No. 642,043. Patented Jan. 23, 1900.

W. A. KOPE.

GAS ENGINE.

(Application filed Aug. 6, 1897.)

(No Model.)

Fig. 1.

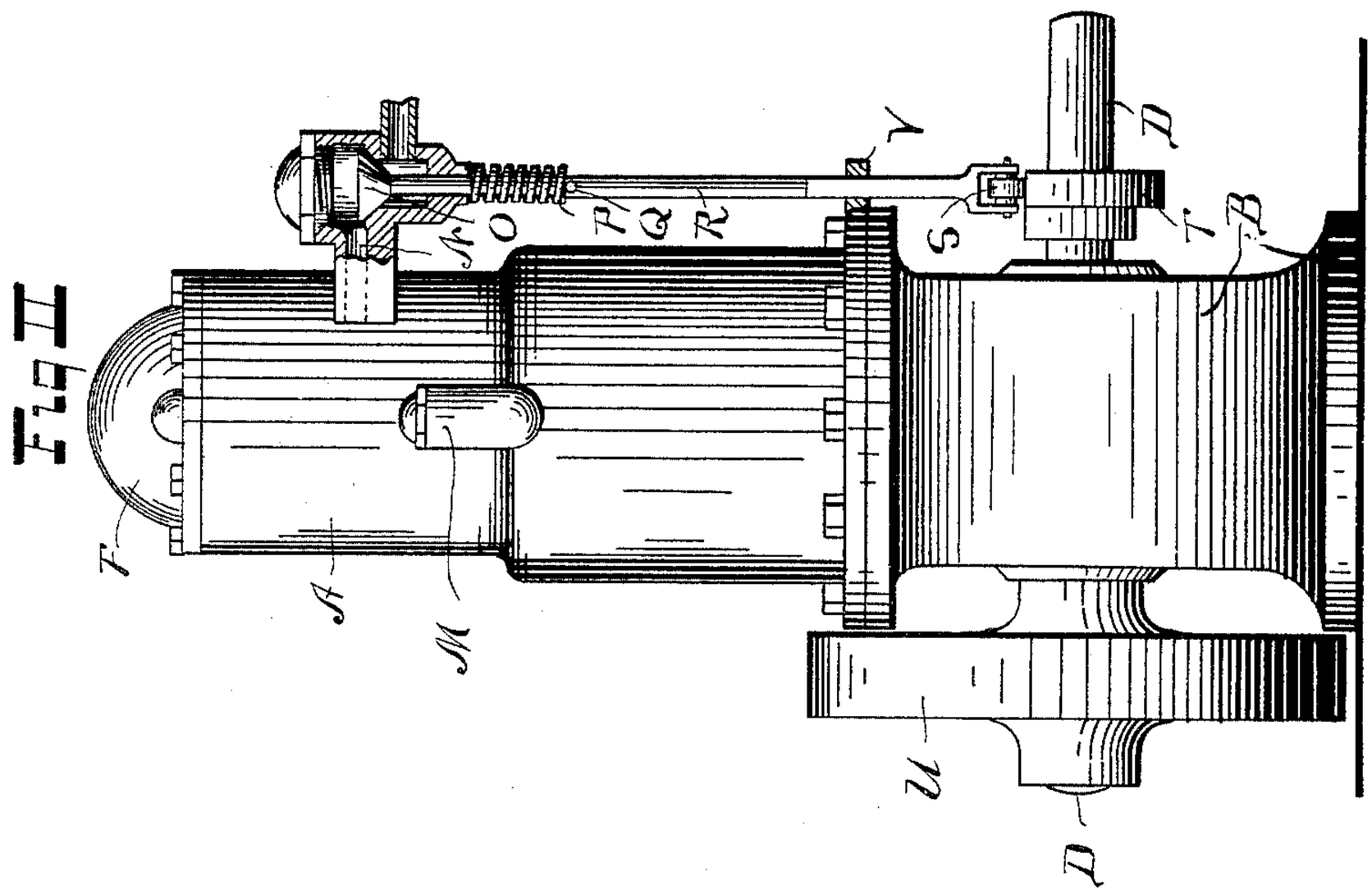
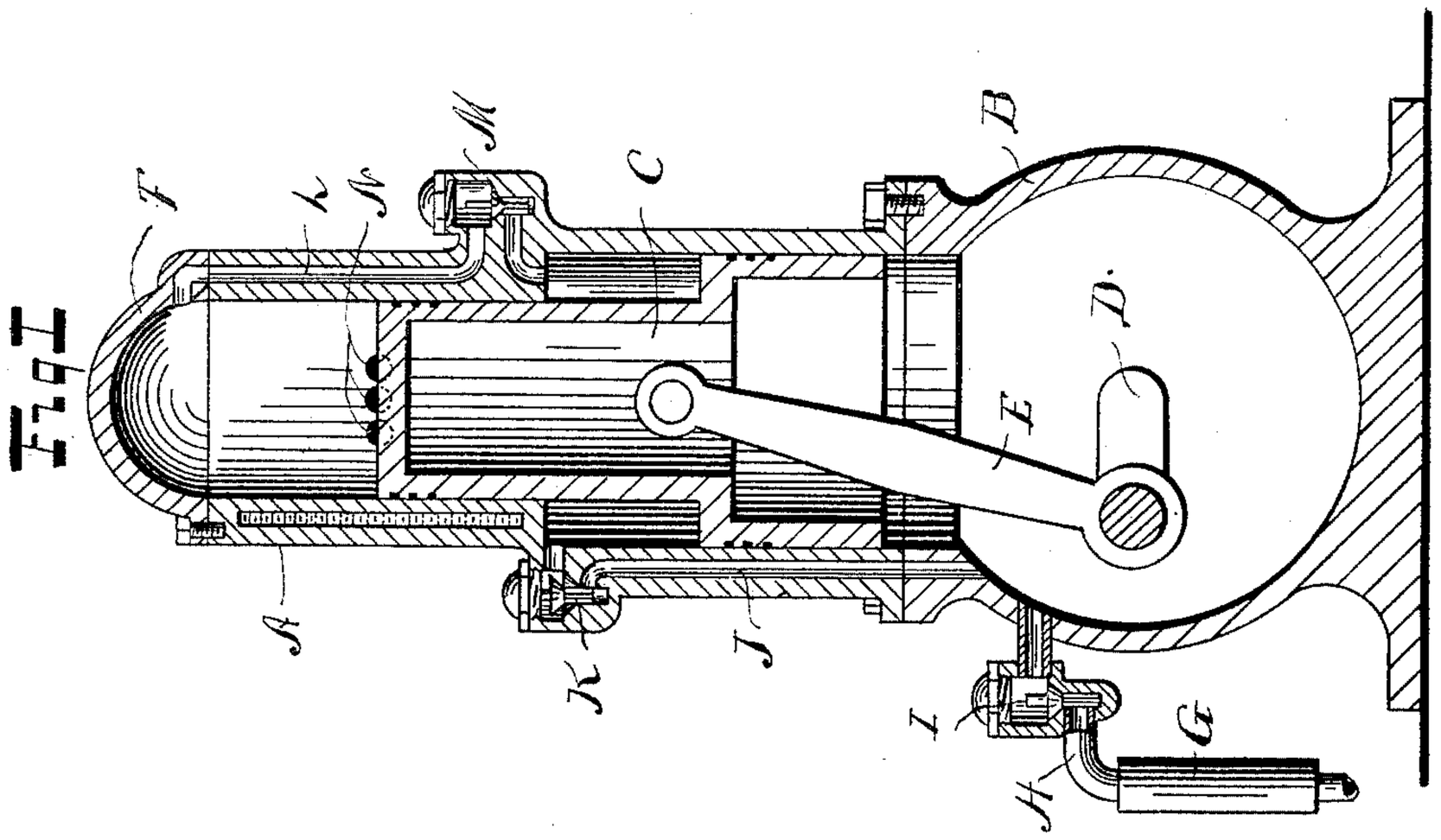


Fig. 2.



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WILLIAM A. KOPE, OF KANSAS CITY, KANSAS.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 642,043, dated January 23, 1900.

Application filed August 6, 1897. Serial No. 647,290. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. KOPE, a citizen of the United States, residing in Kansas City, in the county of Wyandotte and State of Kansas, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in gas and gasolene engines.

It relates particularly to the class of gas-engines of the two-cycle explosive type in which the explosive mixture is first compressed before ignition.

My invention provides a construction of engine employing a piston reciprocable in a cylinder so combined with a system of gas passages and valves that during the forward stroke of the piston the explosive gas mixture is drawn into a receiving-chamber and is then transferred upon the return stroke of the piston and compressed into the working end of the cylinder, the gas mixture being exploded at or near the end of the return stroke and the burned gas expelled from the cylinder during the first half of the next return stroke of the piston.

My invention provides, further, a reciprocable piston operating in a cylinder, the piston being provided with a peripheral annular enlargement which is fitted in an enlargement provided therefor in the cylinder combined with gas-passages leading from the gas-supply to the said enlarged portion of the cylinder, a suitable valve or valves controlling the flow of gas through the said passage, a gas-passage leading from the said cylinder enlargement to the working end of the cylinder, a valve controlling the said last-named passage, and means for expelling the burned gas from the cylinder at the proper time.

My invention provides certain other novel features of construction hereinafter fully described and claimed.

In the accompanying drawings, which illustrate my invention, Figure I represents a vertical sectional view of a vertical type of engine in the construction of which are employed the principles of my invention. In this view the piston is represented half-way on the downward stroke. Fig. II represents a front elevation view, a portion being broken away so as to show the construction of the valve controlling the exhaust-gas passage.

Similar letters of reference indicate similar parts.

Referring to the drawings, which illustrate an engine of the vertical type, A indicates the cylinder, the lower end of which is secured to the upper end of the crank-casing B, which wholly incloses a chamber in which rotates the crank-shaft D. The upper end of the crank-chamber is provided with an annular opening the peripheral walls of which register with the peripheral walls of an enlarged chamber with which the lower end of the cylinder A is provided.

C indicates the piston, the upper end of which is longitudinally movable in the smaller or working chamber of the cylinder and the lower end of which is provided with an annular peripheral enlargement fitted to and longitudinally movable in the enlarged portion of the cylinder.

E is the bar connecting the piston C with the crank of the crank-shaft D.

F indicates the cap covering the upper end of the cylinder A. The under side of the cap F is provided with a cavity which serves the purpose of an exploding and compressing chamber.

G designates a carbureter or mixing-chamber through which the supply of mixed gas and air is drawn and which may be of any desirable construction and which communicates with the chamber in the crank-casing by means of a gas-passage H, in which is inserted between the carbureter and the crank-casing chamber a check-valve I, also of any desirable construction and which prevents the return of the gas from the crank-casing chamber to the carbureter or gas-supply. Connecting the crank-casing chamber with the enlarged portion of the cylinder-chamber above the peripheral enlargement of the piston is a gas-passage J, made, preferably, by coring the casting forming the body of the cylinder. A check-valve K of any desirable construction is inserted in the gas-passage J and prevents the backward flow of the gas from the cylinder to the crank-casing chamber. In the body of the cylinder and the cap

F is provided a gas-passage L, which connects the enlarged portion of the cylinder-chamber with the compressing and exploding chamber at the upper end of the cylinder. A check-valve M of any chosen form is inserted in the gas-passage L and prevents the backward flow of the gas therethrough.

N indicates the exhaust-passage through which the burned gas is expelled from the cylinder. Controlling the said gas-passage N is a valve O, which may be of any suitable positive-acting design and which is actuated to permit the expelling of the burned gas by mechanism operated by some of the moving parts of the engine.

In Fig. II is illustrated a chosen form of mechanism for controlling the escape of gas through the passage N. The valve O is provided with a downwardly-projecting stem R, the lower end of which is square and vertically movable in a square opening in a projection V, extending horizontally from the lower end of the cylinder. Pivotally secured to the lower end of the valve-stem R is a friction-roller S, adapted to rest upon the periphery of a cam T, which is rotatable with the crank-shaft D. The valve O is held to its seat by means of a coil-spring P, which encircles the valve-stem R, the upper end of the spring resting against the casing inclosing the gas-passage N and the lower end bearing against a transverse pin Q, extending through the stem R. The tension of the spring P is such that the stem is forced downwardly, thus holding the valve in its seat except during such time as the stem is raised by the cam T operating upon the roller S. U indicates a fly-wheel mounted upon and rotatable with the crank-shaft D.

My invention is operated as follows: The crank-shank D is rotated so as to force the piston C downward. The enlarged portion of the piston descending in the enlarged chamber of the cylinder A tends to create a vacuum in the said portion of the cylinder above the peripheral enlargement of the piston, and a charge of mixed gas and air then passes through the passage J and past the valve K into the cylinder above the peripheral flange of the piston, the charge being taken from the crank-shaft-casing chamber into which it had been previously drawn from the carbureter G through the passage H and past the valve I. After the piston has reached its lowermost position in the cylinder and starts to rise therein the valve K closes and the valve M opens, permitting the gas charge to pass from the enlarged part of the cylinder through the passage L and past the valve M into the chamber above the small part of the piston, where it is compressed by the continued upward movement of the piston. At the time the piston has reached its highest position in the cylinder the charge of gas has been transferred into the cylinder above the smaller portion of the piston from the enlarged portion of the cylinder, and, owing to the relatively small size of the combustion-chamber compared with the size of the chamber above the peripheral enlargement of the piston, is highly compressed. The charge is then ignited in any of the well-known ways for so doing, as by an ignition-tube attached to the combustion-chamber, by an electric spark generated in the combustion-chamber at the proper time, or by any other desirable firing means. The exploding of the charge forces the piston downward, the effect of the explosion being spent upon the small upper end of the piston. At the time of the exploding of the charge the valve M is closed, thus preventing a backflow of the gas through the passage L. During the upward movement of the piston a fresh charge is drawn into the crank-shaft-casing chamber through the passage H and past the valve I. This charge is drawn into the enlarged chamber of the cylinder during the following downward movement of the piston through the passage J and past the valve K. During the downward movement of the piston, due to the force of the ignited gas mixture above the upper end of the piston the exhaust-passage N is closed by means of the valve O, which is held to its seat by means of the coil-spring P. The cam T is so disposed on the crank-shaft D that it will open the valve O at the end of the downward stroke of the piston, thus permitting the burned gas in the upper end of the cylinder to escape through the passage N, which is located in the cylinder at about the middle of the stroke of the small portion of the piston. The fly-wheel U, through the momentum imparted to it on the downward stroke of the piston, carries the piston on the upward stroke.

In the construction of gas-engine invented by me the piston has an impulse imparted to it at every downward stroke, which permits of great regularity of operation and fits the engine for such work as electric generation and other work requiring regularity of operation. Any well-known form of automatic regulation or governing device may be used in connection with my engine, and, as already stated, the charge may be ignited in any manner desired. Various modifications in construction may be made from the one illustrated in the drawings without departing from the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a gas-engine the combination with a cylinder provided with two communicating chambers of different diameters, of a reciprocable piston fitted to one of the chambers and provided with a peripheral enlarged portion fitted to the other chamber, an inclosed crank-shaft-casing chamber, a gas-passage leading from the supply to the said crank-shaft-casing chamber, a gas-passage leading from the crank-shaft-casing chamber to one of the cylinder-chambers, a gas-passage connecting the

two cylinder-chambers, and suitable valves controlling the said gas-passages, substantially as described.

2. In a gas-engine, the combination with a casing B, of a cylinder A secured at its open end thereto and provided with an inner peripheral enlargement, a piston C fitted in the said cylinder A, an inlet-passage leading to the interior of the casing, a valve controlling said passage, a passage leading from the casing to the enlarged portion of the cylinder, a valve controlling said passage, a passage leading from said enlarged portion of the cylinder to the smaller end thereof, a valve controlling said passage, an exhaust-passage leading from the cylinder, and a valve controlling said passage, substantially as described.

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

WILLIAM A. KOPE.

Witnesses:
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