N. W. HOLT.

ROTARY ENGINE.

No. 186,008. Patented Jan. 9, 1877.

Fig. 2.

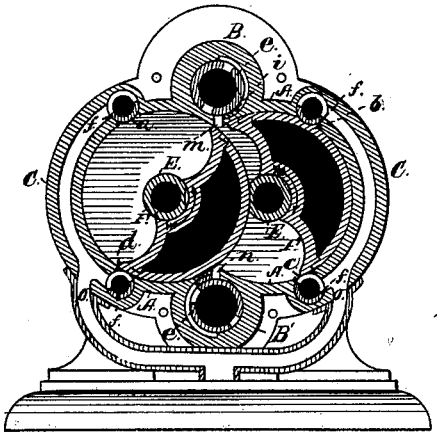


Fig. 1.

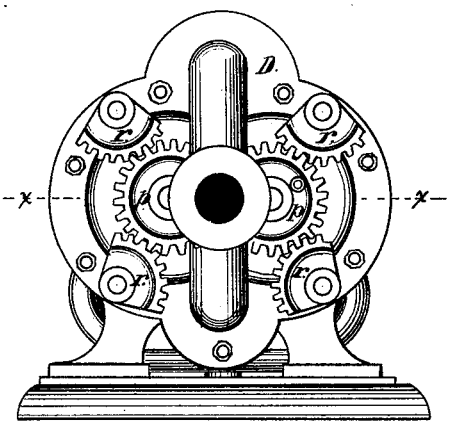


Fig. 3.

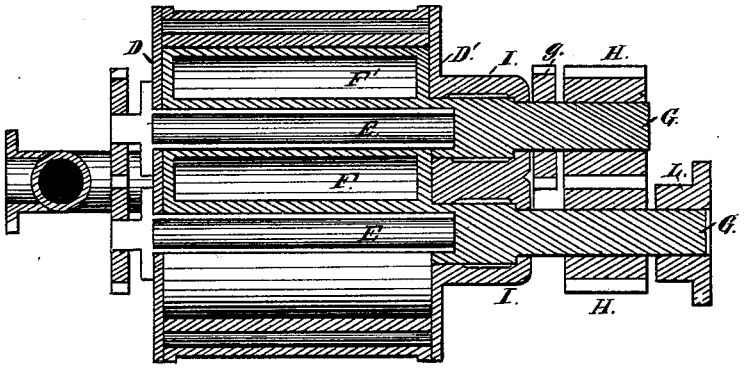
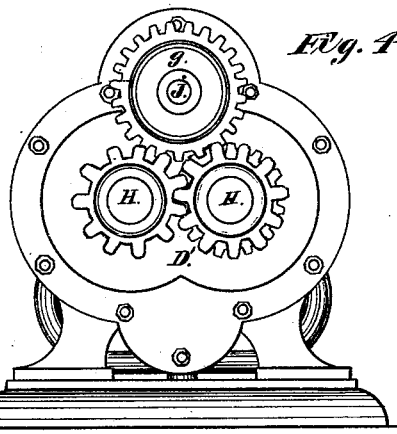


Fig. 5.

Fig. 4.



Witnesses;
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Wm. Ritchie

Inventor;
Noah W. Holt
by his attys
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UNITED STATES PATENT OFFICE.

NOAH W. HOLT, OF DAYTON, OHIO.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **186,008**, dated January 9, 1877; application filed September 11, 1876.

To all whom it may concern:

Be it known that I, NOAH WILLIAM HOLT, of Dayton, in the county of Montgomery and State of Ohio, 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.

This invention relates to certain improvements in double rotary engines, whereby I obtain greater power with less steam and less wear and friction of the parts than in most engines of this class.

My improvements consist of the following: the combination and arrangement, in the double cylinders, of the elongated pistons revolving around concentric fixed shafts, so as to obtain the greatest surface for the action of the steam with the least wear and friction, with the arrangement of the induction and eduction ports; also, in the arrangement of the eduction-ports in positions diametrically opposite to the induction-ports, and in other details, all as will be herewith specifically set forth and claimed.

To enable others skilled in the art to which my invention appertains to make and use the same, I would thus proceed to describe it, referring to the accompanying drawing, in which—

Figure 1 represents a front elevation of the engine, showing the gearing for actuating the ports. Fig. 2 is a central section of the engine in elevation, showing the internal arrangement of the working parts. Fig. 3 is a plan view in section through the line *x x* of Fig. 1. Fig. 4 is a rear elevation of engine. Fig. 5 is a sectional view of a modification of the rotary induction-valve.

Corresponding letters of reference indicate like parts in all the figures.

A represents the cast-iron double cylinder, a section in elevation of the interior surface of which is of the form of two equal intersecting circles, the distance between whose centers is equal to one and a quarter times their radius. It has cast with it, at the top and bottom, the valve-chambers B B′, and at the sides the steam-jackets C. The ends are flanged for attaching by bolts the heads D D′. The four escape-ports *a*, *b*, *c*, and *d*, located as seen in Fig. 1, are each a narrow slot or opening between the interior of the cylinder and the steam-jackets, and extend the entire length of the cylinder. At each port is a chamber, in which is any ordinary rotary valve, *f*. In the head D, at the centers of each cylinder forming the double cylinder, I bolt securely, in any suitable manner, the shafts E, about which revolve the segmental pistons F F′. These pistons are of the shape represented in section in Fig. 1, and may be constructed in any of the usual ways. They extend from end to end of the cylinder, and are steam-packed. They are recessed to revolve upon the shafts E in the directions indicated by the arrows, and in the rear are of one piece with the two shafts G, which are geared together by the pinions H, Fig. 3. These shafts G revolve in steam-packed bearings I in the head D′, as represented, and their ends are recessed to receive the ends of the shafts E and aid in supporting them against strain. The shafts E are recessed on the approaching sides, to complete the annular piston-way. In the circular valve-chambers B are the valves *e*, in the shape of a cylinder, open at one end to admit the steam, extending the length of the engine-case, and having two diametrical openings or slots from end to end. In the rear a shaft, *j*, extends from this valve through the head D′, and has keyed upon it a pinion, *g*, which gears with a pinion of the same size upon one of the shafts G, as seen in Fig. 4. To make a cut-off valve of it a sleeve upon the shaft *j* has extending from it a slide, *i*, of the length of the cylinder. This slide fits in a recess in the valve-chamber, forming the back side of the port, thus making the back of the port movable, and so causing the main valve to close the port sooner or later in its rotation, as is required while running. The sleeve is connected in any suitable way to the governor. A similar valve is located in the lower chamber B′. The lower induction-port *n*, like the upper one, *m*, extends the length of the cylinder. The final escape-ports are represented at *o*, Fig. 1, leading from the space between the jackets and the cylinder. To change the ports in reversing the engine, I pivot two meshing pinions, *p*, upon shafts projecting from the front

head D, as seen in Fig. 4. These pinions gear with four segmental pinions, *r*, each keyed upon the stem of one of the port-valves *a b c d*.

The arrangement of the gearing is such that by turning either of the pinions *p* the whole set is actuated to open the upper ports *a* and *b*, and close the lower ones *c* and *d*, or vice versa.

The action of the engine may be thus briefly explained: As shown in Fig. 1, steam is just entering the upper induction-port *m*, the ports *a* and *b* being closed. As it expands it presses equally against every exposed part of the piston F, causing it to revolve in the direction indicated by the arrow. The revolution of the piston F, by means of the connecting gearing, causes that of the piston F′, but in an opposite direction, so that until half a revolution is accomplished the piston F′ forms a buttress for the steam, which acts on the piston F. After completing the half-revolution, the steam escapes through the port *c*, and the position of the two pistons is exactly reversed, and the entering steam from the revolving valve acts in turn against the piston F′ until it escapes at *d*, and so on alternately.

Attention is called to the fact that by the arrangement of the induction and eduction ports diametrically opposite to each other a balance is obtained while exhausting the steam, which prevents any back pressure and consequent loss of power. Upon closing the ports *c* and *d* and opening *a b* by means of the before-mentioned pinions, and by admitting steam through the lower port *n*, the engine is reversed.

L represents any coupling by which one of the shafts G is united to a line of shafting.

The modification of the induction-valve represented in Fig. 5 consists in having the valve-cylinder in two parts, *s* and *t*, (shown in section,) the one adjustable over the other, to regulate beforehand the size of the induction-apertures.

I am aware that rotary engines have been constructed in which the arrangement of the pistons is the same as mine, with this exception—viz., they revolved around hubs in which also revolved shafts. They also employed facing-disks, which supported pistons, and with which the shafts were concentric. Such arrangement necessitates more than four more bearing-surfaces than mine, and consequently creates much more friction, and is liable to greater wear of the parts. Besides this difference the hubs are quite large, and thus diminish the steam-surface of the pistons. My shafts, on the contrary, are not hubs in which anything revolves, and they have their ends supported in recesses in the shafts G. The ends of the pistons do not revolve against facing-disks, and thus the steam-surfaces are large, so as to receive the complete force of the steam.

Having thus fully described my invention, I claim as new—

1. In a double rotary engine, the pistons F F′, provided with the geared shafts G, arranged to revolve in the double cylinder A around the concentric recessed stationary shafts E, that have their ends recessed in the shafts G, in combination with the escape-ports *a b c d*, arranged in positions diametrically opposite to the induction-ports *m* and *n*, substantially as and for the purpose specified.

2. In a double rotary engine, the arrangement of the escape-ports *a b c d* in positions diametrically opposite to the induction-ports *m* and *n*, 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.

NOAH W. HOLT.

Witnesses:
S. F. AUSTIN,
CHAS. M. PECK.