

**No. 673,901.**

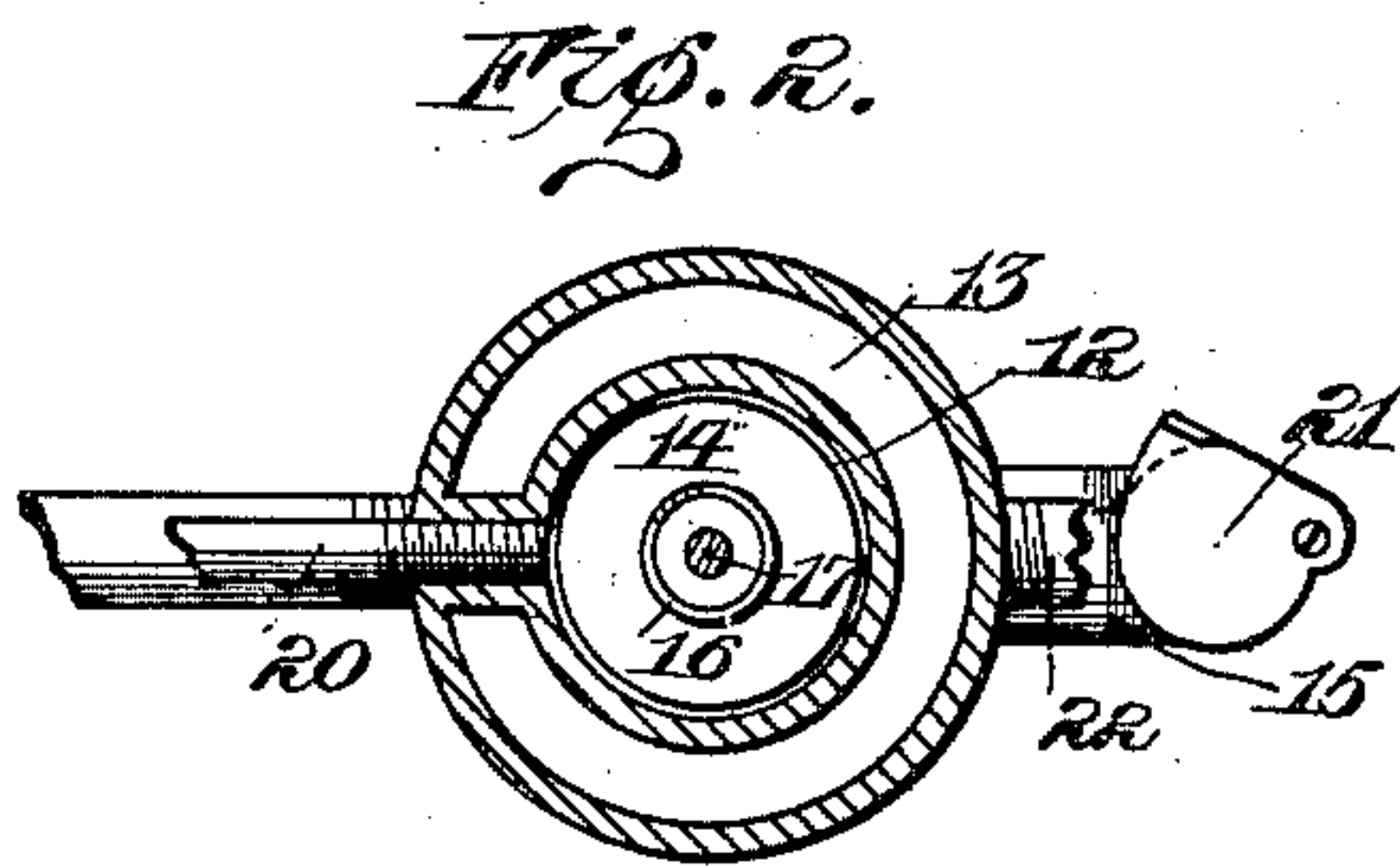
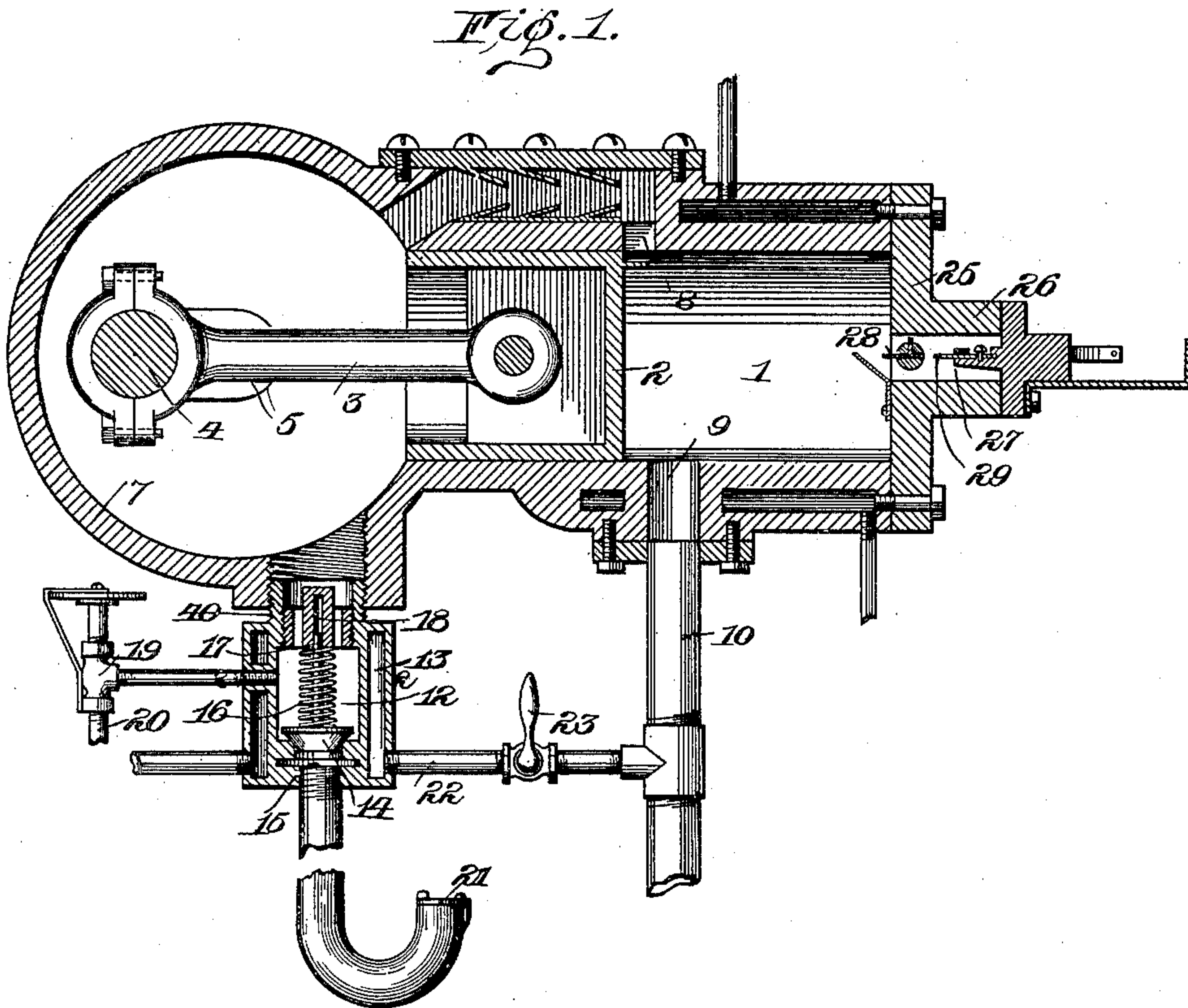
**Patented May 14, 1901.**

**J. ECKHARD.**

## MIXER AND VAPORIZER FOR GAS ENGINES.

(Application filed May 26, 1900.)

(No Model.)



Witnesses:

Willard Rich.

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# UNITED STATES PATENT OFFICE.

JOHN ECKHARD, OF BRIGHTON, NEW YORK, ASSIGNOR TO THE ECKHARD MOTOR COMPANY, OF SAME PLACE.

## MIXER AND VAPORIZER FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 673,901, dated May 14, 1901.

Original application filed September 11, 1899, Serial No. 730,130. Divided and this application filed May 26, 1900. Serial No. 18,103. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ECKHARD, of Brighton, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Mixers and Vaporizers for Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, and to the reference-numerals marked thereon.

One object of my present invention is to provide a device in which the volatile hydrocarbon usually employed in gas-engines may be quickly vaporized and in which the vapors from a given quantity of oil may be combined with a proper proportion of air to produce a gas of the greatest expansive force when ignited.

A further object of my invention is to provide a simple and effective means of heating the generator from the ignited gases as they are exhausted from the cylinder.

To these and other ends my invention consists in certain improvements in construction and combination of parts, all as will be described, and the novel features pointed out in the claims at the end of this specification.

This is a divisional application of my prior application, Serial No. 730,130, filed September 11, 1899.

In the drawings, Figure 1 is a longitudinal sectional view of an engine embodying a vaporizer constructed in accordance with my invention, and Fig. 2 is a cross-sectional view on the line 2 2 of Fig. 1.

Similar reference-numerals in both figures indicate similar parts.

I have shown my invention as applied to a type of two-cycle gas-engines in which the gas is admitted to the cylinder and compressed therein and ignited upon each complete stroke of the piston-head. The engine embodies the cylinder 1, in which operates the piston-head 2, connected by a pitman 3 to the crank-shaft 4, carried in the bearings 5. The cylinder is open upon its inner end, and the pitman and crank on the shaft are enclosed in a casing 7, connecting with the cylinder and forming a chamber into which the

supply of fresh gas and air is drawn and somewhat compressed before passing into the cylinder. The chamber is connected to the cylinder by means of an inlet-port 8, and an exhaust-port 9, arranged upon the opposite side of the cylinder and slightly in advance of the inlet-port, allows the products of the combustion of the gas to escape through a suitable pipe 10.

The gas employed is generated by vaporizing a liquid—such as gasoline, naphtha, or other similar material—and mixing such vapor with the proper quantity of air to obtain the greatest expansive force when the mixture is ignited. Attached to the casing 7 and communicating therewith is a generator or vaporizer embodying the chamber 12, surrounded by the jacket or passage 13 and provided with a check-valve 14, normally closing the air-inlet passage 15 and adapted to be held upon its seat by a spring 16, surrounding the valve-stem 17, the upper end of the latter being guided in a spider or bearing 18, which may be screwed into the upper end of the generating-chamber or otherwise removably secured to permit grinding of the seat for the valve 14. The flow of liquid to the generator is governed by a hand-operated regulating-valve 19, located in the liquid-supply pipe 20, and the desired quantity of air admitted to the passage 15 is governed by an adjustable cap or valve 21, pivoted to the pipe at the end of the passage. The generator is adapted to be heated to vaporize the gasoline, and for this purpose the jacket or passage 13 is connected by a pipe 22 to the exhaust-port leading from the engine-cylinder in which the explosion takes place, permitting a portion of the heated products and gases to pass around the generator and heat the parts. In order that the quantity of the heated gases and products of combustion exhausting from the cylinder and admitted to the passage 13 may be regulated and the temperature of the generator controlled to accomplish the vaporizing in the best manner, I provide a stop-cock or valve 23 in the passage 22, as shown in Fig. 1.

Upon the outer end of the main cylinder is the head 25, provided with an extension 26, forming a pocket 27, in which are located elec-



tric contact members 28 and 29, adapted to be operated into and out of engagement to form a spark and ignite the charge whenever the piston 2 reaches the limit of its outward movement.

The interior of the casing 7 is connected to the generator, and the vapor as it is generated is drawn into the casing, together with the proper amount of air admitted through the check-valve by the vacuum created by the outward movement of the piston 3. The inlet-port leading from the casing to the cylinder extends along the side of the latter and is adapted to be opened by the piston upon its inward stroke and closed as it is advanced in the cylinder. As the piston returns the gas in the casing is compressed, the check-valve 14 preventing its escape through the air-inlet passage 15 until the inlet-port is opened, when by its expansive force the gas passes into the cylinder, where it is again compressed by the outward movement of the piston and ignited as the latter reaches its limit of movement in that direction or at any portion of the stroke, as may be desired.

By arranging the generator in connection with the casing 7 and connecting the latter with the rear end of the cylinder the liquid is drawn into the generator, vaporized, and mixed with the proper quantity of air at each outward stroke of the piston. The cap 21 regulates the amount of air admitted to the generator, and the check-valve 14 automatically closing the air-passage prevents the loss of gas, allowing it to be compressed in the chamber as the piston returns.

The device is simple and easily constructed, and by employing a portion of the hot gases emitted from the cylinder and arranging means for regulating the quantity of the same the temperature of the generator may be regulated as desired, in proportion to the speed of the engine.

The vaporizer is constructed as a complete article, having the exterior threaded neck or portion 40, and the tapped apertures in the sides may be readily applied to any of the ordinary forms of engines now in use.

I claim as my invention—

1. In a vaporizer for gas-engines, the combination with a shell or casing having the double side walls with the passage between them surrounding a central chamber, the threaded portion upon the casing adapted to connect the chamber with the inlet-port of the engine-cylinder and the passage leading from the passage around the generating-chamber to the exhaust-port of the engine, of an air-inlet passage, the check-valve in the chamber normally closing the latter having the stem, the bearing forming a guide for the latter, the spring arranged between the bearing and the valve and the oil-inlet passage entering the chamber above the valve, permitting the oil to be fed continuously into the generating-chamber.

2. In a vaporizer for gas-engines, the com-

bination with a chamber adapted to be connected to the inlet-passage of the engine-cylinder having the double side walls and the passage between them adapted to be connected to the exhaust-port of the engine, of an air-inlet pipe leading into the chamber having the curved outer end, the valve upon said end, a check-valve normally closing the opposite end of said passage, having the stem, the bearing forming a guide for the latter arranged within the chamber, the oil-inlet passage located above the check-valve, and the valve arranged in said passage whereby the desired quantity of oil may be regulated and fed continuously into the generating-chamber.

3. In a gas-engine having the cylinder open upon one end the piston operating therein and the casing connected therewith in rear of the piston, the inlet-port leading from the casing to the cylinder and the exhaust-passage from the latter, the combination with a generator having the double side walls forming an outer passage surrounding a central chamber, and adapted to be connected by a passage with the exhaust-port of the engine and a valve arranged in the latter passage, of a boss located on the casing surrounding the end of the chamber, permitting the latter to be connected directly to the engine-casing, an air-inlet pipe leading into the opposite end of the chamber having the valve, the check-valve in the chamber closing the air-passage having the stem, the guide forming a bearing for the latter and a spring arranged between the bearing and the valve, an oil-inlet passage leading into the chamber above the check-valve and a regulating-valve located therein, whereby the desired amount of oil may be fed continuously to the generating-chamber.

4. In a vaporizer for gas-engines, the combination with a chamber adapted to be connected to the inlet-passage of the engine-cylinder having the double side walls, and the passage between them adapted to be connected to the exhaust-port of the engine, of an air-inlet passage leading into the central chamber, the valve at the outer end, a valve-seat in the chamber above the opposite end of said passage, and the valve operating thereon, the stem on the valve, a bearing for said stem removably secured in the upper end of the chamber and the spring arranged between the bearing and the valve, and an inlet-passage leading into the cylinder above the check-valve and a regulating-valve therein.

5. In a vaporizer for gas-engines, the combination with a casing having the double side walls forming an outer passage, and a central chamber adapted to be connected to the inlet-passage of an engine-cylinder, and having the internally-threaded end of an air-inlet pipe connected to the opposite end of the chamber having the valve, a valve-seat located in the chamber above the air-inlet pipe, a valve resting thereon, adapted to be operated by air-pressure, a stem upon the valve,



a bearing for the latter removably screwed into the upper end of the chamber, and a spring surrounding the stem and extending between the bearing and the valve, an exhaust-passage leading from the exhaust-port of the engine connected to the outer passage of the casing, having a regulating-valve, an oil-inlet passage leading into the chamber above the check-valve and a valve arranged therein, whereby the desired quantity of oil may be regulated and fed into the generating-chamber continuously.

6. A vaporizer for attachment to gas-engines, consisting of the body having the chamber extending centrally through it and the double outer walls forming a heating-cham-

ber around the latter, the upper end of the central chamber being adapted for connection with the inlet-passage of the engine, and the lower end being the valve-seat, the check-valve arranged wholly within the central chamber cooperating with the seat, the oil-inlet passage entering the central chamber above the valve-seat, the air-passage connected to the lower end of the central chamber below the valve-seat and the regulating-valve therefor.

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Witnesses:

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