No. 638,529. Patented Dec. 5, 1899.

B. C. VANDUZEN.

VAPORIZER FOR EXPLOSIVE ENGINES.

(Application filed Dec. 29, 1898.)

(No Model.) 2 Sheets—Sheet 1

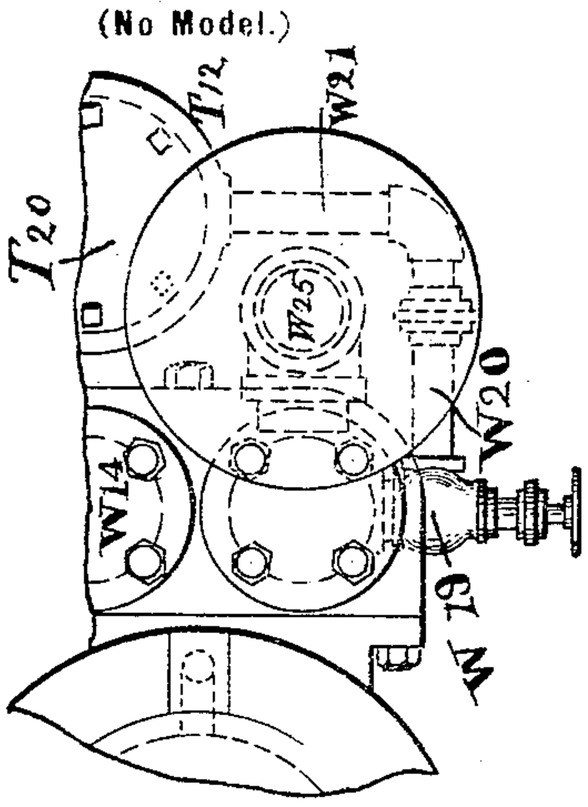

Fig. 4.

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

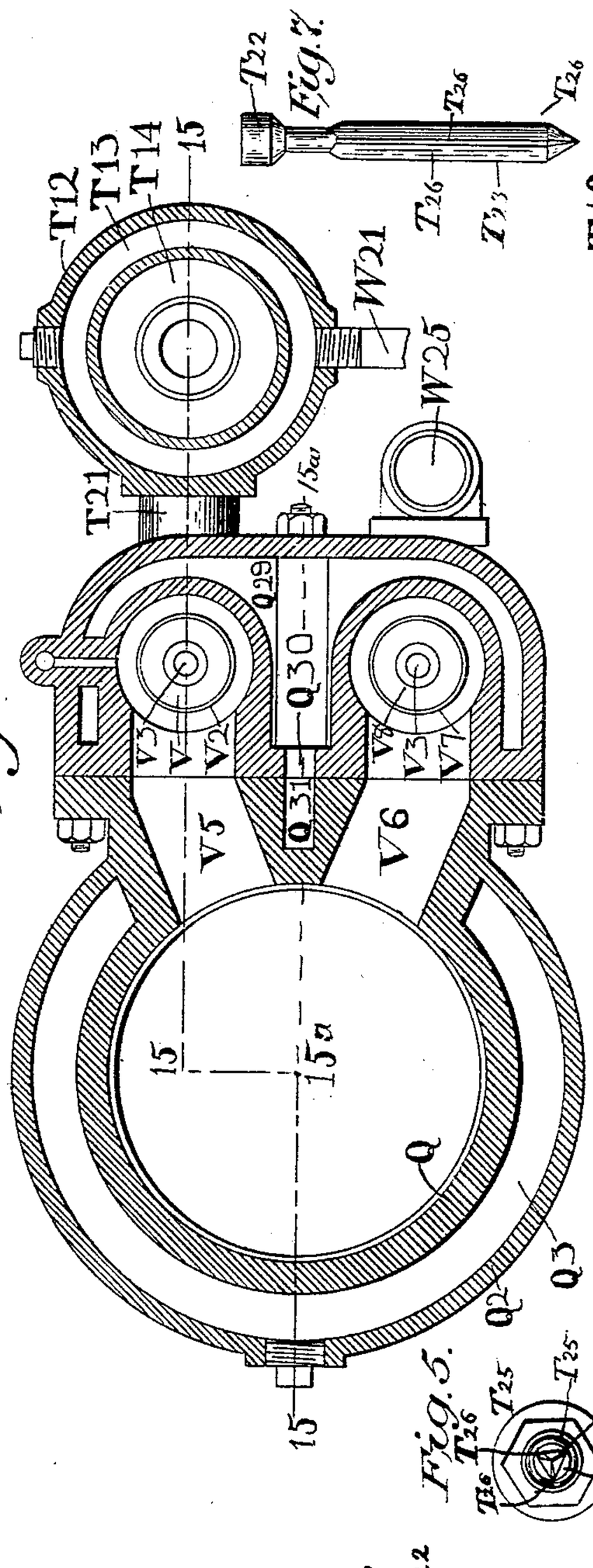


Fig. 3.

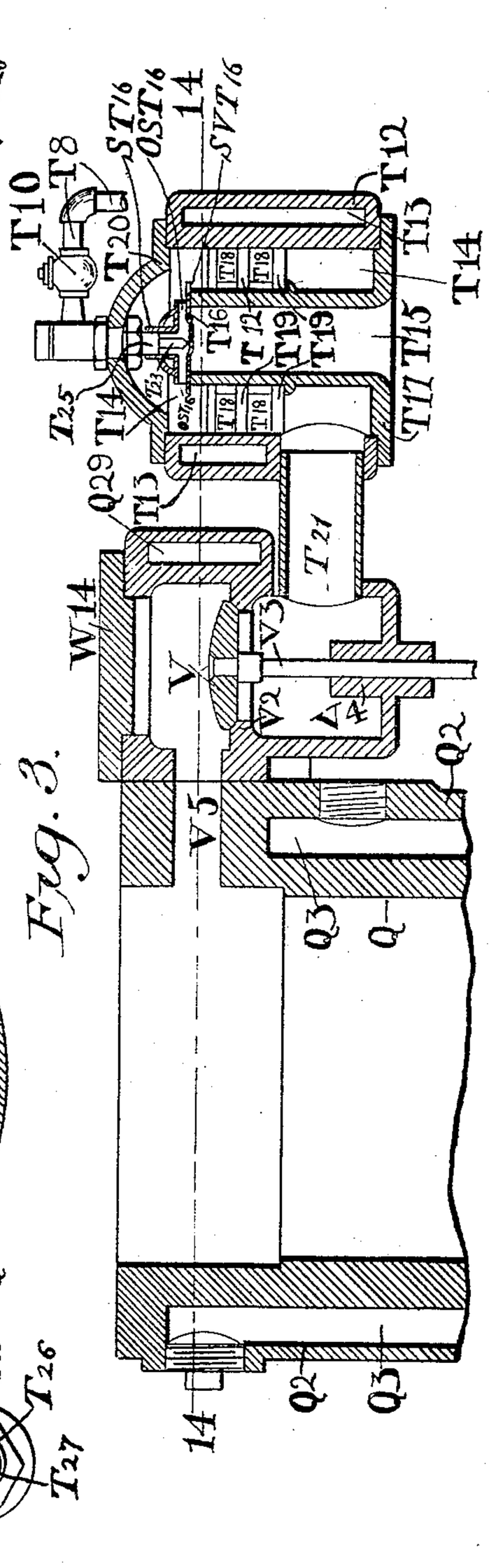
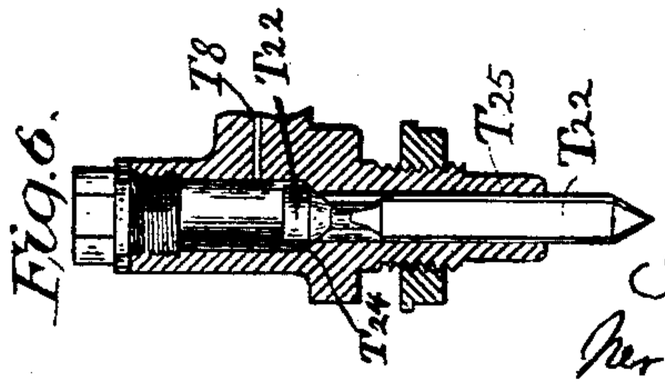


Fig. 5.

Fig. 6.



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UNITED STATES PATENT OFFICE.

BENJAMIN C. VANDUZEN, OF WINTON PLACE, OHIO.

VAPORIZER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 638,529, dated December 5, 1899.

Original application filed September 13, 1894, Serial No. 522,898. Divided July 1, 1898, Serial No. 684,978. Again divided and this application filed December 29, 1898. Serial No. 700,612. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN C. VANDUZEN, a citizen of the United States, and a resident of the town of Winton Place, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Engines, of which the following is a specification.

My improvements relate to that class of engines which are operated by the vapors or gases derived from gasolene, benzin, kerosene, and other oils.

The invention herein set forth is a division of one for which application was filed July 1, 1898, and which bore the serial number 684,978, and the said application Serial No. 684,978 is a division of my application, Serial No. 522,898, filed September 13, 1894, and which after division resulted in Letters Patent No. 609,253, dated August 16, 1898. Due reference is hereby made to the said applications.

The improvements described and claimed herein relate to apparatus used to charge air or gas with vitalized hydrocarbons.

The several features of my invention and the various advantages derived from their use conjointly or otherwise will be apparent from the following description and claims.

In the accompanying drawings, making a part of this application, Figure 1, Sheet 1, is a view, partly in elevation and partly in section, of mechanism embodying my invention. The section is taken in the plane of the dotted line 15, 15^a, and $15^{a'}$ of Fig. 2, that face of the section being shown which faces downward in Sheet 2. Fig. 2, Sheet 2, is a horizontal section of the same mechanism, taken in the plane of the dotted line 14 14 of Fig. 3, the lower face of the section being shown. Fig. 3, Sheet 2, is a vertical section of the same mechanism, taken in the plane of the dotted line 15 15^a 15 15 of Fig. 2, that face of the section being shown which faces toward the bottom of Sheet 2. Fig. 4, Sheet 1, is a top view of a certain portion of the mechanism of my invention. This view, partly by solid and partly by dotted lines, contributes to illustrate certain features of my invention. Fig. 5 is a bottom view of the valve mechanism designed to regulate the flow of hydrocarbon to the carbureter. Fig. 6 is a view in elevation of this valve and stem and of the surrounding case, valve-seat, and valve-stem, such case, seat, and stem being shown in vertical central section. Fig. 7 is an elevation of this valve and stem by themselves and showing an edge of the triangular stem turned toward the spectator. In Fig. 6 a flat side of the valve is turned toward the spectator.

Q indicates the main cylinder of the engine, and Q^{17} the piston-head moving within the cylinder. I envelop the cylinder with a shell or jacket. The space Q^3 between the jacket and the cylinder, as well as the space Q^5 in the cylinder-head Q^4, is kept full of cool water to keep the cylinder cool during the operation of the engine.

Q^{28} indicates a passage connecting the space Q^3 to the space Q^5, Q^{31} a passage connecting space Q^3 with the passage Q^{30}, and Q^{29} a space for the most part surrounding the receiving-valve and also the exhaust-valve, and through which the cool water is supplied to passage Q^{30} and thence to the cylinder. L^4 indicates an overflow-pipe for discharging the water from the water-spaces of the cylinder in order to allow cooler water to enter such spaces. As these water feed and delivery conduits form no part of the present invention, further description of them is omitted, with the remark that they may be varied as desired.

The exhaust passage or port V^6 is duly connected with the discharge-pipe W^{25}, the passage of gas through the same being duly regulated by a suitable valve, preferably one, as shown, consisting of the valve V^8, valve-seat V^7 therefor, and valve-stem V^3, the latter sliding in a suitable guide.

It is to be understood that the engine is duly provided with a piston-rod, means for enabling that rod to transmit power, and means for duly operating the exhaust-valve and the receiving-valve.

The cylinder is duly supplied with carbureted air or gas through the port V^5. The passage of the carbureted air or gas through the latter is regulated by a suitable receiving-valve, preferably one consisting of the valve V, having a seat V^2 and a stem V^3, sliding in a guide V^4. Below the valve-seat V^2 is a space which may be considered as a continuation of the supply-conduit T^{21}. The latter, in

turn, receives its supply of carbureted air or gas from the carbureter. This carbureter constitutes an important feature of the present invention. It is constructed substantially as follows: The carbureter consists of two concentric chambers, (see Fig. 3,) an outer one T^{13} and an inner one T^{14}. In the center of the carbureter is the air-chamber T^{15}, connected at its lower end with the outer air and closed at top by the valve T^{16} when the latter is seated. As features of construction the vertical walls of the chamber T^{15} are in one with the lower head T^{17} of the carbureter. (See Fig. 3.) The valve-seat SVT^{16} of the valve T^{16} is formed upon the upper ends of the walls of the chamber T^{15}, and the valve rises and reseats itself automatically.

In the annular chamber T^{14} of the carbureter are the mixing-spaces T^{18}. These spaces are interconnected by means of interstices in the diaphragms T^{19}. The latter are preferably made of a woven fabric, and of these gauze wire is a very desirable fabric. The space T^{13} is for the reception of the hot air and gases exhausted from the cylinder Q.

The upper head T^{20} of the carbureter rests upon the cylindrical part of the carbureter and is suitably secured thereto.

A conduit T^{8} is present for admitting gasolene to the upper portion of the carbureter-chamber T^{14} above the valve T^{16}. It is provided with a valve T^{10}, by which the flow of gasolene through this conduit may be increased or diminished or altogether stopped, as desired. There is also present a valve T^{22}, which serves to admit a charge of gasolene to the carbureting-chamber T^{14} at every admission of carbureted air or gas to the cylinder Q. This latter valve T^{22} has a stem T^{23}, which rests upon the central portion of the valve T^{16}. It has a seat T^{24} and a guideway T^{25}. The valve T^{22} has a stem T^{23}, which can slide up and down in this guideway T^{25}. The latter also is made to serve as a conduit for the gasolene, as follows: The guide is circular in cross-section. The valve-stem is triangular in cross-section, and the rounded edges T^{26} of it touch loosely the sides of the guideway. The gasolene, when the valve T^{22} is elevated, passes down the guideway past the flat sides of the stem T^{23} through the openings T^{27}. (See Fig. 5.) When the valve T^{22} is seated, the bottom of its stem rests upon the top of the valve T^{16} or is in very close proximity to it. The elevation of the valve T^{16} serves to lift the valve-stem T^{23} and its valve T^{22}, and as the valve T^{16} descends to its seat the valve T^{22} likewise falls until it is seated. Thus the movement of valve T^{16} controls the movement of the valve T^{22}.

While various means for guiding the valve T^{16} may be employed, I utilize the exterior of the guide T^{25} of the valve-stem T^{23} for guiding the valve T^{16}. This is the means I prefer, as it results in a compact structure and one produced at a slight expense. The construction for this purpose consists of the sleeve ST^{16}, fixed at its lower end to the valve-plate T^{16} and sliding on the lower portion of the guide T^{25}, which latter it embraces. Openings OST^{16} through the sleeve from the chamber thereof to its exterior are present to allow the gasolene admitted by valve T^{22} and coming down by the valve-stem to pass out onto the top of the valve T^{16} outside of the sleeve and duly run off, as hereinafter specified.

The operation of the foregoing apparatus is as follows: At a given descent of the piston Q^{17} the suction thereby caused is by the raising of valve V communicated to the carbureter-chamber T^{14} and raises valve T^{16} and allows air to come in and become carbureted, as hereinafter mentioned. This elevation of the valve T^{16} raises the valve T^{22} and admits gasolene from conduit T^{8} to the upper surface of the valve T^{16}. Thence the gasolene runs out over the latter and slowly falls (trickles) from the outer periphery of the valve down upon the gauze T^{19} and thence passes into the upper chamber T^{18} and thence into the next chamber T^{18}. This gasolene is commingled with air drawn in through the space T^{15}, (covered by valve T^{16},) as the latter lifts, and past the valve. After the charge in the main cylinder Q has been exploded and has passed out through the exhaust-port V^{6}, &c., the next depression of the piston Q^{17} creates a vacuum in the cylinder Q, and the valve V being lifted a vacuum is also created in passage T^{21} and in the carbureting-chamber T^{14}. This suction operates to lift the valve T^{16} and draw air from chamber T^{15}—viz., under valve T^{16}—and down through the chambers T^{18} and their gauzes, wet and dripping with gasolene, into the passage T^{21} and through the valve V and port V^{5} into the cylinder Q. Thus the air is thoroughly and rapidly charged with the hydrocarbon vapor and enters the cylinder Q in condition to be used as an explosion to drive down the piston immediately after the latter has risen to the upper point of its stroke and has begun to descend. In this manner the successive charges of hydrocarbon vapor are made and are carried to the cylinder Q.

A valuable feature of my invention is the utilization of the heat of the waste products of combustion, to wit: I connect the exhaust-port behind the valve V^{8} with the jacket-chamber T^{13} of the carbureter, and I locate in the passage-way between the exhaust-valve and the carbureter a valve for regulating the amount of heated exhaust-gas, &c., which shall pass from the cylinder into the carbureter jacket-space T^{13}. Thus W^{19} is a globe-valve connected on one side to the exhaust chamber or port behind the valve and on the other to a conduit W^{20}, and the latter is continued in a conduit W^{21} to the jacket-chamber T^{13}, (around the carbureting-chamber T^{14}.)

As the piston Q^{17} reaches the lower end of its stroke the exhaust-valve V^{8} opens and allows the burned products of combustion to leave the cylinder. A portion of the products

of combustion passes immediately through the globe-valve W^{19} (when open) and thence, by way of passage W^{21}, into the jacket T^{13} around the carbureter, thus enabling the hot waste products of combustion to keep the carbureter warm. This disposition of the heat of all or a sufficient portion of the products of combustion is a very great advantage. Great difficulty has been experienced in keeping the temperature of the carbureter sufficiently high for working purposes in cold climates and in cold weather. Escape-steam or heated air from other sources has often had to be produced to keep the carbureter warm, and in many instances such production has been expensive, especially where steam or heated air had to be produced for the specific object of warming the carbureter.

By my disposition of the heat of the waste products of combustion I am enabled to economize heat and to at all times, when necessary, keep the carbureter at a temperature sufficiently high to insure its perfect operation. The waste products of combustion after surrounding the carbureter issue from the jacket-chamber T^{13} through a suitable opening or conduit W^{23} into the open air. When desired, an exhaust-pipe may connect with conduit W^{23} and carry the waste products of combustion to another point and may there, if desired, discharge them into the open air. Those portions of the products of combustion which do not pass out of the exhaust-chamber (behind the exhaust-valve) pass through the exit W^{25}, and are thence preferably carried to a muffler. This may be of any well-known form, the form shown consisting of the cylindrical casing W^{12}, made in two sections and held together by the hinge parts W^{16} and W^{17}, thus allowing free access to the interior arrangements of the muffling medium. The exhaust from the cylinder enters at the bottom from the pipe W^{25} and escapes through an opening in the top W^{29}; but any form of muffler may be selected at will, as it forms no part of my present invention.

As a feature of construction the upper head or top T^{20} of the carbureter is removable, and the valve-chamber of valve T^{22} is connected thereto.

As heretofore remarked, the lower head or bottom T^{17} of the carbureter is preferably in one with the wall or walls of the central chamber T^{15}. Such a construction increases the simplicity and economy of construction and enables the parts of the carbureter to be more readily and quickly put together or separated. When the bottom and chamber T^{15} are removed, the lift-valve can be brought away with them.

What I claim as new and of my invention, and desire to secure by Letters Patent, is—

1. In a gas-engine, a carbureter, having a removable top T^{20} and a conduit and valve connected therewith, and the cylindrical body, forming chamber T^{14}, and a removable bottom T^{17}, and a central air-chamber T^{15}, and a lift-valve thereon, this central chamber being in one with the bottom T^{17}, this bottom, central chamber and lift-valve being removable together, substantially as and for the purposes specified.

2. In a gas-engine, the combination of a carbureter provided with a central air-inlet and a removable top, a tube for supplying oil passing through said top, an oil-valve located in said tube and extending through the end thereof into the top of the carbureter, and a hollow air-valve surrounding said oil-valve and the end of said tube and guided thereby, said valve being provided with lateral openings and seated on the upper end of the central air-inlet of the carbureter, substantially as described.

3. In a gas-engine, the combination of a carbureter composed of a triple cylindrical casing, forming three passages, the central one for the air-inlet, the middle one acting as a carbureter-chamber, and the outer one as a heating-chamber, said middle chamber being provided with wire-gauze to thoroughly mix the air and the oil, a removable top for said carbureter, an oil-supply tube passing through said top, an oil-valve located in said tube and extending through the end thereof into the carbureter, and an air-valve, circular in form and seated on the upper end of the central air-inlet of the carbureter, said valve being provided with lateral openings and with a central upwardly-extending tubular extension adapted to fit around the oil-supply tube and be guided thereby, substantially as described.

BENJAMIN C. VANDUZEN.

Attest:
EDWARD S. LEAVITT,
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