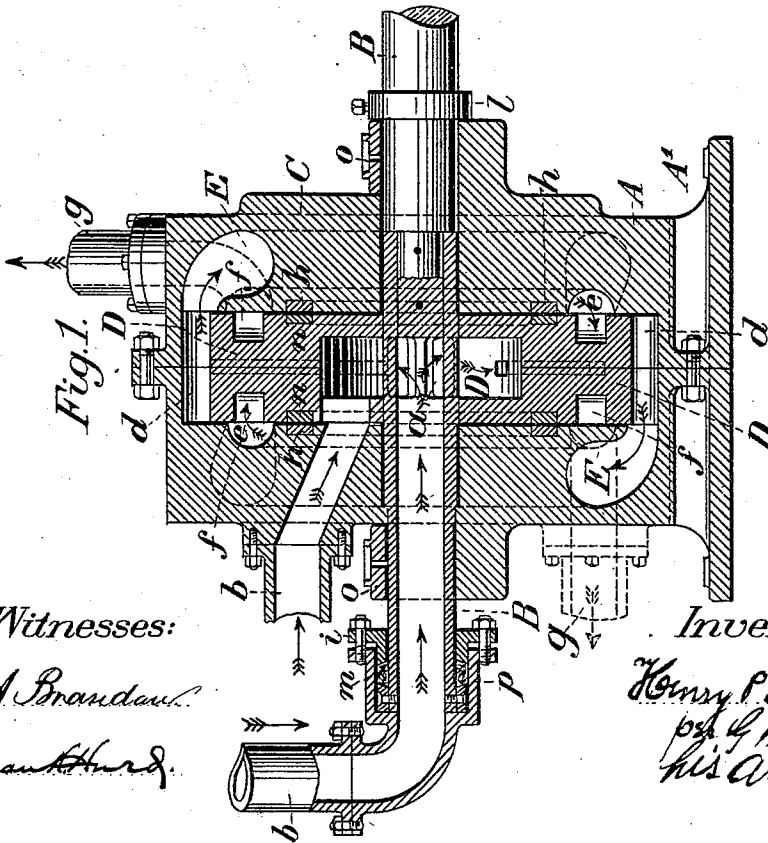
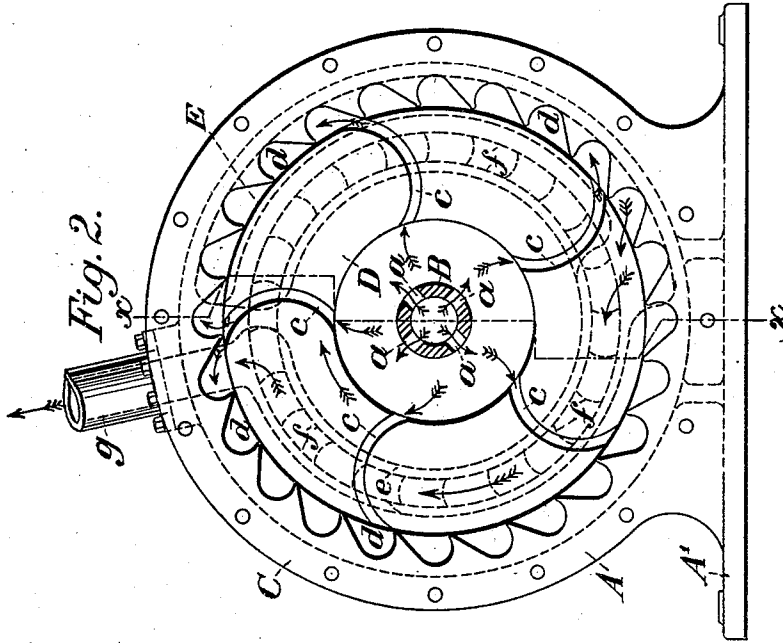


H. P. HOLLAND.
ROTARY ENGINE.

No. 521,541.

Patented June 19, 1894.



Witnesses:

E. A. Brandau.
Norman Hurd.

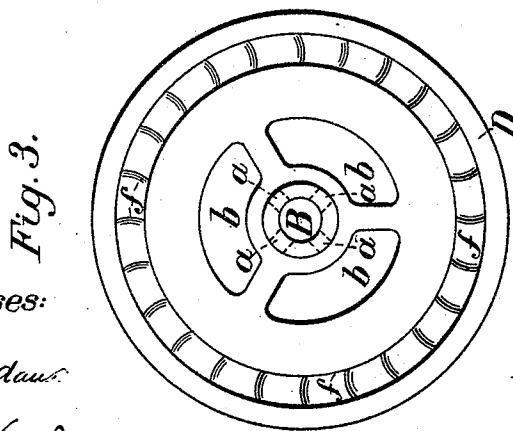
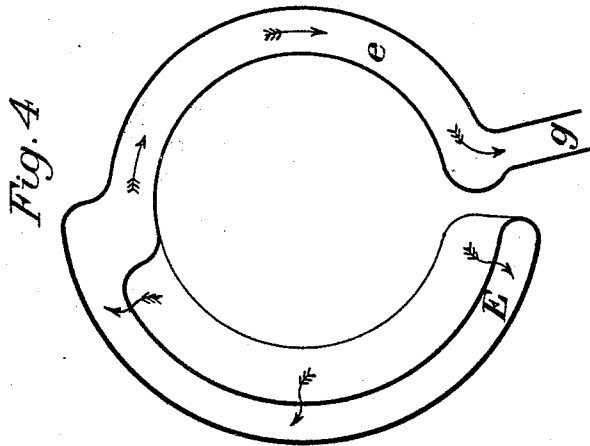
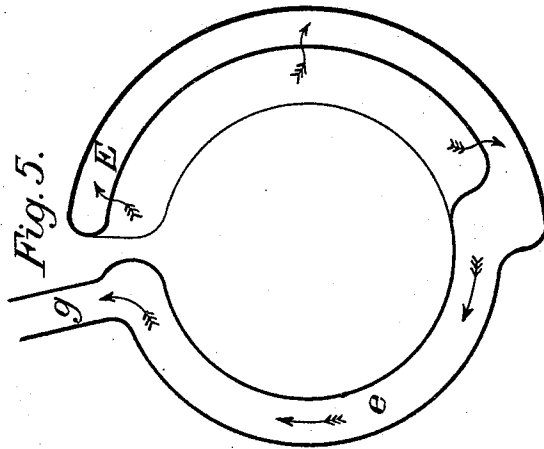
Inventor:

Henry P. Holland
per W. H. Beecher
his Attorney

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UNITED STATES PATENT OFFICE.

HENRY P. HOLLAND, OF SAN FRANCISCO, CALIFORNIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 521,541, dated June 19, 1894.

Application filed September 1, 1893. Serial No. 484,570. (No model.)

To all whom it may concern:

Be it known that I, HENRY P. HOLLAND, of San Francisco, county of San Francisco, and State of California, have invented a certain new and useful Improvement in Rotary Engines—viz., a Double-Expansion Rotary Engine—of which the following is a specification.

My invention relates to improvements in rotary engines by the application of the power as a continuous uninterrupted force acting upon fixed buckets continuously arranged around the inside circumference of the rotating cylinder surrounding a central steam chest or receiver, mounted upon a hollow revolving shaft; said cylinder and steam chest or receiver being inclosed by an outside casing, made in two halves, bolted together at the outer circumference, each half containing a chamber, larger at one end and gradually diminishing in size to the other end. On the inside circumference of said chambers, pockets are arranged continuously into and against which the steam, or other propelling power employed, forces itself as it comes from the steam chest or receiver surrounding the shaft. The steam or motive power is introduced first through the hollow shaft into the steam chest or receiver by the port inlets in the shaft, when expanding, it forces itself through conduits made in the casing, extending from the steam chest or receiver to the outside chamber in the casing, where, the steam or power employed, strikes against the pockets on the inside circumference of the chambers and rolls over expanding and filling the same, and forces itself through the ports in the small ends of the chambers that connect there, with the cylinder against the buckets continuously arranged around the inside of the circumference of the cylinder and, by its push force and expansion, rotates the cylinder rapidly and passes out of the exhaust ports provided therein. This action of the steam as it is forced through the ports leading from the power chambers into the cylinder, by reason of its great and rapid expansion in said chambers, is driven with a tremendous push power against the buckets in the cylinder as it strikes against them, and also acts continuously upon them by its second expansion till it reaches the exhaust ports, where it passes out as dead steam.

The steam or other power employed for pro-

PELLING the engine passes through the chambers into the cylinder, acting upon the buckets arranged upon the inside circumference of the cylinder, rotating the engine in a steady continuous motion. By a double expansion of the steam, the engine is rendered far more effective, and much less force is required to accomplish the same result, than by any other device now in use. An engine thirteen inches in diameter will possess from three to five horse power.

The engine may be operated by steam, compressed air, gas or water, and will be quite effective and useful when made only six or seven inches in diameter. With the use of steam, compressed air, or gas, there will be two expansions and two pushes operating to propel the engine. The power acts in a direct continuous push in giving to the engine its rotary circular movement, and with the full degree or volume of power applied. When machinery is driven from both ends of the shaft, the steam or power may be admitted to the steam or chest receiver, through the port inlets upon the side of same, extending to the outside of the casing.

I attain the objects of my invention by the mechanism illustrated in the accompanying drawings, in which—

Figure 1,—is a vertical longitudinal section, through Fig. 2; Fig. 2,—a vertical section of the rear half of the engine; Fig. 3,—front half of steam cylinder; Fig. 4,—diagram drawing of the front power chamber. Fig. 5,—diagram drawing of rear of Fig. 4, corresponding to Fig. 2.

The rotary engine consists of the hollow shaft B. mounted in bed piece A., and carrying cylinder C. and steam chest or receiver D., the bed piece A. forms a casing in two halves which bolted together at their outer circumference incloses the rotating cylinder and steam chest, having a steam or power chamber E. E. in each half, and resting upon and fastened to bed piece A'. The power or steam employed is introduced through the hollow shaft into the steam chest or receiver, through the port inlets *a. a.* in the shaft, or ports *b. b.*, on the side of the receiver and casing where expanding it pushes through the conduits *c. c.* extending from the steam chest or receiver to the power chambers E. E.

g. g. are the exhaust ports,—*h. h.* packing joints about the cylinders, *i. i.* collars on the end of shaft holding packing ring in place,—*l. l.* collars on shafts, *m. m.* packing joints on the end of shaft where the steam or power first enters,—*n. n.* packing rings on cylinder, *o. o.* boxes inclosing shaft, *p.* sleeve over packing ring.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. A double expansion rotary engine, consisting of the hollow shaft, B, the bed piece, A, resting on bed piece, A', in which said shaft is mounted, the same being in two halves, each containing a steam or power chamber, and forming a casing, when joined together at the outer circumference inclosing the rotating cylinder and receiver; the steam chest or receiver, D, surrounding said shaft, into which the steam discharges from the hollow shaft; the port inlets, *a a*, in the hollow shaft through which steam or power is discharged into the receiver; the cylinder, C, surrounding said receiver, which with the receiver revolves with the shaft inclosed in said casing; the conduits, *c c*, for the passage of steam or other power employed in operating said engine, extending from the receiver to the power chambers in the casing; the power chambers, E E, one in each half of the casing into which the steam or other power discharges from the conduits and expands; the pockets, *d d*, on the inside circumference of the casing against which the steam or other power acts as it discharges from the conduits into the chambers, said chambers being open from the top to the bottom next to the cylinder, half way round on opposite sides, to receive the steam or other power as it forces itself into and against the pockets from the conduit discharges as the cylinder revolves; the port inlets, *e e*, for the passage of the steam or power from the chambers into the revolving cylinder; the buckets, *f f*, on the inside of said cylinder against which the steam or other power pushes and acts upon them by its expansion, as it comes through the port entrance from the chambers into the cylinder, filling the same; the exhaust ports, *g g*, through which the steam or other power discharges from the cylinder; the collars, *l l*, on the end of the shaft; the packing rings, *n n*, on the cylinder; the boxes, *o o*, about the shaft; and the sleeve, *p*, substantially as herein described and set forth.

2. In a double expansion rotary engine the combination of the hollow shaft B, having port inlets *a. a.* with the steam chest or receiver D. and cylinder C., the casing or bed piece A. having chambers E. E. containing pockets *d. d.* into and against which the steam or power employed forces itself as it comes from the receiver through the conduits *c. c.*,

the ports *e. e.* opening for the passage of steam or other power from the chambers into the cylinder, the buckets *f. f.*, exhaust ports *g. g.*, substantially as herein described and set forth.

3. In a double expansion rotary engine the combination of the steam chest or receiver D. cylinder C. and shaft B. having port inlets *a a* and *b b* for the admission of steam or other power into the receiver through the side of the casing, by which the rotating cylinder and receiver are propelled, with the outside casing in two halves A. A. joined together at the top and bottom forming with A' the bed piece in which the shaft carrying the steam chest or receiver, and the cylinder are mounted; the conduits *c. c.*, chambers E. E., pockets *d. d.*, ports *e. e.* and buckets *f. f.*, and the exhaust ports *g. g.*, substantially as herein described and set forth.

4. In a double expansion rotary engine the combination of the port inlets *a. a.* in the hollow shaft B. and the port inlets *b. b.* on the side of the casing extending through into the receiver, with the steam chest or receiver D. on shaft B., the conduits *c. c.*, casing A. in two halves united and forming in one with A' the bed piece in which said shaft is mounted; the chambers, E. E., pockets *d. d.*, ports *e. e.*, cylinder C., buckets *f. f.*, and the exhaust ports *g. g.* substantially as herein described and set forth.

5. In a double expansion rotary engine the combination of the conduits *c. c.* extending from the steam chest or receiver to the outside casing A. with shaft B., port inlets *a a* and *b b* steam chest or receiver D. chambers E. E., pockets *d. d.*, ports *e. e.*, cylinder C. buckets *f. f.*, and the exhaust ports *g. g.*, substantially as herein described and set forth.

6. In a double expansion rotary engine the combination of the outside casing A. in two halves, which united together at the outer circumference form with A' the bed-piece in which the shaft B. carrying the steam chest or receiver D. is mounted, with the chambers E. E., pockets *d. d.*, ports *e. e.*, cylinder C., buckets *f. f.*, steam chest or receiver D., shaft B., port inlets *a. a.* and *b. b.*, conduits *c. c.* and the exhaust ports *g. g.*, substantially as herein described and set forth.

7. In a double expansion rotary engine, the combination of the cylinder C., surrounding steam chest or receiver D., attached to shaft B., mounted in bed piece A, and A'. with port inlets *a a* and *b b* receiver D., conduits *c. c.* chambers E. E., pockets *d. d.*, ports *e. e.* buckets *f. f.* and exhaust ports *g. g.*, substantially as herein described and set forth.

HENRY P. HOLLAND.

Witnesses:

WILLIAM J. FITZGERALD,
JAMES T. BLOOMFIELD.