No. 644,269. Patented Feb. 27, 1900.

G. A. AYER.

ROTARY ENGINE.

(Application filed Apr. 27, 1899.)

(No Model.)

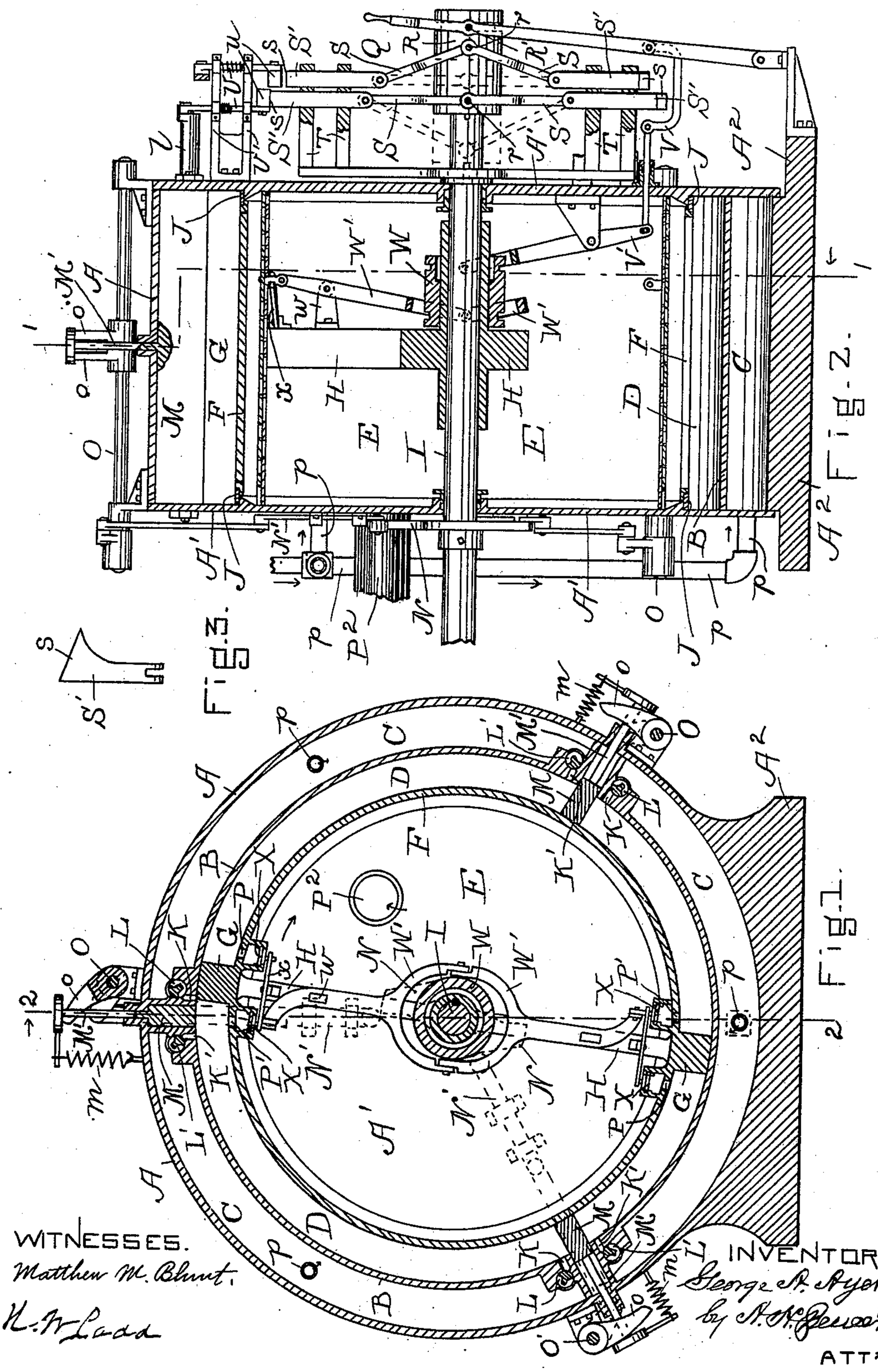

Fig. 2.

Fig. 3.

Fig. 1.

WITNESSES.

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GEORGE A. AYER, OF BEACHMONT, MASSACHUSETTS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 644,269, dated February 27, 1900.

Application filed April 27, 1899. Serial No. 714,705. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. AYER, of Beachmont, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

This improvement in rotary engines provides for two constantly-acting pistons moving in an annular piston-chamber to which steam is admitted through three ports in order that it may act directly on both pistons at all times. The exhaust is constantlly open at two points in front of the pistons to discharge steam into the central exhaust-chamber. There are duplicates of these exhaust-passages for use when the movement of the pistons is reversed, the change from one pair to the other being effected by means of a sliding collar on the main-shaft-actuating levers within the exhaust-chamber and carried on the arm which connects the two pistons to each other and to said shaft, said levers opening the duplicate port or passage when the original is closed.

Adjoining each inlet-port is a sliding abutment for the steam to bear against immediately after the piston has passed the port, these abutments being operated by rock-shafts and connecting-rods from cams on the main shaft. The steam-chamber will preferably surround the annular piston-chamber, and the sliding abutments will draw back into recesses in such outer chamber.

Valves controlling the inlet-ports will be of ocsillating or other form and actuated by cams or otherwise, as preferred. They come successively into operation, two of the three being normally open, but arranged to cut off at the desired point in the stroke. Duplicate valves are provided and means for actuating them when the movement of the piston is to be reversed.

The circular inner wall of the piston-chamber is integral with and revolves with the pistons and their connecting-arm, which at its center is keyed onto the main shaft. The side walls and outer peripheral wall form the stationary parts of the piston-chamber.

In the drawings, Figure 1 is a vertical section through my improved engine on line 1 1 of Fig. 2. Fig. 2 is a like section on line 2 2 of Fig. 1. Fig. 3 is a detail hereinafter explained.

A represents the outer cylindrical wall, A′ the end walls, and A^2 the base of the hollow shell forming the body of the engine.

B is a circular partition joined to the end walls within the shell and separating the outer steam-chamber C from the intermediate piston-chamber D.

E is the central exhaust-chamber, and F the circular inner wall of the piston-chamber separating the live steam from the exhaust.

G G are two pistons fitting and traversing the chamber D and formed at the ends of the connecting-bar H, which is keyed to the central shaft I to actuate it.

The wall F is integral with or secured to the pistons G and bar H and rotates with them under the pressure of steam in chamber D, of which chamber said wall is the inner boundary, its edges running close to the inner face of the walls A′. Suitable packing-rings J are interposed to resist the escape of steam with the least possible friction.

Three steam-inlet ports K, equidistant from each other, are formed through the partition B to admit steam from the outer to the intermediate chamber, these ports being furnished with automatic valves L, arranged to admit steam immediately behind the piston G and to cut it off at the proper moment. Three radially-moving abutments M are provided adjacent to the valves L for the steam to bear against, these abutments being shown as provided with springs *m* to press them inward immediately after one piston passes and withdrawing into adjacent recesses as the next piston approaches. The outward movement of each abutment is caused by a cam N, Fig. 2, on shaft I engaging a terminal roller on a connecting-rod N′, reciprocating through guides on the end wall A′ and serving to oscillate a rock-shaft O, having central cam-like fingers *o*, which lift the stem M′ of the abutment.

Exhaust-ports P, formed through the circular wall F in front of each piston, are constantly open to permit the steam to escape

into the exhaust-chamber E as the piston advances. An enlarged passage outwardly from this chamber is indicated at P^2. Steam-inlet pipes *p* lead to the divisions of the steam-chamber C.

In order to provide for reversing the movement of the pistons, the engine is furnished with duplicate inlet-ports K′ and valves L′ and means for actuating said valves at the instant required, as well as with duplicate exhaust-passages P′ and means for opening them and closing the passages P simultaneously. The reversing devices are operated by a single lever and will be best understood by reference to Fig. 2.

The devices for operating the valves L and for reversing their use are as follows: The operating-lever Q is pivoted at foot to the base A^2 of the engine. On the main shaft I is a sliding sleeve R, having near its outer end a deep peripheral groove. This groove receives a ring connected by a stud R′ to the operating-lever Q. Studs *r* also connect to said sleeve the two members of the toggle-lever S, the outer ends of such levers being pivoted to radially-movable bars S′. These bars pass through supporting-arms T, carried on the shaft I, and at the extremities of said bars cams *s*, Fig. 3, are formed, one of which at each revolution bears on a terminal roller *u* at the end of a rod U, which reciprocates through a fixed arm U′, and at the outer end is connected to a crank-arm on the stem *l* of the oscillating valve L or L′. When the operating-lever Q is pushed inward from the position shown in Fig. 2, the sleeve R and toggle-lever S change from the positions shown in full lines to those indicated in dotted lines and the valves L′ will become operative and valves L dormant. The same movement closes the exhaust-ports P and opens the duplicate ports P′. A jointed rod V extends from lever Q into the exhaust-chamber E and is connected therein to one end of a lever V′, the other end of which is forked and engaged by terminal studs in a circumferential groove of a sliding sleeve W, mounted on shaft I or on the hub of arm H. This sleeve has another groove engaging similarly-forked levers W′, pivoted on fulcrums *w* on said arm. The outer ends of these levers are turned aside, as in Fig. 1, and connected to a pivoted plate *x*, which actuates two damper-like slides X, respectively opening and closing the exhaust-ports P and P′.

For convenience in assembling the parts of the engine the casing may be made in two or more sections adapted to be united by bolts or rivets and capable of being separated for repairs or otherwise.

I claim as my invention—

1. In a rotary engine, a cylindrical shell comprising an outer annular steam-chamber, a central exhaust-chamber and an intermediate annular piston-chamber with three inlet-ports connecting said annular chambers and two outlet-ports connecting the intermediate and exhaust chambers, in combination with a rotatable cylindrical wall separating the intermediate chamber from the exhaust, and carrying two pistons and their diametrical connecting-bar, the exhaust-ports being formed through said rotatable wall in front of the pistons, substantially as set forth.

2. In a rotary engine, an annular steam-chamber and piston-chamber with three valve-controlled inlet-ports and three radially-moving steam-abutments adjacent thereto and successively actuated, in combination with a rotatable cylindrical shell formed with a diametrical bar mounted on the main shaft, with two pistons extending into the piston-chamber and with a central exhaust-chamber and an exhaust-port open through said shell in front of each piston into said central chamber, substantially as set forth.

3. In a rotary engine, an annular steam-chamber and piston-chamber with valve-controlled steam-ports, radially-moving abutments adjacent thereto and means for operating and reversing the valves to control the direction of movement of the pistons, in combination with a rotatable cylindrical shell formed with a diametrical bar secured on the main shaft, with a piston extending into the piston-chamber to traverse it and with a central exhaust-chamber and an exhaust-port leading from said shell in front of each piston into said central chamber, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

GEORGE A. AYER.

Witnesses:

A. H. SPENCER,

PHILIP HIGHLEY.