

L. HILLS.
 REVERSIBLE ROTARY STEAM ENGINE.
 APPLICATION FILED DEC. 16, 1908.

933,037.

Patented Aug. 31, 1909.

2 SHEETS—SHEET 1.

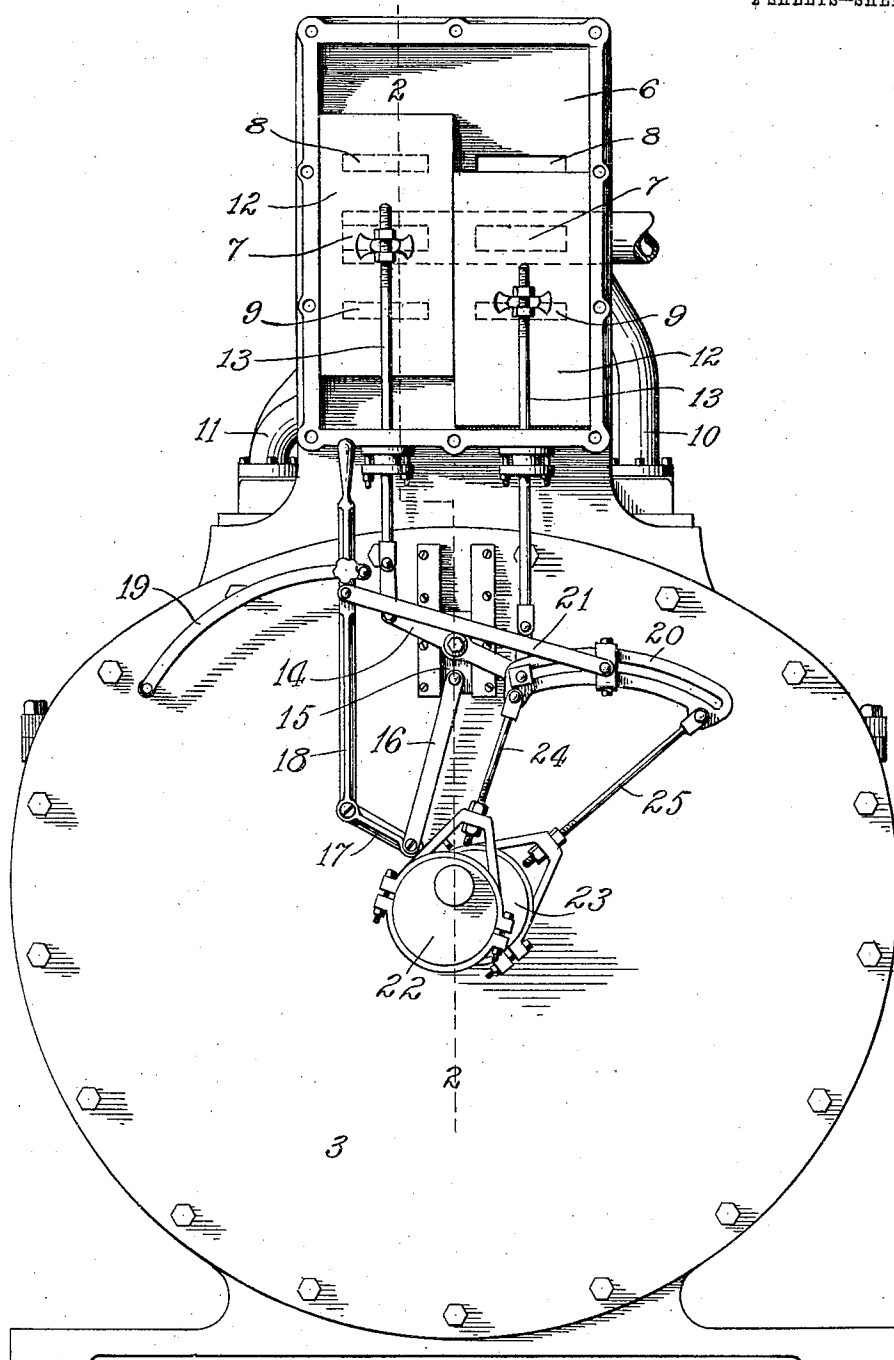


FIG. 1.

Witnesses
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Georgiana Chase

Inventor
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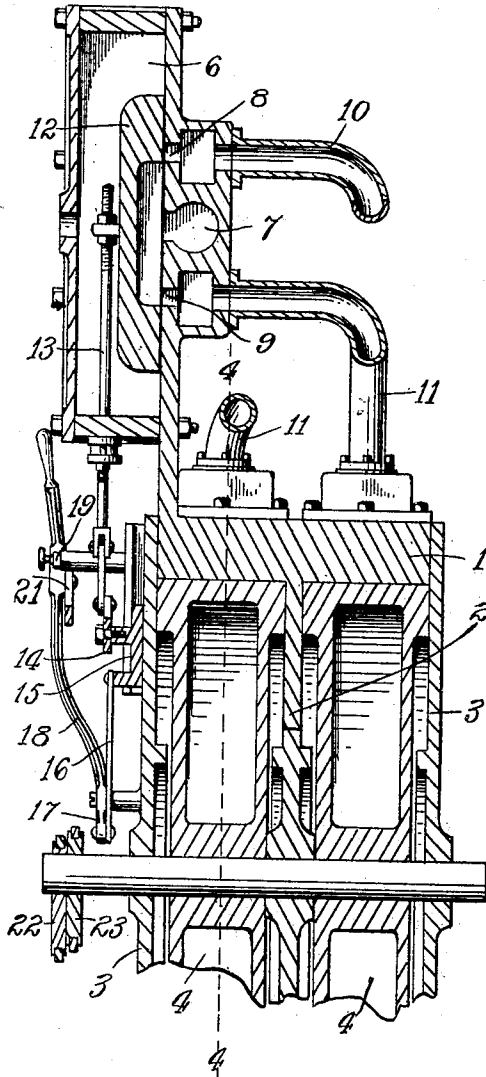


FIG. 2.

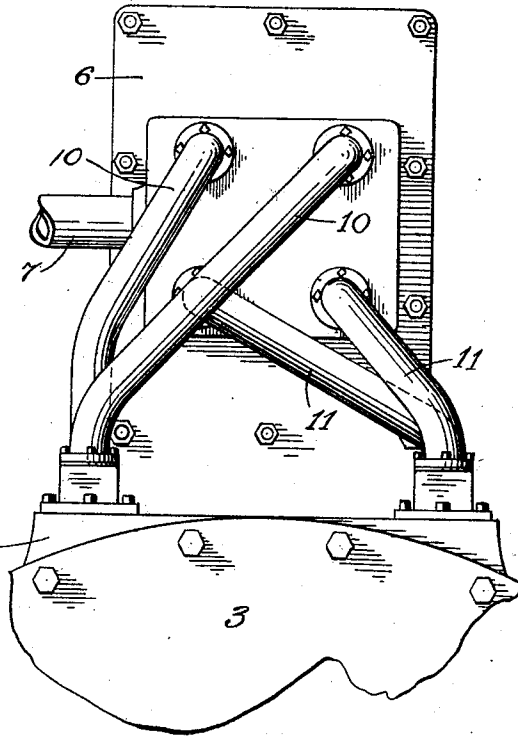


FIG. 3.

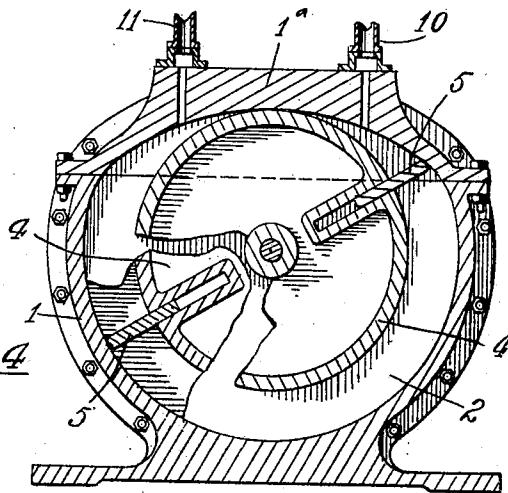


FIG. 4.

Witnesses
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UNITED STATES PATENT OFFICE.

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REVERSIBLE ROTARY STEAM-ENGINE.

933,037.

Specification of Letters Patent. Patented Aug. 31, 1909.

Application filed December 16, 1908. Serial No. 467,783.

To all whom it may concern:

Be it known that I, LEVI HILLS, a citizen of the United States of America, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Reversible Rotary Steam-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.

My invention relates to improvements in reversible rotary engines, and its object is to provide means for readily reversing the engine; to provide means for working the steam expansively, and to provide the device with various new and useful features hereinafter more fully described and particularly pointed out in the claims, reference being had to the accompanying drawings in which:

Figure 1 is an elevation of a device embodying my invention with the cap of the steam chest removed. Fig. 2 a sectional detail in vertical section on the line 2—2 of Fig. 1. Fig. 3 a rear elevation of the upper part of the device. Fig. 4 a reduced transverse section on the line 4—4 of Fig. 2 with parts broken away.

Like numbers refer to like parts in all of the figures.

1 represents the lower part of the case of the engine, and 1^a a detachable upper part of the same. This case is divided into two equal parts by a partition 2 and provided with heads 3, and a rotary piston 4 in each part each piston having a sliding abutment 5. The lower part of the case for about two-thirds of its circumference is concentric with the piston, and the upper part of the same is internally formed on an arc of greater radius than the lower part, whereby the piston contacts the same at the top adjacent to the steam chest 6. This chest is provided with two exhaust ports 7 at the middle of the chest, which ports are constantly covered by two oppositely reciprocating D-valves 12. Two upper and two lower live steam ports are arranged at the respective sides of the exhaust ports 7 properly spaced apart therefrom, and extending from these live steam ports are pipes or passages 10 and 11. The pipes 10 communicate with the upper ports 8 and one side of the respective pistons to admit steam to turn the pistons in one direction, and the pipes 11 communicate with the

ports 9 and the pistons at the other side thereof to admit steam to turn the same in the opposite direction.

The valve operating mechanism is so organized that the valves operate alternately to open the live steam ports, and the pistons have their respective abutment oppositely arranged to each other whereby each piston receives steam alternately. The valve mechanism is also so organized that when moved to uncover or open the ports 8, the ports 9 are in constant communication through the interior of the D-valve with the exhaust ports 7, and when the valves are shifted to run the engine in the opposite direction, the ports 9 are opened and the ports 8 are in constant communication with the said exhaust ports 7. For this purpose the chamber in each valve is made equal in length to the space between the live steam ports plus the width of one of said ports and the stroke of the valve adjusted so that one of said ports is at all times in communication with said chamber, and the other closed except as uncovered to admit live steam, and each valve is provided with a valve rod which extends through a gland in the steam chest and these rods are connected to the opposite ends of a rocker bar 14, which latter is centrally pivoted on a slide 15 adjustable toward and from the steam chest by means of a crank arm 17 on the reverse lever 18 and a connecting rod 16. Thus when the lever is shifted the slide 15 is moved toward and away from the steam chest sufficient to shift the valves 12 a proper distance to reverse the engine by connecting two of the live steam ports with the exhaust ports and alternately opening the other two live steam ports. The reverse lever 18 is adjusted on a sector 19 in the usual way and a connecting rod 21 connects said lever to a link 20 which link is adjustably connected to one end of the rocker bar 14 to operate the same. This link is operated by two eccentrics 22 and 23 on the main shaft of the engine respectively adjusted to run the engine either forward or backward. The connecting rods 24 and 25 between the respective eccentrics and the respective ends of the link 20 differ in length by an amount equal to the travel of the slide 15, whereby each respective end of the link is adjusted at proper distance from the axis of the shaft to properly operate the valves in either the forward or backward running

position. By adjusting the link in various positions between its ends, the cut off action of the valves will be modified in the usual way, and by throwing the link to its respective ends the valves are shifted bodily endwise to properly adjust the same for running the engine in either direction.

What I claim is:—

1. A reversible rotary engine, comprising a steam chest, a case communicating with the chest by two live steam ports spaced apart and also having an exhaust port between the live steam ports, a rotary piston in the case, a D-valve adapted to continuously connect one live steam port and the exhaust port and to intermittently open the other live steam port to the interior of the chest, and means for shifting said valve to connect the other live steam port and the exhaust port and to periodically open the first named live steam port, whereby the engine may be reversed.
2. A reversible rotary engine, comprising a steam chest, a case having two live steam ports communicating with the chest and case and spaced apart, and also having an exhaust port between the live steam ports, a D-valve arranged to continuously connect one live steam port and the exhaust port and to intermittently open and close the other live steam port, and to shift to opposite position to continuously connect the other live steam port with the exhaust port and to open and close the first named live steam port, two eccentrics and a link to operate said valve, said eccentrics being connected to the link by rods having different lengths, whereby the valve is shifted by shifting the link, and means for shiftably connecting the link and valve.
3. A reversible rotary engine comprising a rotary piston, a steam chest, a case surrounding the piston and spaced apart therefrom throughout a part of its circumference and contacting the piston at one portion, said case having live steam ports at the respective sides of its contacting portion communicating with the steam chest and an exhaust port opposite its contacting portion, a D-valve in the steam chest of such length that when adjusted to alternately open and close one live steam port at one end, it will continuously connect the other live steam

port and the exhaust port, two eccentrics to alternately operate said valve, rods of different lengths attached to the respective eccentrics, and means for alternately connecting said rods with the valve, whereby the valve is shifted to reversed position by shifting said connections.

4. A rotary engine, comprising two rotary pistons having oppositely arranged abutments, a steam chest having two exhaust ports and also having two live steam ports at one side of the exhaust port communicating with one side of the pistons and two live steam ports communicating with the other side of the pistons, two D-valves in the chest, a rocker bar centrally pivoted and connected at its respective ends to the valves, means for shifting the rocker bar toward and from the chest, a link connected to the rocker bar, an eccentric for each end of the link, and rods of different lengths connecting the eccentrics and the respective ends of the link.

5. A reversible rotary engine, comprising two pistons having opposing abutments, a steam chest having two exhaust ports, and a live steam port at each side of each exhaust port, two live steam ports being in communication with one side of the pistons and the other two live steam ports communicating with the other side of the pistons, two D-valves adapted to shift to constantly and alternately connect two live steam ports with the exhaust ports and to periodically open and close the other two live steam ports and to shift to oppositely operate said ports, a rocker bar connected at its respective ends to the valves, a slide to which the bar is pivoted at the middle, a link adjustably connected to the rocker bar, an eccentric for each end of the link, rods of different lengths connecting the respective eccentrics to the ends of the link, a reverse lever having a crank extension, a rod connecting the slide and crank extension, and a rod connecting the reverse lever and the link.

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

LEVI HILLS.

Witnesses:

GEORGIANA CHACE,
L. V. MOULTON.