O. HARDY.

DOUBLE ENDED GAS ENGINE.

APPLICATION FILED JULY 29, 1912.

1,067,334. Patented July 15, 1913

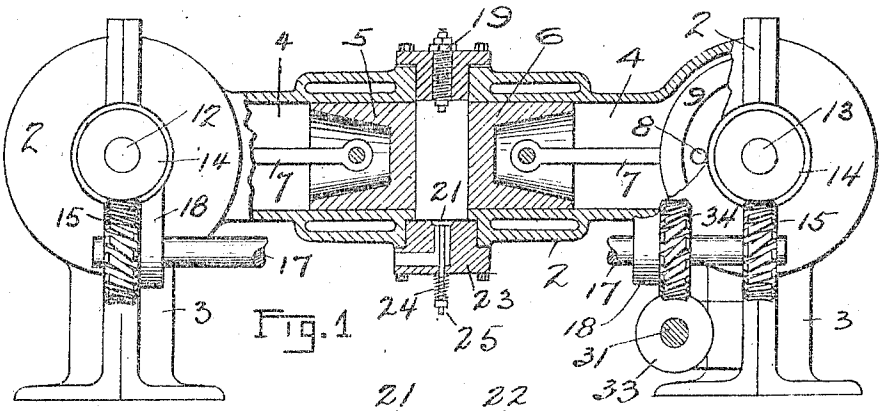


Fig. 1

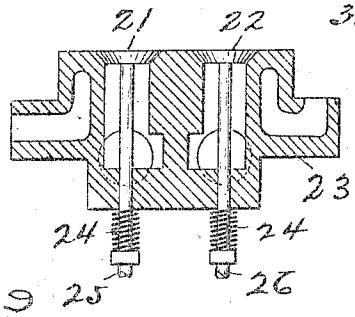


Fig. 4

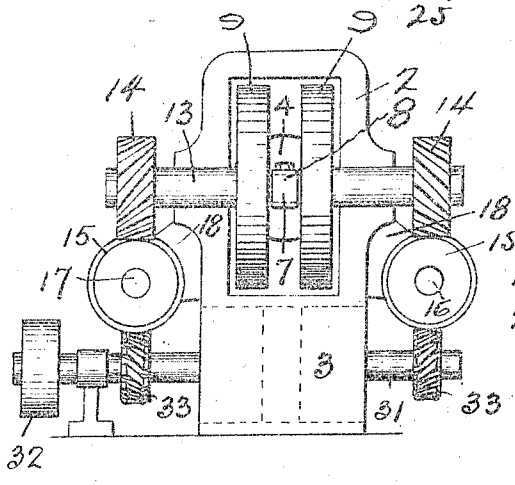


Fig. 2

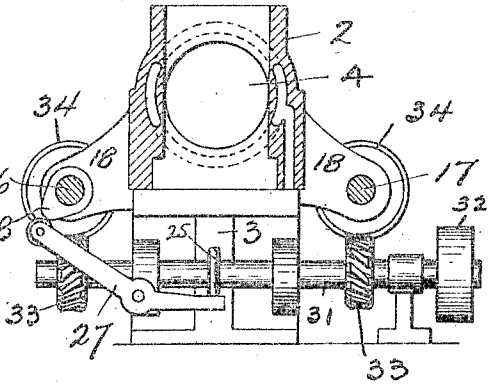


Fig. 3

WITNESSES

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UNITED STATES PATENT OFFICE.

ORLEN HARDY, OF RAYMOND, CALIFORNIA.

DOUBLE-ENDED GAS-ENGINE.

1,067,334. Specification of Letters Patent. Patented July 15, 1913.

Application filed July 29, 1912. Serial No. 711,977.

To all whom it may concern:

Be it known that I, ORLEN HARDY, a citizen of the United States, and a resident of Raymond, county of Madera, and State of California, have invented certain new and useful Improvements in Double-Ended Gas-Engines, of which the following is a specification.

The invention relates to improvements in double ended internal combustion engines of the type in which one charge actuates both pistons.

The object of the invention is to provide a perfectly balanced double ended gas engine.

A further object of the invention is to provide an improved means for taking off the power from the engine.

Another object of the invention is to provide an improved means of operating the inlet and exhaust valves of the engine.

The invention possesses other advantageous features, which, with the foregoing, will be set forth at length in the following description, where I shall outline in full that form of the invention selected for illustration in the accompanying drawings, in which:

Figure 1 is a side elevation of the engine, parts thereof being broken away to disclose the interior. Fig. 2 is an end elevation, part of the case being removed. Fig. 3 is a cross section taken through the center of the engine casting, showing the means for operating the valves. Fig. 4 is a cross section of the valves.

The engine consists of a suitable frame or body 2, having legs or standards 3 which rest upon the engine base or support. This body 2 includes the cylinder 4 in which the pistons 5—6 are arranged to move in opposite directions. The pistons are connected by means of the connecting rods 7 to the crank pins 8 arranged between the fly wheels 9 which are secured to the shafts 12—13 bearing in the body at the opposite ends. The fly wheels 9 are inclosed in the body 2 into which is introduced a quantity of oil so that the engine may be properly lubricated.

The shafts 12 and 13 which project from the casing are provided on each end with spiral gears 14 which mesh with similar gears 15 on the longitudinal shafts 16—17 arranged on opposite sides of the engine, which shafts bear in the lugs 18 formed on the casing. The shafts 12 and 13 are thereby positively connected together so that the pistons 5 and 6 move synchronously. The pistons are arranged so that they travel in opposite directions simultaneously, thereby allowing both pistons to be driven by the explosion of one charge. The charge is introduced into the cylinder between the pistons, and is compressed by the two pistons moving toward each other from the outer ends of the cylinder. Arranged in the casing intermediate the pistons, is a suitable ignition device, such as the spark-plug 19.

The inlet and outlet valves 21—22 are similarly arranged intermediate the pistons, and are preferably arranged in a removable block 23, so that access may be readily had thereto for cleaning and repairing. The cylinder and the block 23 are suitably water-jacketed to prevent over-heating. The valves 21—22 are held to their seats by means of springs 24 engaging the valve rods 25—26. The valve rods are each actuated by levers 27 pivoted to the frame of the engine. The levers 27 are in turn operated by the cams 28 on the shaft 16. The spiral gears 14 and 15 are designed and proportioned so that the shaft 16 completes one revolution for two revolutions of the shafts 12—13. The cams 28 on shaft 16 are adjusted so that the inlet and exhaust valves are opened at the proper time to produce efficient operation of the engine.

The spiral gears 14 and 15 and the shafts 16 are made of sufficient strength that other than serving as timing means for the two pistons, they transmit the power from each end of the engine. Arranged transversely of the engine, and below the shafts 16 and 17, is a shaft 31 provided with a pulley 32, or other suitable driving element, from which the power of the engine is taken off. The shaft 31 is provided adjacent to its opposite ends with spiral gears 33 which mesh with similar gears 34 arranged on each of the longitudinal shafts 16. The power in each piston, which is the same for both pistons, is taken off evenly from opposite sides of the drive shafts 12—13, and is imparted evenly to the shaft 31 from which it is distributed. The spiral gears employed in the construction permit a minimum of independent movement or back-lash of the gears, so that the two ends of the engine are properly timed, and the pistons are constrained to move synchronously at all times. The

load on the engine is equally distributed to both pistons and a perfectly balanced engine is obtained.

I claim:

1. In a double ended internal combustion engine, a cylinder, two pistons arranged in said cylinder adapted to move in opposite directions, shafts to which said pistons are connected, spiral gears on said shafts, longitudinally disposed shafts arranged on opposite sides of the engine, spiral gears on said shafts meshing with said first mentioned gears, a third spiral gear on each of said longitudinal shafts, a transversely arranged shaft, and spiral gears on said transverse shaft meshing with said third spiral gears.

2. In a double ended internal combustion engine, a cylinder, two pistons arranged in said cylinder adapted to move in opposite directions, shafts to which said pistons are connected, spiral gears on said shafts, a longitudinally disposed shaft, spiral gears on said shaft engaging with said first mentioned gears, inlet and outlet valves in said cylinder, and cams on said longitudinal shaft operatively connected with said valves.

In testimony whereof, I have hereunto set my hand at Raymond, this 18th day of July, 1912.

ORLEN HARDY.

In presence of—
GEO. W. HARRISON,
FRANCIS J. MELLO.