J. H. DARRAGH.

Rotary Steam-Engine.

No. 213,096. Patented Mar. 11, 1879.

Fig. 1

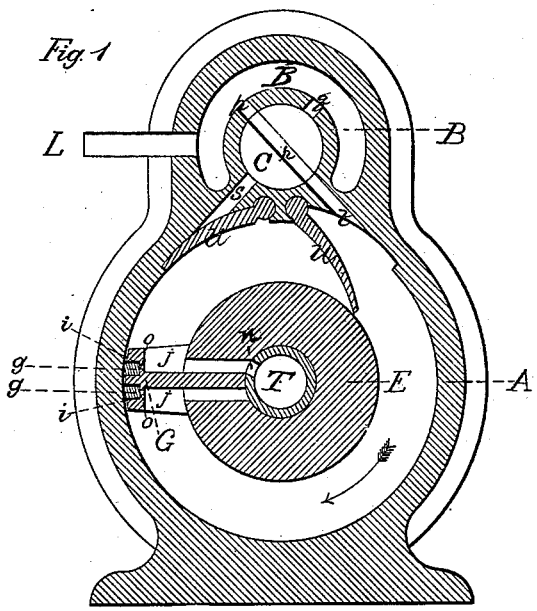


Fig. 2

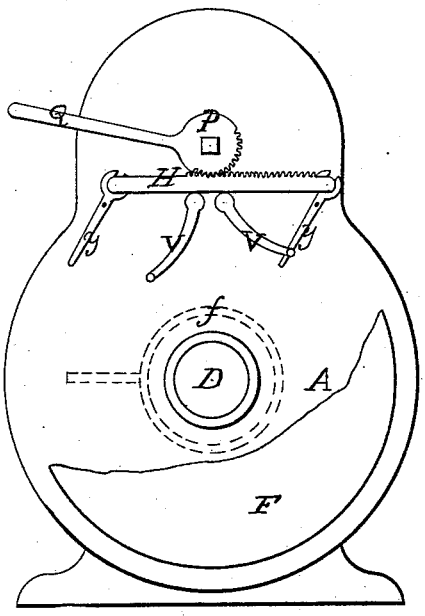
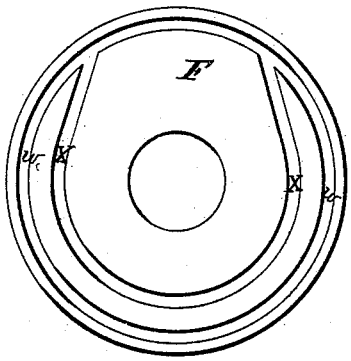


Fig. 3



Witnesses

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JOHN H. DARRAGH, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN ROTARY STEAM-ENGINES.

Specification forming part of Letters Patent No. **213,096**, dated March 11, 1879; application filed July 30, 1878.

To all whom it may concern:

Be it known that I, JOHN H. DARRAGH, of the city and county of San Francisco, in the State of California, have invented certain Improvements in Rotary Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the drawings accompanying this specification, and forming a part of the same.

My invention has reference to certain improvements in rotary steam-engines, as hereinafter more fully described.

Referring to the accompanying drawings, Figure 1 is a vertical section. Fig. 2 is a side view with lower part broken away. Fig. 3 is a view of the cam-wheel.

The shell or case A of the engine I construct with a semicircular steam-chest, B, upon it, and in this steam-chest I place a reversing-valve, C, by means of which I can direct the steam to either side of the center, so as to drive the engine-shaft D in either direction, as hereinafter more fully described.

The engine-shaft I make with an enlargement or piston, E, upon it, so as to increase its diameter inside of the shell A, and thus decrease the steam-space in the engine. The ends of this enlargement fit close against the sides of the case A, and a ring-packing, *f*, prevents the entrance of steam between its ends and the sides of the case.

The shaft D passes through stuffing-boxes in the sides of the case, so that there is no chance for leakage of steam.

A single piston-wing, G, extends radially from the enlargement E, so that its outer end moves close against the inside face of the shell A. To pack the edge of this piston-wing, I make two grooves, *i i*, longitudinally along its edge, one near each side, and in each groove I place a steel or other metal bar, *g*. I also make a chamber, *j*, in each side of the piston, and connect the bottom of each groove *i* with the chamber underneath it by means of holes *o o*, so that one groove connects with the chamber on one side, and the other connects with the chamber on the other side. These bars will then serve as packing for the edge of piston-wing, because when steam is admitted into the engine it will fill the chambers *j* and holes *o o*, and press the bars *g* outward against the face of the case, so that no matter how much they wear they continually adjust themselves to the surface to be packed.

B is the steam-chest, which I have represented in the present instance as semicircular; but it might be made in any desired form. L is the steam-pipe which conducts steam to the steam-chest. C is the rotary plug or valve by means of which the direction of the steam is reversed. This plug or valve is placed in a bore or hole in the steam-chest, and it has a passage, *r*, leading through it.

Ports or passages *p q* connect the bore in which the plug or valve rotates with the steam-chest, and two similar ports, *s t*, with the engine-cylinder, one on each side of the shaft-center. The arrangement of these ports is such that when the plug is turned so that its port or passage *r* connects the port *p* with the port *t*, steam can pass into the cylinder through the port *t*; but when the plug is turned so as to connect the passages *q s*, steam will be admitted into the cylinder through the port *s*, thus reversing the motion of the piston.

U U are hinged valves or abutments, one of which is placed over each of the ports *s t* and allowed to open in opposite directions. When closed they lie in recesses in the cylinder-face, so that the piston can pass them without being obstructed.

On one side of each valve or abutment U U is extended a journal through the side of the case, and a crank, V, is attached to the projecting end of each journal.

A wheel, F, is secured upon the engine-shaft close to the side of the case A, and has a groove, *w*, formed on its inside face near its periphery, which is concentric with the engine-shaft. The pins of the cranks V V enter this groove, when the wheel rotates with the engine-shaft. A cam-groove, X, is also made in the face of this wheel, so as to communicate with a portion of the groove *w*, as shown.

y y are levers attached to the outside of the case, one on each side of the cranks V. These levers are connected by a rack-bar, H.

The stem of the plug C also projects through the side of the case just above the rack-bar, and has secured upon it a partially-toothed wheel, P, which has a lever-handle, Q, projecting from it. This toothed wheel engages with

the teeth of the rack-bar H, so that when the lever is moved in either direction the plug is rotated and the levers *y y* are shifted simultaneously. When the lever Q is thrown to the left the plug is turned so that its passage *r* connects with the steam-port *p* and admits steam to the right-hand port to drive the engine in one direction. The same motion of the lever Q sets one of the levers *y* against the crank V of the opposite valve, which is closed, and fastens it, so that its pin traverses the concentric groove, while the opposite crank is released, so that its pin will follow the cam-groove, and thus alternately open and close the valve to admit the steam to and cut it off from the engine.

To reverse the engine, the lever-handle Q is thrown in the opposite direction, so as to bring the passage *r* in the plug in line with the ports *s* and *q*, and at the same time lock the crank V of the right-hand valve and release the crank of the left-hand valve, so that steam is admitted in the opposite direction and the engine reversed.

The valves or abutments U U serve to receive the back-pressure of the steam. The operating valve or abutment is opened and closed at the proper instant by its crank V and the cam-groove X, so that it opens instantly after the piston passes it, and remains open until the piston has moved around and up to it, when it is closed to let the piston pass, and opened again immediately after the piston passes it. I exhaust the steam after each stroke through the engine-shaft, which I make hollow for that purpose, as follows: A passage connects the bottom of the chamber in each side of the piston with the bore in the engine-shaft D. Inside of this hollow engine-shaft I slip a tight-fitting tube, T, which has only one passage, *n*, through it, and this passage is so arranged that it can be brought into line with either one of the passages in the enlargement E by turning the tube slightly; but when it connects with one it closes the other. When the engine is running in one direction this tube is turned so that its passage connects with the side of the piston opposite that on which the steam is admitted, so that after the piston passes the abutment or valve U the last charge of steam will be exhausted through the hollow engine-shaft. It will be noticed that the abutment cuts off the last charge of steam from the fresh charge each time the piston passes it, thus transferring the old charge of steam to the opposite side of the piston, where it can exhaust during the next entire stroke. Thus the engine is taking steam on one side of the piston and exhausting on the opposite side throughout each stroke. When the engine is reversed the same operation is repeated in a reversed direction.

In practice I shall mount two shafts in separate chambers on one shaft, so that while one is passing the dead-point the other will be working, thus obtaining a continuous power. I shall also operate the lever Q by suitable means to cut off the steam during a portion of the stroke, so as to work the steam expansively.

I thus provide a very simple rotary steam-engine that can be run in either direction by simply reversing the lever Q. An engine of this construction is now in successful operation in San Francisco, California.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a rotary engine, the shell A, with its steam-chest K, rotary plug or valve C, and the passages or ports *p q r s t*, and the hinged valves or abutments U U, arranged as described, in combination with the engine-shaft D, with its enlargement E and single piston-wing G, and the center exhaust through the hollow engine-shaft, all combined and arranged substantially as and for the purpose described.

2. In a rotary engine, the rotary valve or plug C, with its passage *r*, and operating-lever handle Q, with its toothed wheel P, in combination with the ports or passages *p q s t* and the hinged valves or abutments U U, with their cranks V V, grooved wheel F, and the levers *y y*, and connecting rack-bar H, all combined and arranged to operate as described.

3. In a rotary engine, the wheel F, attached to the engine-shaft, and having the concentric groove *w* and cam-groove X, in combination with the hinged valves or abutments U U, with their cranks V V, and the levers *y y*, whereby either one of the valves or abutments can be thrown into or out of operation, substantially as above specified.

In witness whereof I have hereunto set my hand and seal.

JOHN H. DARRAGH. [L. S.]

Witnesses:
JEREMIAH BROWELL,
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