

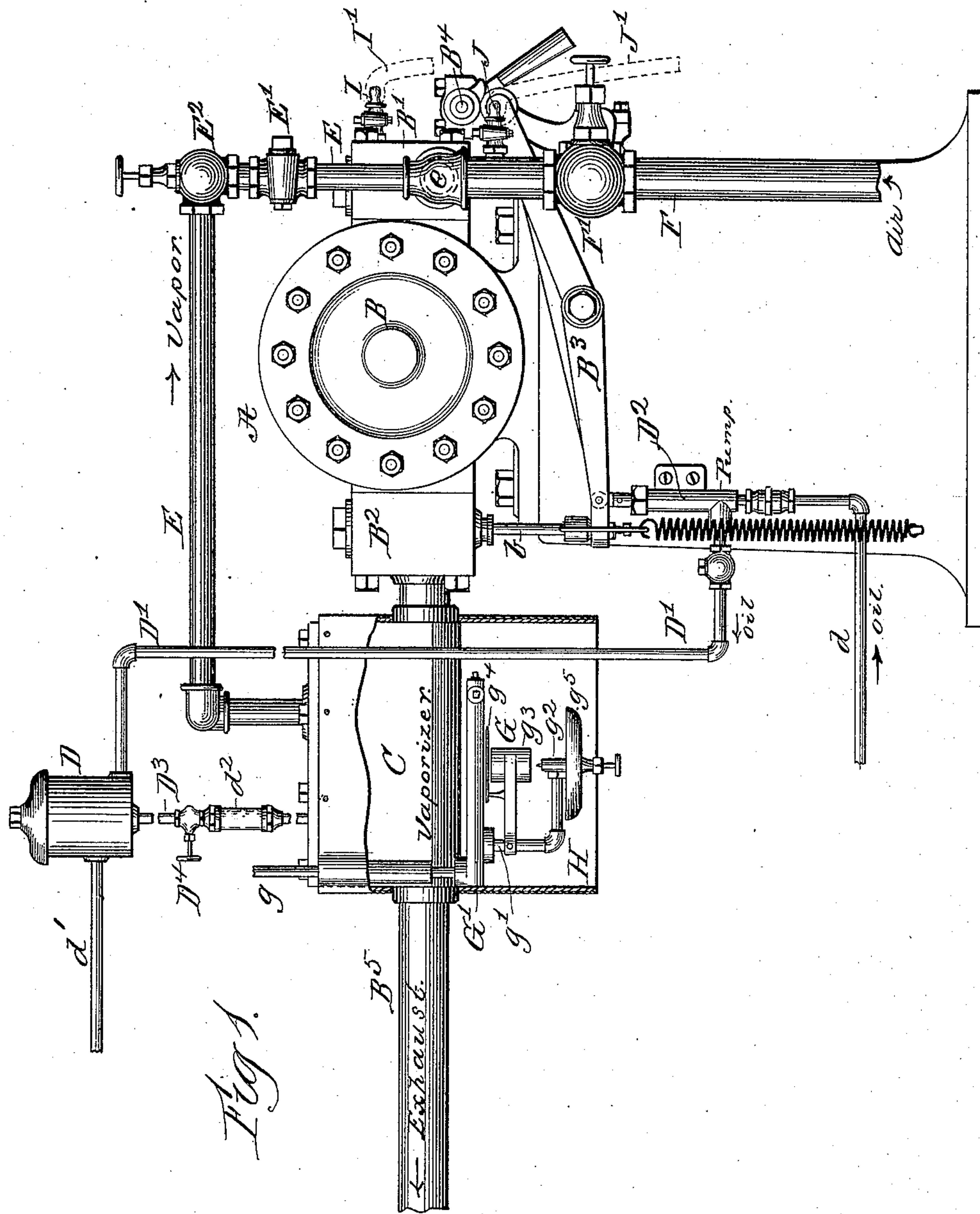
(No Model.)

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G. W. LEWIS.  
VAPOR ENGINE.

No. 577,189.

Patented Feb. 16, 1897.



Witnesses  
Wm. J. Huming  
John W. Adams.

Inventor  
George W. Lewis.  
by Dayton, Pool & Brown.  
Attys.

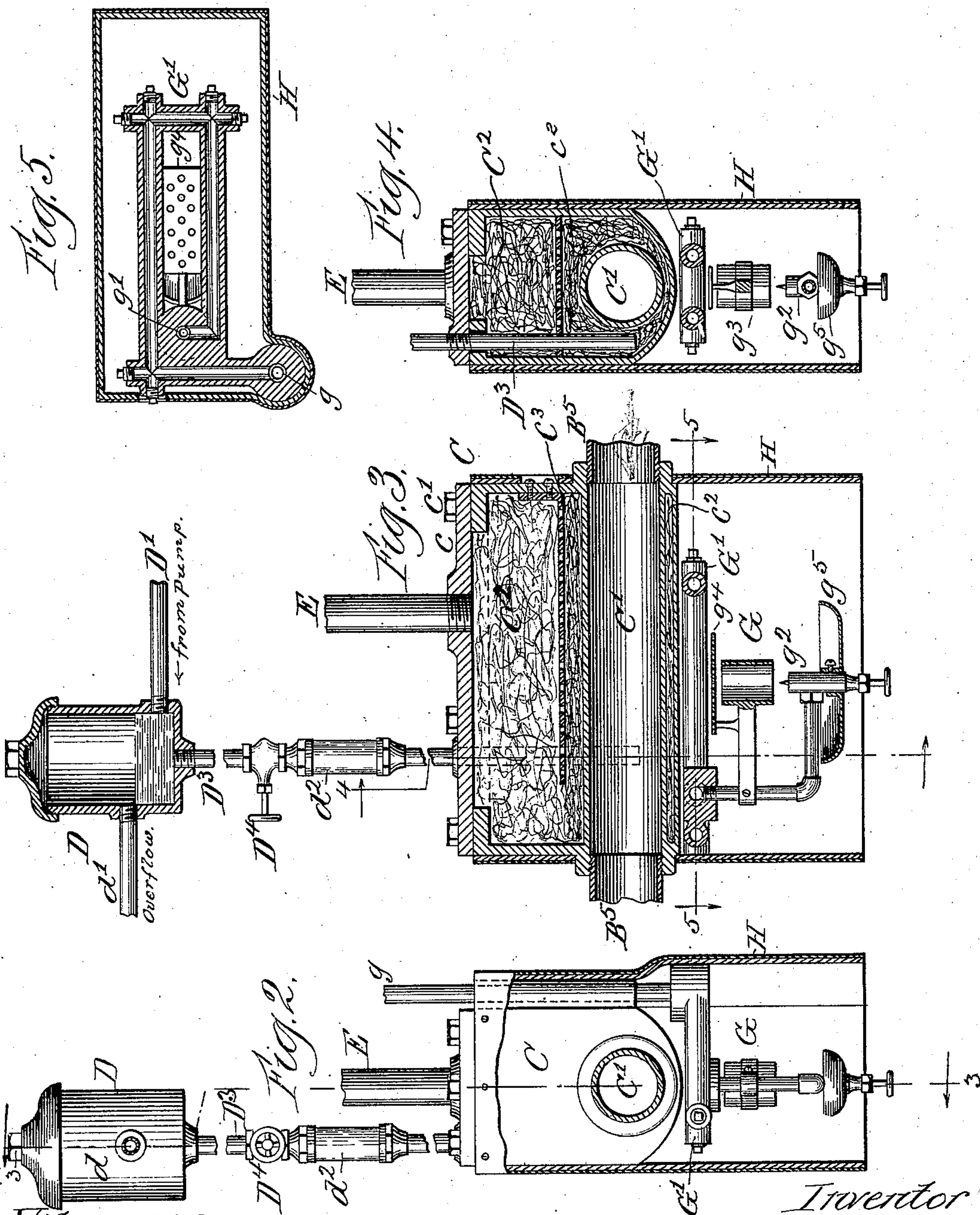
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# UNITED STATES PATENT OFFICE.

GEORGE W. LEWIS, OF CHICAGO, ILLINOIS.

## VAPOR-ENGINE.

SPECIFICATION forming part of Letters Patent No. 577,189, dated February 16, 1897.

Application filed March 19, 1894. Serial No. 504,141. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. LEWIS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Vapor-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to the class of gas-engines more particularly known as "vapor-engines," in which a volatile liquid hydrocarbon is vaporized for the purpose of supplying the inflammable element to the explosive mixture by which the engine is impelled.

The invention relates, primarily, to the vaporizing devices of such engines, in connection with which it has for its object to provide a construction relating to the vaporizer by which low grades of liquid hydrocarbon may be successfully vaporized.

In the accompanying drawings, which illustrate one practical form of my invention, Figure 1 is an end elevation of a gas or vapor engine having my improvement applied thereto, a part of the hood of the vaporizing attachment being broken away to show the vaporizer in side elevation. Fig. 2 is an end elevation of the vaporizer, revealed by the removal of a portion of the hood which incloses it, showing also the superposed reservoir for the liquid hydrocarbon and the immediate connections of the parts. Fig. 3 is a longitudinal vertical section in the indirect line 3 3 of Fig. 2. Fig. 4 is a vertical transverse section in the line 4 4 of Fig. 3. Fig. 5 is a horizontal section in the line 5 5 of Fig. 3.

The arrows on the various section-lines of Figs. 2 and 3 indicate the direction in which the sectional figures are viewed.

A in Fig. 1 represents a gas or vapor engine which is made of any suitable construction, but which, so far as shown, is represented as corresponding with that illustrated and described in my pending application for patent, Serial No. 482,342, filed August 4, 1893, in which B is the piston or power cylinder, B' is the receiving vapor-chest, containing a suitable supply-valve and ignition devices, and B<sup>2</sup> is an exhaust-chest containing an exhaust-valve, the stem of which is seen at *b*, B<sup>3</sup> being

a centrally-pivoted lever engaged with the valve-stem *b* and operated by a cam upon a rotating shaft B<sup>4</sup>. B<sup>5</sup> represents the exhaust-pipe of the engine.

C is the vaporizing-chamber of my present invention, through the lower part of which passes the exhaust-pipe B<sup>5</sup>, the preferable construction as to said exhaust-pipe being illustrated in Fig. 3, wherein it is shown as having within it a section C' of the exhaust-pipe, the ends of which are screw-threaded to receive the connected portions of the exhaust-pipe at either side thereof.

As illustrated, the vaporizing-chamber C is a box-shaped casting open only at the top, where it is provided with a cover *c*, suitably secured to the body of the casting by bolts *c'* or otherwise. The bottom wall of the vaporizing-chest C is also shown as being rounded or parti-cylindrical, and a narrow space *c*<sup>2</sup> is provided between this bottom wall and the exhaust-pipe section C' above the same.

The interior of the vaporizing chest or chamber C is shown as being filled with a loose fibrous substance C<sup>2</sup>, which is preferably of wire-gauze and asbestos, the wire-gauze being folded or crumpled and serving to hold the asbestos fiber in a loose and open condition to prevent its packing at the bottom of the chamber and to allow free movement of the vapor through it. The gauze and fiber in the upper portion of the chamber may be additionally supported with advantage by means of a perforated diaphragm C<sup>3</sup>.

D is a reservoir for kerosene or other liquid hydrocarbon, said reservoir being elevated suitably to give a proper hydraulic head to insure the supply of oil therefrom to the interior of the vaporizing-chamber C against the pressure within the latter when such pressure is low enough to require further supply.

D' represents an oil-supply pipe connecting the reservoir D with a pump D<sup>2</sup>, which is fed through a pipe *d* from any suitable source. An overflow-pipe *d'*, leading from the reservoir D, is shown as being placed at a suitable elevation above the inlet-pipe D' to insure the preservation of a sufficient body of liquid in the reservoir.

D<sup>3</sup> is a pipe leading from the bottom of the reservoir D into the vaporizing-chamber C and preferably terminating near the bottom



of the latter at one side of the contained section C' of the exhaust-pipe, as indicated in Fig. 4. Said pipe D<sup>3</sup> is provided with a needle-valve or other suitable valve D<sup>4</sup>, by which liquid from the reservoir D may be delivered, drop by drop, into the vaporizing-chamber, d<sup>2</sup> being a glass or other transparent section of the pipe D<sup>3</sup> through which the dropping or feeding of the oil may be observed.

E is a pipe leading from the vaporizing-chamber C to the receiving-chest B' of the engine, said pipe being provided with a stop-valve E' and between said stop-valve and the vaporizing-chamber with an adjusting-valve E<sup>2</sup>.

F is an air-inlet pipe also communicating with the receiving-chest B' and preferably being arranged in line with the pipe E, as indicated in Fig. 1, both the pipes E and F being joined with the vapor-chest B' of the engine by means of a horizontal pipe, (indicated by dotted lines at e.) The air-pipe F is provided with a suitable adjusting-valve F'.

G represents a vapor-generating burner arranged beneath the vaporizing-chamber C for the purpose of initially heating said chamber preparatory to operation of the engine. This generating-burner G may be of any suitable construction, several of the well-known devices of this character being adapted for this purpose. As here represented, G' is a vapor-generator containing suitable passages for oil and vapor, as illustrated, for example, in Fig. 5, g being a supply-pipe leading thereto from a suitable source of liquid-hydrocarbon supply, and g' a pipe leading therefrom to a needle-valve g<sup>2</sup>, arranged beneath the generator G', so that the vapor-jet from said valve, passing through the air-mixing tube g<sup>3</sup> and against the superposed plate g<sup>4</sup>, may give a suitable flame for keeping the generator G' of the burner hot and also for heating the superposed vaporizer C preparatory to starting the engine. A drip-cup g<sup>5</sup> serves the usual purpose of containing a small quantity of fluid for initially heating the generator G'. This burner G may be kept in operation, if necessary, while the engine is running, but ordinarily the heat of the exhaust fluids passing through the tube C' of the vaporizer C will be sufficient to supply all the heat necessary to vaporize the liquid hydrocarbon furnished from the reservoir D.

H is a hood applied to and depending from the vaporizer C around the subjacent burner G for the purpose of confining the heat of said burner and giving the latter greater efficiency as a heater of the vaporizer.

By connection of the piston or plunger of the pump D<sup>2</sup> with the valve-operating arm or lever B<sup>3</sup>, which in this instance represents the medium through which the governor controls the vapor-supply to the engine, the supply of oil to the reservoir D will be regulated somewhat in accordance with the consumption of the engine; but this is not necessary to the general invention, inasmuch as the pump may

be otherwise connected and operated, and inasmuch, further, as the overflow d will preserve a given depth of oil in the reservoir, notwithstanding it may be supplied in excess of direct demands for vaporization.

I represents a valved nipple connected with the vapor-receiving chest B' of the engine and adapted to receive a rubber or other pipe, (shown by dotted lines at I',) and J is a similar valved nipple connected with the air-pipe F near its junction with the vapor-pipe E and adapted to receive a similar rubber pipe, (shown by dotted lines at J'.) These are adjuncts which will be desirably provided upon engines of the larger sizes with a view of connecting the rubber pipes I' and J' with a suitable pump, (not shown,) so that by operation of the pump in starting the engine air and vapor may be forcibly drawn from the pipes F and E through the nipple J and sent by the pump through the nipple I to the ignition-chamber of the engine.

It will be understood that in the operation of the engine with its vaporizing attachment, as above described, the pressure in the vaporizer C will vary, and that when such pressure is high, owing to the pressure of an abundance of vapor within said chamber C, such pressure will interrupt the dropping of liquid from the valve D<sup>4</sup>, but when the pressure is again lowered by the consumption of vapor the dropping and supply of liquid to the vaporizing-chamber will be resumed under the pressure due to the hydraulic head of the liquid above said valve.

It will be observed that the construction above set forth is distinguished from previous constructions in which heat is applied to a reservoir or tank containing a body of liquid hydrocarbon or in which heat is applied to a chamber containing a mixture of liquid hydrocarbon and air, the distinct feature of my invention being the vaporizing-chamber connected with a source of liquid-hydrocarbon supply through means by which said liquid hydrocarbon is supplied to the vaporizing-chamber drop by drop or otherwise in minute quantities and only so fast as it is vaporized and in the absence of air, the air being subsequently mixed with the vapor after the latter has been produced in the vaporizing-chamber and has left said chamber on its way to the power-cylinder.

I claim as my invention—

1. In combination with a vapor-engine, a vaporizer subject to the heat of the exhaust of the engine, an elevated reservoir for liquid hydrocarbon, a pipe leading from the reservoir to the interior of the vaporizer, a valve in said pipe adapted to allow the liquid to descend therefrom drop by drop into the vaporizer, a burner arranged externally to and in position to heat the vaporizer, and a pump operated by the engine for the supply of liquid to the reservoir.

2. In combination with a vapor-engine, a vaporizing-chamber containing within it, and



integral therewith, a section of the exhaust-pipe of the engine, said section of pipe being arranged near the bottom of the vaporizing-chamber, a supply-reservoir having valved connection with the interior of the vaporizer, a pump operated by the engine for the supply of the reservoir, and a burner external to the vaporizer for heating the same.

3. The combination with a vapor-engine, a vaporizing-chamber from which air is excluded, and means for heating said chamber of an elevated reservoir for liquid hydrocarbon, connected by a pipe with the interior of the chamber, and a valve in the pipe below the reservoir, whereby in the variation of pressure within the chamber the liquid may descend in minute quantities under the hydraulic head or may be arrested by the pressure in the vaporizer.

4. In combination with a vapor-engine, a vaporizing-chamber, means for heating said chamber, an elevated reservoir for liquid hydrocarbon connected by a pipe with the interior of the vaporizing-chamber, and a valve in said pipe arranged beneath a suitable hydraulic head in the pipe and reservoir, whereby, in the variation of pressure in the vaporizing-chamber, the liquid may descend in successive minute quantities under the pressure of the hydraulic head or may be arrested by the pressure in the vaporizer.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

GEORGE W. LEWIS.

Witnesses:

M. E. DAYTON,  
ALBERT H. GRAVES.