W. M. STEVENSON.

Rotary-Engine.

No. 167,134. Patented Aug. 24, 1875.

Fig. 2

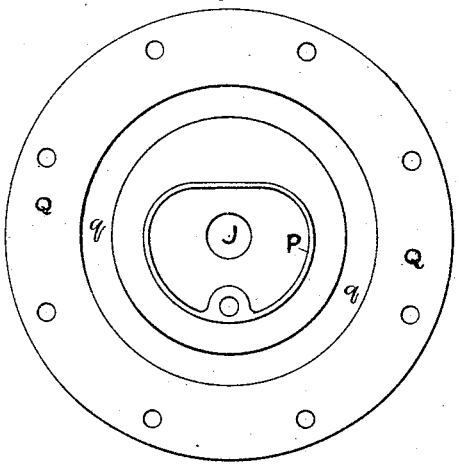


Fig. 3.

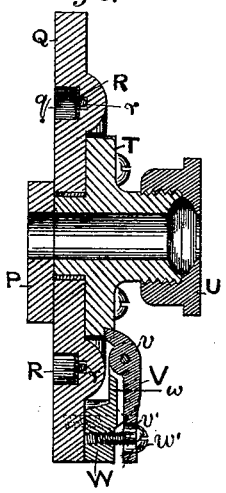


Fig. 4.

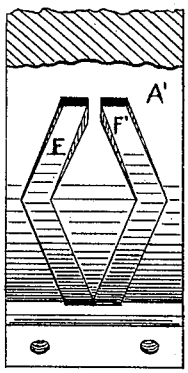


Fig. 5.

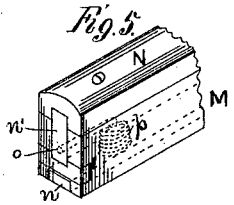
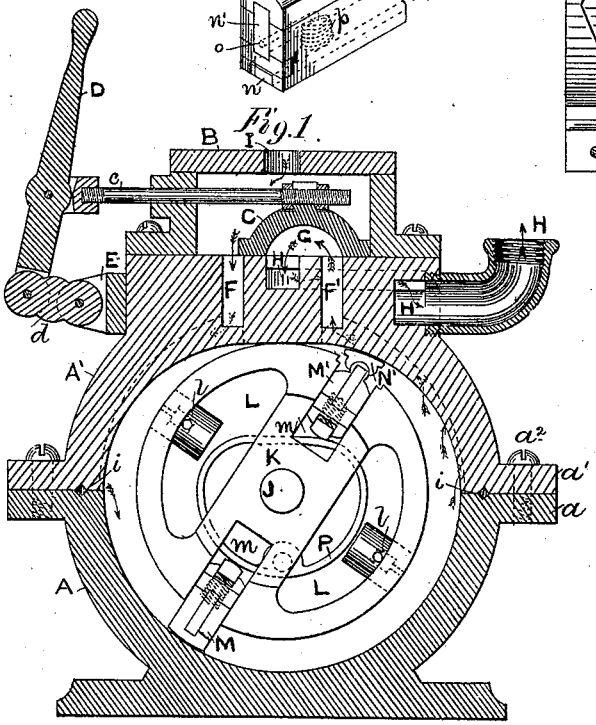


Fig. 1.



Witnesses.

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UNITED STATES PATENT OFFICE.

WILLIAM M. STEVENSON, OF SHARON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO WILLIAM McGILVRAY, OF SAME PLACE.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **167,134**, dated August 24, 1875; application filed April 20, 1875.

To all whom it may concern:

Be it known that I, WILLIAM M. STEVENSON, of Sharon, in the county of Mercer and State of Pennsylvania, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to rotary engines; and the invention consists in certain improvements in the construction and arrangement of the parts, whereby the operation of such engines is rendered more perfect, and the objections heretofore existing to their use obviated.

My engine is so constructed that it may be reversed at any point of a revolution, and will work with like facility in either direction. It is of comparatively simple construction, easily operated, and occupies but a small space as compared with other descriptions of engines.

In the accompanying drawings, Figure 1 is a sectional view, showing the construction of the revolving drum, pistons, valves, &c. Fig. 2 is a view of the inner side of one of the covers, showing the cam-plate or piston-carrier attached thereto. Fig. 3 is a sectional view, showing the bearings and device for adjusting the same. Fig. 4 is a view showing a portion of the upper cylinder and the form of the zigzag ports. Fig. 5 is an enlarged view of a portion of one of the pistons, showing its construction.

Referring to the parts by letters, A represents the under half of the cylinder, the inner periphery of which is a true arc of a circle. A′ is the upper half or portion of the cylinder containing the steam and exhaust ports. It is of the same diameter as the lower portion A at the point of contact with the latter; but, instead of its inner periphery being the true arc of a circle, like the lower portion, it is parabolical, or two arcs from different centers united by a plane, as clearly shown in Fig. 1 of the drawings. The two halves of the cylinder are provided with projecting flanges a a^1, by means of which they are securely united together by bolts a^2, their faces being also grooved with angular grooves, in which metal or other suitable packing $i\,i$ is inserted before the two portions of the cylinder are united. B is the steam-chest, secured to the upper portion A of the cylinder; and C is a slide-valve within the steam-chest, provided with a valve-stem, c, which passes out through the end of the steam-chest, and is pivoted to a hand-lever, D, the lower end of the hand-lever being pivoted to an arm, d, the inner end of which is pivoted between the projecting ears of a plate, E, which is secured to the portion A′ of the cylinder. F F are the steam-ports leading from the steam-chest to the interior of the cylinder. They are formed tapering and of a peculiar zigzag form, and with double channels converging at the ends, as clearly shown by Fig. 4 of the drawings. G is the exhaust-cavity formed on the under side of the valve C, and communicating with one or other of the ports F, and with the eduction or exhaust port H. I is the induction-port, leading into the steam-chest. K is the drum, made cylindrical in form, and keyed to the central shaft J, so that they both revolve together. The drum K is made hollow or with a cavity, L, which communicates with the steam-space within the cylinder by means of check-valves, which may be provided with diaphragms $l\,l$, for a purpose hereinafter described.

$m\,m$ are two radial grooves, formed in the drum K for the reception of the pistons, and in which the pistons are made to slide back and forth, or reciprocate, as hereinafter set forth. M represents one form of the piston. It is made hollow by core or otherwise, and the inner end is provided with a shoe, n, of brass or other suitable material, which is set into a groove formed in the under side of the piston. The other end is provided with a fixed shoe, N, of brass or other suitable material, and the sides are provided with packing n', which is held against the sides of the grooves m by means of the force of steam, which finds its way from the hollow piston through a lateral channel, o, to the rear side of the packing, as shown by dotted lines, Fig. 5. M′ represents a piston, constructed the

same as the piston M, except that, instead of the fixed shoe N, it is provided with an oscillating shoe, N′, which rocks or oscillates upon a circular head on the end of the piston, so as to conform and fit close to the cylinder as the drum revolves. Two or more coiled springs, *p*, are placed in the pistons between the shoes N *n* or N′ *n*′, which hold them in place, yet permit the inner shoes to yield or vibrate within the grooves in the inner end of the piston. P represents the piston-carriers, cam-shaped disks or rings of metal attached to the inner side of the cylinder-heads, and fitting within the sides of the cylinder-drum, in contact with the inner piston-shoes *n*. Q represents the inner face of one of the cylinder-heads, having an annular groove, *q*, formed therein for the reception of the annular projecting edge or face of the drum K, metallic or other suitable packing R being inserted in the groove, and held against the edge of the drum by a wire spring, *r*, or other suitable means. T represents one of the bearing-boxes for the shaft, having an inner hub, which passes through the cylinder-cover, suitable packing being provided between them. The outer ends of the bearings are provided with screw-caps U, to keep out the dust and other extraneous matter. V represents a device for adjusting and sustaining the bearing-boxes in proper position. It consists of a lever, *v*, pivoted between the uprights or standards *w* of a plate, W, which is secured to the cylinder-cover or frame of the machine. The upper end of the lever *v* is turned inwardly, and fits a groove formed in the periphery of the bearing-box for its reception. The lower end of the lever is cut with an elongated slot, *v*′, through which and into the plate W a thumb-screw or bolt, *w*′, is passed. An adjusting and sustaining device of this description may be provided for both bearing-boxes.

The operation of my invention is as follows: When it is desired to start the engine, the throttle-valve is opened, and steam is admitted through the port I to the steam-chest. The valve is then moved by the handle D, so as to open one or other of the steam-ports F F′, according to the direction in which the shaft is desired to be revolved. If to the left, the valve will be pushed in, as shown in Fig. 1, thereby admitting steam through the port F in the direction shown by the arrows, and, pressing against the piston M, will cause the drum K and shaft J to revolve. The end of the piston is kept in position against the interior periphery of the cylinder by means of the cam-plate or piston-carrier P, the periphery of which corresponds in form with the interior of the cylinder, and as the drum revolves the piston M passes the steam-port, and receives the full force of the steam when the piston M′ passes the exhaust-point, which begins at the junction of the upper and lower portions of the cylinder.

The exhaust steam passes through the port F′ to the exhaust-cavity G, and from thence through the eduction-port H. The flat top or plane portion of the upper half-cylinder forms the steam-abutment between the ports, and this portion of the cylinder being always in contact with the drum or shoes of the pistons, no steam can pass this point. The shoes are always kept in contact with the inner periphery of the cylinder by means of the cams or carriers P, which causes them to reciprocate back and forth in the grooves *m*, so that no steam can pass the pistons. It will be seen, therefore, that as long as the port F is open for the admission of steam, the drum and shaft will continue to revolve to the left, the steam exhausting through the port F′. When it is desired to reverse the engine, the lever D is moved outwardly, so as to slide the valve across the steam-chest, thereby opening communication between the steam-chest and the port F′, establishing communication between the port F and the exhaust G, when the drum and shaft will revolve to the right.

It will be obvious to those skilled in the art that by this arrangement of the ports, the pistons, and the revolving drum, the force of the steam is applied in the lower or working half of the cylinder, and that by exhausting at the junction of the lower and upper halves there is little or no resistance to the revolution of the drum and shaft by back pressure, and that the engine may be reversed at any point of a revolution. By moving the valve to the center of the steam-chest both the ports are closed and the engine stopped. It will also be seen that steam is admitted to the interior of the piston-drum by means of the check-valves *l l*, thereby serving the double purpose of balancing the pressure on the pistons, and, through the pistons being made hollow and communicating with the steam-space in the hollow drum, aiding in keeping the shoes against the periphery of the cylinder and the packing *n*′ in the proper position.

The peculiar tapering and branched form of the zigzag ports F F′ serves to diffuse the steam and prevent it from acting injuriously against any one portion of the surface of the drum—an effect it would have if injected through a straight port, so as to continually act with its fullest force against one particular portion of the drum-surface. This peculiar form of the ports also enables the steam to exhaust more rapidly, thereby offering less resistance to the revolution of the drum. The drum and shaft are journaled centrally with the lower half A of the cylinder by the adjustable bearing-boxes T; and should the drum become worn through friction, or otherwise drop, so as not to form a close connection or fit with the steam-abutment or plane part of the upper partion of the cylinder, it can be raised by means of the adjusting devices V, a turn or two upon the screws *w*′ accomplishing the desired result.

Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. The graduated and zigzag ports F F′, constructed substantially as and for the purpose specified.

2. The combination of the zigzag ports F F′, valve C, exhaust G H, and steam-chest B with the cylinder A A′ and piston-drum K, all operating substantially as and for the purpose specified.

3. The pistons M, having shoes N *n*, springs *p*, and packing *n′*, and arranged to reciprocate within the grooves *m* of the drum K, in the manner substantially as and for the purpose set forth.

4. The combination of the cylinder-covers Q, drum K, and cylinder A A′ with the adjustable bearing-boxes T, substantially as and for the purpose specified.

5. The combination of the cylinder-covers Q with the adjustable bearing-boxes T and the adjusting device V, substantially as and for the purpose specified.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WM. M. STEVENSON.

Witnesses:

ABNER APPLEGATE,

JOSEPH J. RIGBY.