G. CASSADY.

ROTARY ENGINE.

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907,737.

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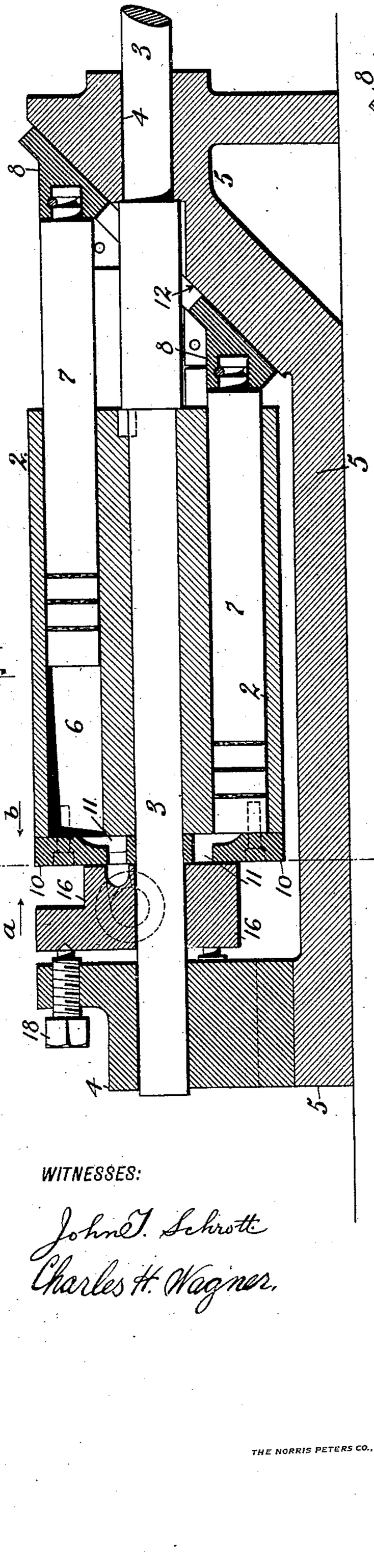

Fig. 1.

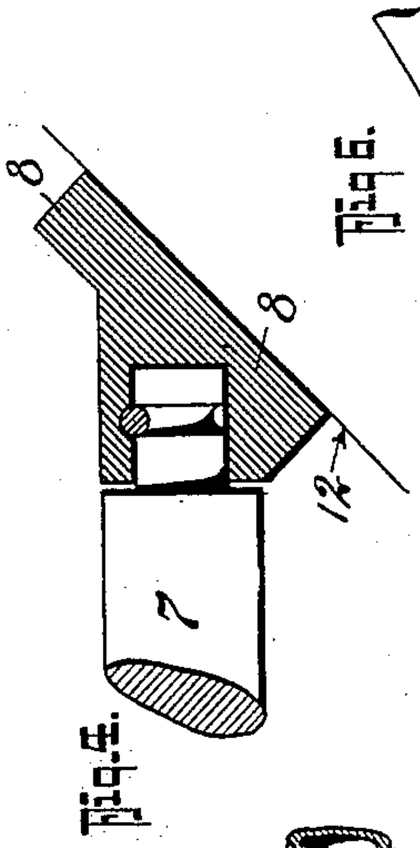

Fig. 4.

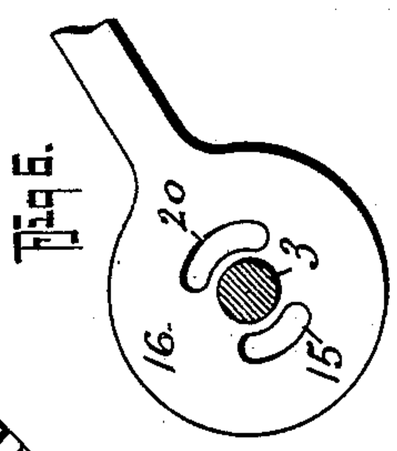

Fig. 6.

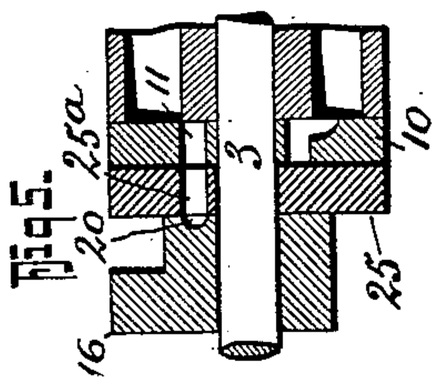

Fig. 5.

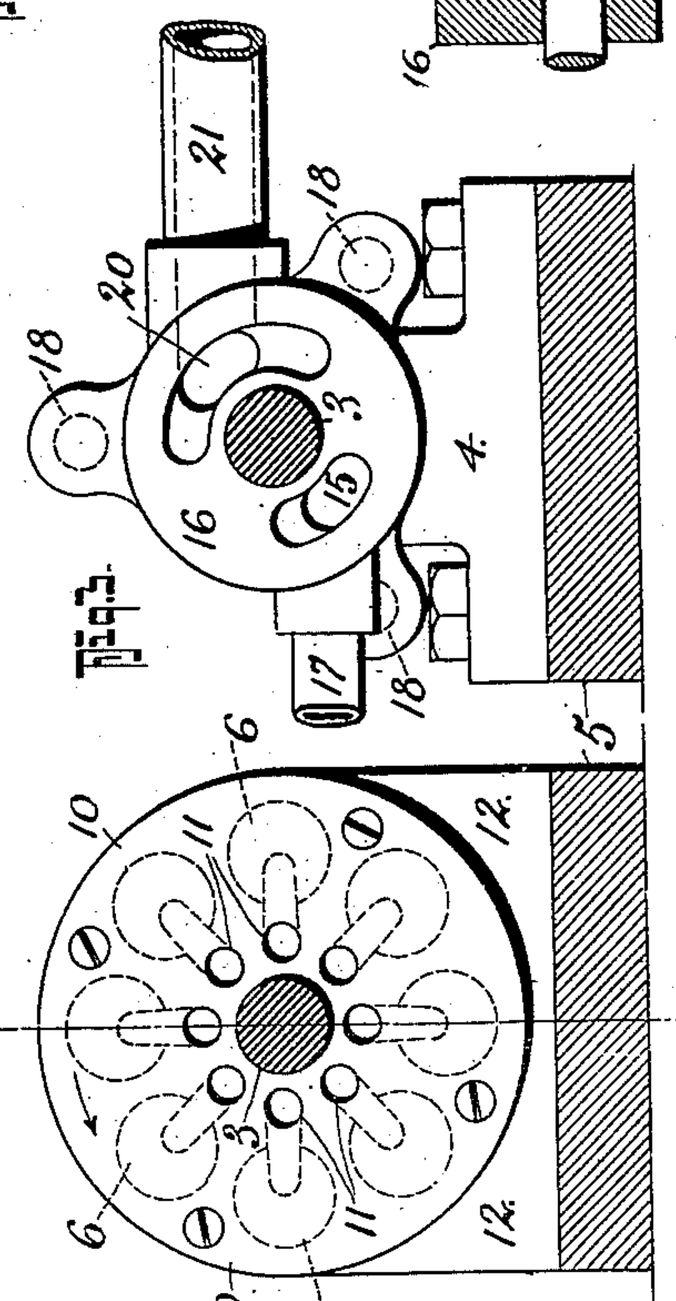

Fig. 2.

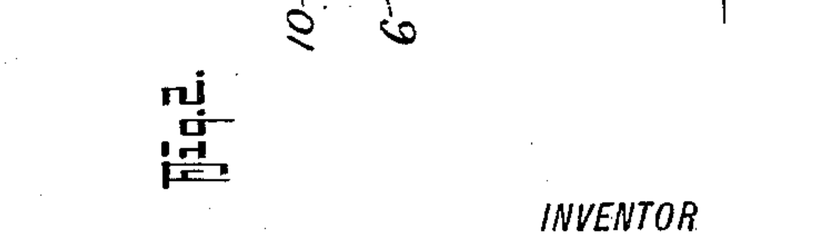

Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## ROTARY ENGINE.

No. 907,737. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed January 14, 1908. Serial No. 410,775.

*To all whom it may concern:*

Be it known that I, GEORGE CASSADY, citizen of the Dominion of Canada, residing at New Westminster, in the Province of British Columbia, Canada, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification.

This invention relates to a rotary engine wherein a series of plungers endwise movable in cylindrical chambers are circumferentially arranged round the axis of rotation of a rotatable body and parallel to their axis.

When steam or other fluid pressure is admitted to the chambers which are on one side of the mid-plane the ends of the plungers on that side are forced out against an oblique plane surrounding the axis of rotation, whereby the rotatable body is impelled to turn, the fluid pressure being exhausted from behind each plunger as it passes during rotation the point where by contact with the oblique plane the plunger begins to return within its chamber.

The invention is fully described in the following specification, reference being made to the drawings by which it is accompanied, in which:

Figure 1 is a vertical section in the plane of the axis of rotation, being on the line C C in Fig. 2, Fig. 2, a vertical cross section on the line A A in Fig. 1 looking in the direction of the arrow *a* showing the port face of the rotatable body, Fig. 3, a similar view of the port face of the steam chest, being a cross section on the same line A A looking in the direction of the arrow *b*, and Fig. 4, is an enlarged detail view of the bearing shoe for the outer end of the plungers. Figs. 5 and 6 are detail views of portions of my invention hereinafter referred to.

In these drawings 2 represents a rotatable body, preferably cylindrical, which is secured to a driving shaft 3, rotatable in bearings 4 secured to or integral with the bed plate 5 of the engine. Cylindrical chambers 6 are bored in the rotatable body 2, parallel to the axis of rotation and preferably at equal radii and equi-distant from one another. At one end these chambers 6 are closed by a port plate 10 secured to the cylindrical body and having ports 11 corresponding in number with the chambers 6, with which they connect.

Within each chamber 6 is endwise movable a plunger 7 which plungers may be provided with water grooves to render them practically steam tight, and project beyond the end of the rotatable body and which carry shoes 8 that bear on a surface 12 inclined to the axis of rotation and surrounding it at one end adjacent to the shaft bearing 4, and formed on or secured to the bed plate or frame of the engine. These plungers are forced outward against the inclined surface 12 by fluid pressure the fluid being admitted to the chambers 6, in a manner to be described, and as the fluid is admitted during movement upward on one side of a plane through the middle line and is released during movement down the other side, the pressure of the ends of the plungers against the incline 12 will rotate the body 2 by the reaction of the incline.

The admission and release of the steam or other fluid to and from the several chambers 6 is controlled by the movement of their ports 11 past circumferential ports 15 and 20 in the face of a distributing box 16. This member is supported on the driving shaft 3 which passes through it and the port face of the box 16 is held in place and may be set up to the adjacent face of the plate 10 of the rotatable body 2 by set screws 18 threaded through projections from the adjacent bearing 4. Admission and exhaust pipes 17 and 21 are connected to this distributing box 16 with which pipes the admission and release ports 15 and 20 are respectively connected. The angular position and length of the admission port 15 in relation to the mid-plane C C will determine the point at which steam will successively be admitted to the chambers 6 and when that admission is cut off. Similarly the release of the steam on the other side of the mid-plane is determined by the angular position and length of the exhaust port 20 as each port 11 passes its beginning and end.

The operation of the engine is as follows: On the admission of steam or other fluid to the box 16, steam will enter through the port 15 and will pass through such of the ports 11 of the rotatable body as are uncovered to it, and the plungers 7 in the chambers to which these uncovered ports connect will be forced outward and in contact with the oblique plane and as such extended plungers will be all on one side of the vertical mid-plane of the engine, will by the reaction of that plane cause the rotation of the body 2, and of the driving shaft 3, to which it is secured. As

the body 2 rotates entrance through these ports 11 will be cut off as they successively pass beyond the end of the port 15, and during the remainder of the movement, until these chambers approach the middle plane, *i. e.* where their respective plungers are at the further limit of their outward movement the steam may act expansively, and during such movement other ports 11 are successively opened to the admission of steam as they approach or pass the mid-plane at the lower side. As the ports 11 successively approach the mid-plane where their plungers are at the limit of their outward movement the ports are successively uncovered to the exhaust port 20 and the release of the steam is continued throughout such portion of the angular movement as may be considered desirable before compression is allowed to commence.

It will be obvious that if the angular position of the steam chest ports in relation to the mid-plane be altered to throw the steam admission port 15 to the right side of the mid-plane and the exhaust port to the left, the direction of rotation of the engine will be reversed. This may be conveniently done by the interposition of a separate rotatable port plate 25, between the port face of the steam chest and that of the rotatable body, as indicated in Fig. 5, the port plate 25 having ports 25[a], as indicated in Figs. 5 and 6.

The power may be taken either direct from the rotatable body, or from the driving shaft 3 beyond the bearing 4, by any approved means of belt pulley or gearing, or the shaft 3 may be connected direct or by means of a clutch to the mechanism it is desired to rotate. The end of each plunger 7 is provided with a shoe 8 having a bearing face angled to that of the oblique plane on which it bears, which will provide a larger wearing surface and one which is easily renewable when required.

The engine is simple in construction as its machined parts are practically all lathe work, and the working parts are largely duplicates. The operation and means of control are also simple, and what parts are subject to wear are easily accessible and readily renewable. It is practically balanced so that it is susceptible of being run at a high rate of speed, while the operation of the steam in the plunger chambers is such that it may when required be run at a slow speed.

Having now particularly described my invention and the manner of its operation, I hereby declare that what I claim as new and desire to be protected in by Letters Patent, is:

1. A rotary engine comprising a rotatable body having a series of endwise extensible plungers arranged parallel to and surrounding the axis of rotation, a relatively fixed oblique surface intersecting the axis of rotation adjacent to one end of the rotatable body, flat shoes carried by each of said plungers to engage said oblique surfaces and lie in contact therewith, means for admitting fluid under pressure to extend the plungers on one side in a mid-plane through the axis of rotation, and means for releasing the fluid to reduce its pressure on the other side of the mid-plane.

2. A rotary engine comprising, a rotatable body having a series of cylindrical chambers surrounding and parallel to the axis of rotation, a port plate for closing one end of these cylindrical chambers said plate having a series of ports therethrough connecting one with each chamber, plungers endwise movable steam tight in the chambers the ends of which plungers project beyond the end of the rotatable body, a bearing surface against which the ends of the plungers may contact surrounding and oblique to the axis of rotation adjacent to the end of the body through which the plunger ends project, a stationary distributing box contacting with the port plate of the rotatable body to which box a fluid admission pipe and an exhaust pipe are connected which connect with an admission port and an exhaust port on the contacting face the admission port being so arranged as to admit a fluid to the cylindrical chambers or retain it therein while the chambers are on one side of a mid-plane through the axis of rotation and dividing in equal angles the oblique plane and the exhaust port arranged to release the fluid from the chambers on the other side of the mid-plane and a flat shoe carried by each plunger to contact the oblique bearing surface and lie flat against the same.

3. A rotary engine comprising, a rotatable body having a series of cylindrical chambers surrounding and parallel to the axis of rotation, a port plate for closing one end of these cylindrical chambers said plate having a series of ports therethrough connecting one with each chamber, plungers endwise movable steam tight in the chamber the ends of which plungers project beyond the end of the rotatable body, a bearing surface against which the ends of the plungers may contact, surrounding and oblique to the axis of rotation adjacent to the end of the body through which the plunger ends project, a stationary distributing box coöperating with the port plate of the rotatable body to which box a fluid admission pipe and an exhaust pipe are connected which connect with an admission port and an exhaust port on the contacting face, the admission port being so arranged as to admit a fluid under pressure to the cylindrical chambers or retain it therein while the chambers are on one side of a mid-plane through the axis of rotation and dividing in equal angles the oblique plane, and the exhaust port arranged to release the

fluid pressure from the chambers on the other side of the mid-plane, a flat shoe carried by each plunger to contact the oblique bearing surface and lie against the same, and a separate rotatable port plate interposed between the distributing box and the first mentioned port plate.

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

GEORGE CASSADY.

Witnesses:

ROWLAND BRITTAIN,

CLIVE S. CARMAN.