shown) through the perforated ears 4, of the head 3, and into suitable openings 5 in the edge of the cylinder 2. The head 3 is provided with a suitable cen-

tral opening 6 to accommodate the shaft 7 and a bearing sleeve 8 which is projected outwardly from said head to assist in supporting and protecting the shaft 7. Any suitable packing 9 and cap 10 may be provided at the end of the sleeve to make a steam tight joint and thus prevent the escape of steam from the interior of the engine, at this point. It will be understood that my form of drive wheel or power transmission element (not shown) may be carried upon the projected end of the shaft 7. The opposite end of the shaft is mounted within the bearing 11 provided therefor on the head 12.

Secured in the closed end of the bearing 11 is a suitable feed pipe 13, from an oil cup 14, containing a lubricant. Rigid upon the shaft 7, between the heads 3 and 12 is the rotor 15 which has one side open, and against this open side is positioned the piston head guide plate 16 carrying the crescent guide flange 17, the purpose of which will presently appear. The plate 16 is placed in position against the open side of the rotor 15 and held against rotation by means of a locking pin (not shown) positioned within the notch 18 in the periphery of said plate and in a corresponding notch 19 in the wall of the stationary cylinder 2. The plate 16 is provided with a suitable central opening 20 to accommodate the shaft 7 and after said plate has been properly positioned and the locking pin driven in place, the removable head 3 is placed upon the shaft 7 and placed against the open end of the stationary cylinder 2, it being understood that the plate 16 fits within the cylinder 2 and that the removable head 3 fits against the adjacent face of said plate. Suitable tension-regulating screws 21 extend through the head 3, preferably upon opposite sides of the shaft 7 and (see Fig. 3) bear against the plate 16 to hold the latter in properly adjusted position against the rotor 15.

Seated in suitable openings in the side of the rotor 15 are the piston heads 22 which are riveted, by means of the perforated ears 23 thereof, to the short arms of the bell cranks 24, the long arms of which are carried upon the pivot pins 25 secured in the head 26 of the rotor 15. The bell cranks 24 and the piston head controlling springs 27 resiliently retain the piston heads 22 against the curved interior of the stationary

cylinder 2, by acting upon the bell cranks 24. Each spring 27 has one end secured to the head 26 of the rotor and has its medial portion coiled around one of the pivot pins 25 and its other end is secured to the bell crank 24, carried by said pin, thus exerting a continual resilient action upon said bell crank to hold the piston head 22 outwardly, against the interior surface of the stationary cylinder 2. Each bell crank 24 has a roller-supporting pin 28 at the junction of its short arm with its long arm, upon which pin is carried the roller 29 for rolling upon the under side of the crescent shaped guide flange 17, as the rotor 15 revolves, for the purpose of gradually drawing downward the piston head and preventing it from striking the side of the double partition wall 30. The double partition member 30 is positioned between the stationary cylinder 2 and the rotor 15, at the uppermost portion of the latter, and is held in place by means of a transverse rib 31 fitting within the central longitudinal groove 32 of said member 30, the rib 31 being formed upon the interior surface of the cylinder 2. The double partition member 30 has sloping sides 33 and a slightly concaved under surface 34, fitting upon the periphery of the rotor 15. Between the partitions 35 of the double partition member 30, are suitable springs 36 which have their opposite ends pressing against seats formed therefor in the rib 31 and in the central portion of the member 30, to retain said member against the rotor 15. The springs 36 are especially useful after the engine has been used for some time and the parts have become slightly worn, said springs compensating for such wear.

The exterior surface of the stationary cylinder 2 is flattened at the upper portion thereof, as shown at 37 to receive the three-way valve casing 38, which is secured to the flattened top 37 by means of suitable bolts 39 through the flange 40 of said casing. Extending through the base portion of the valve casing 38 are the narrow passages 41 which diverge and communicate with the passages 42 through the upper portion of the cylinder 2, said passages 42 communicating with the interior of said cylinder, at opposite sides of the double partition member 30, the purpose of which will be readily apparent. The passages 42 register with the passages 41 and the upper ends of the latter communicate with the large central bore 43 of the valve casing 38, said bore 43 being circular and extending through the valve casing, from the front to the back thereof, to accommodate the three-way valve 44, which will presently be fully described. Secured in the upper portion of the three-way valve casing 38 is a small supply pipe 45, which may be connected with any suitable source of supply and to which is connected

a pipe 46 from the lubricator 47. The end of the exhaust outlet pipe 48 is also secured in the upper portion of the three-way valve casing 38.

The three-way valve 44 has the inlet passage 49 near one end and is adapted for communication with the supply pipe 45, by means of the short passage 50, within the casing 38, said passage communicating with the end of the supply pipe 45 and with the central bore 43. The inlet passage 49 is of such size as to communicate with the short passage 50 when the valve is in either of its three positions, and the passage 49 connects with the narrow passage 51 extending approximately the full length of the valve 44, the long and narrow passage 51 being adapted for registration with either of the passages 41 in the lower portion of the casing 38 and connecting with the passages 42 which lead to the interior of the cylinder 2. At the opposite end of the valve 44, from the passage 49, is the outlet passage 52 which communicates with two exhaust passages 53, upon opposite sides of the inlet passage 51 and extending approximately the full length of the valve 44. The long and narrow passages 53 are adapted for registration with the passages 41, only one passage 53 being in registry with a passage 41 at a time, to allow the escape of exhaust steam from between the rotor 15 and the cylinder 2, after said steam has entered the cylinder 2 by means of the other passage 42 and has rotated the rotor 15 by acting upon the piston heads 22 to force the latter around the interior of said cylinder.

The engine may be readily reversed by rotating the three-way valve 44, so as to shift the long and narrow passage 51 from registry with one passage 41 into registry with the other passage 41, which latter has been serving as an exhaust outlet, and thus to connect the latter into an inlet passage, while the passage 41 which has been serving as an inlet passage becomes the exhaust outlet passage. It will be understood that by thus changing the position of the valve 44, the long and narrow passage 53 will be brought into registration with the passage 41 which now becomes an exhaust outlet passage, while the passage 53 which was previously in registration with the other passage 41 will be placed against the wall of the central bore 43 and thus become inactive. When the valve is turned to its closed position to cut off the supply of steam to the interior of the stationary cylinder 2, the narrow passage 51 assumes a position between the upper ends of the passage 41, preventing the steam from entering either of these passages from said passage 51. When the valve is in this position, both of the passages 53 are out of engagement with the passages 41. The opposite ends 54 and 54^a

of the valve 44 are reduced and extend through caps 55 which are engaged within the opposite ends of the central bore 43 of the valve casing 38. The end 54^a is threaded and a washer 56 and a nut 57 are secured upon the same, outwardly of the cap 55.

Secured upon the end 54, outwardly of the cap 55 is one end of the valve controlling lever 58 having a rod 59 movably seated in a longitudinal opening in the upper portion thereof and having its lower end 60 bent at an angle and projected laterally through an opening in the side of the lever 58 and communicating with the longitudinal opening. The bent lower end 60 of said rod projects a short distance out of the lever 58 and is adapted for engagement with a toothed segment 61, to hold the lever in adjusted position, said bent end 60 being normally held in engagement with the segment 61 by means of the coil spring 62, within the lever 58, said spring pressing upwardly against the bent end. The upper end of the rod 59 projects slightly above the upper end of the lever 58 and is headed as shown at 63 for engagement by the hand of the operator to force the rod 59 downward for the purpose of disengaging the lower bent end 60 thereof from the segment 61, which is mounted on the valve casing 38.

The operation of this engine, it is believed, will be obvious to any one skilled in the art to which it appertains, in view of the foregoing disclosure of its construction and of the following: As the rotor 15 rotates and the piston heads 22 approach the double partition member 30 they are drawn inward by means of the crescent shaped flange 17 and the rollers 29, while the corresponding piston heads pass over the upper side of the guide flange. The piston controlling springs 27 act to return the piston heads 22 to their

normal positions against the curved interior surface of the stationary cylinder 2, as they pass the double partition 30. Owing to the formation of the guide flange 17, the springs 29 are prevented from acting too abruptly in returning the piston heads to their normal positions, as will be clearly understood.

It will thus be seen that I have provided a rotary steam engine which may be readily reversed to operate in either direction.

What I claim is:

In a reversible rotary engine, a rotor casing, a rotor in the casing carrying piston heads, means including a bell crank and a roller thereon for actuating each of the piston heads, a guide flange in the path of the rollers for actuating the bell crank, a valve casing having alternative inlet and exhaust passages communicating with the rotor casing, inlet and exhaust pipes communicating with the valve casing, and a valve rotatably mounted in the valve casing, said rotary valve having two separate exhaust passages and having an inlet passage between the exhaust passages, said exhaust passages communicating with the exhaust pipe and being adapted respectively to be alternately moved into and out of communication with the first said passage, the relation of the passages being such that the last said inlet passage communicates with one of the first said passages when either of the exhaust passages of the valve is in communication with the other of the first said passages.

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

JOHN HJALMAR LINDELL.

Witnesses:

JAMES W. THROOP,
E. C. HRALAK.