(No Model.) 4 Sheets—Sheet 1.

L. H. NASH.

IGNITOR FOR GAS ENGINES.

No. 418,419. Patented Dec. 31, 1889.

Fig. 1.

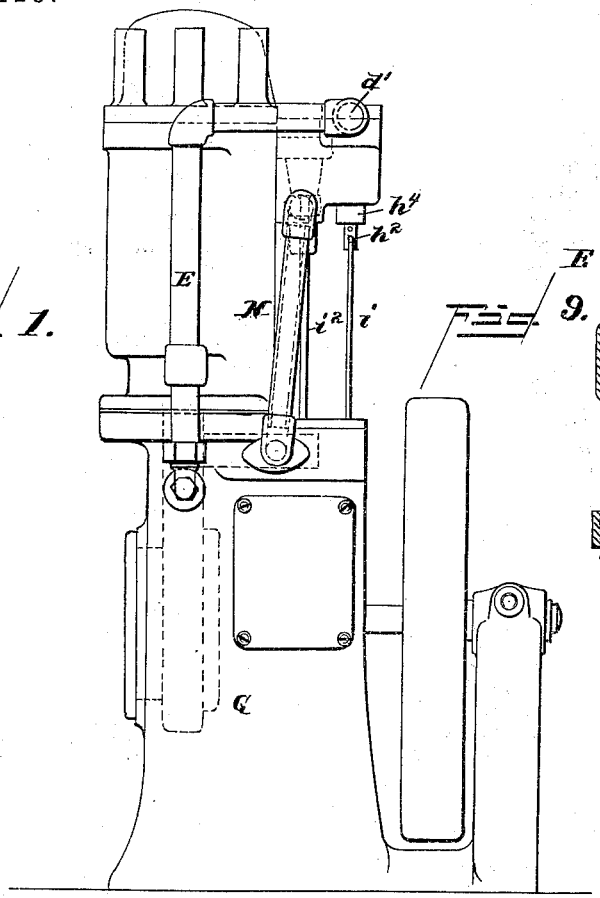


Fig. 2.

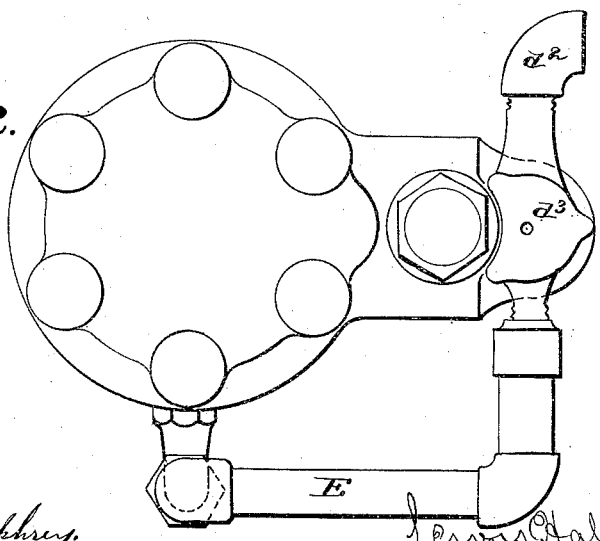
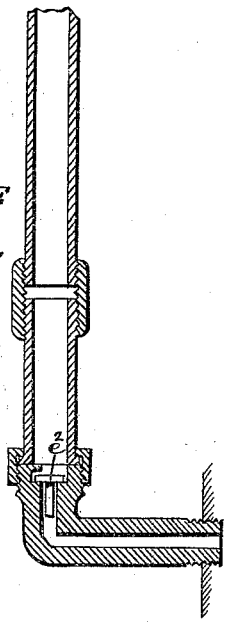


Fig. 3.



Witnesses
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(No Model.) 4 Sheets—Sheet 2.

L. H. NASH.

IGNITOR FOR GAS ENGINES.

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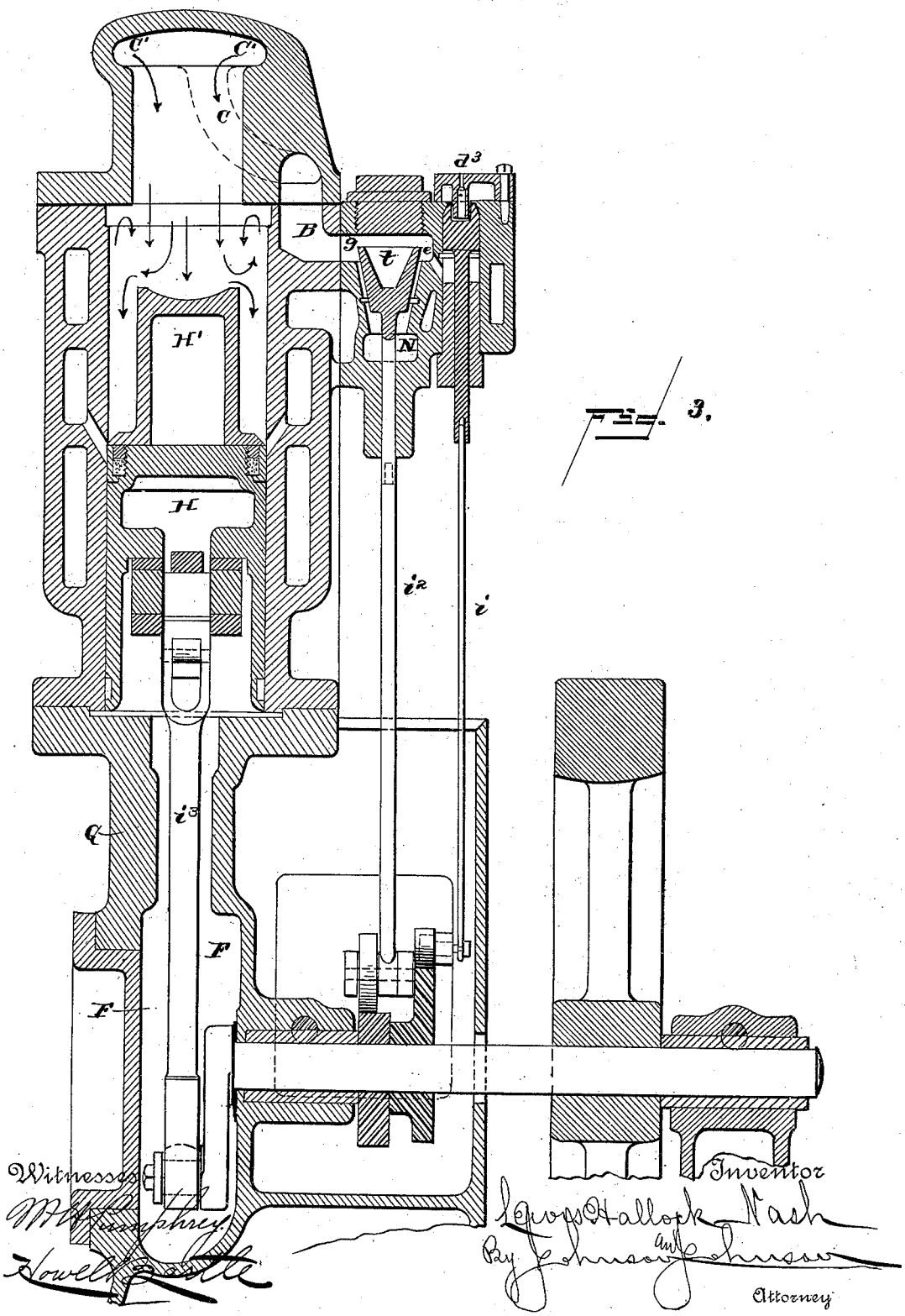

Fig. 3.

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(No Model.) 4 Sheets—Sheet 3.

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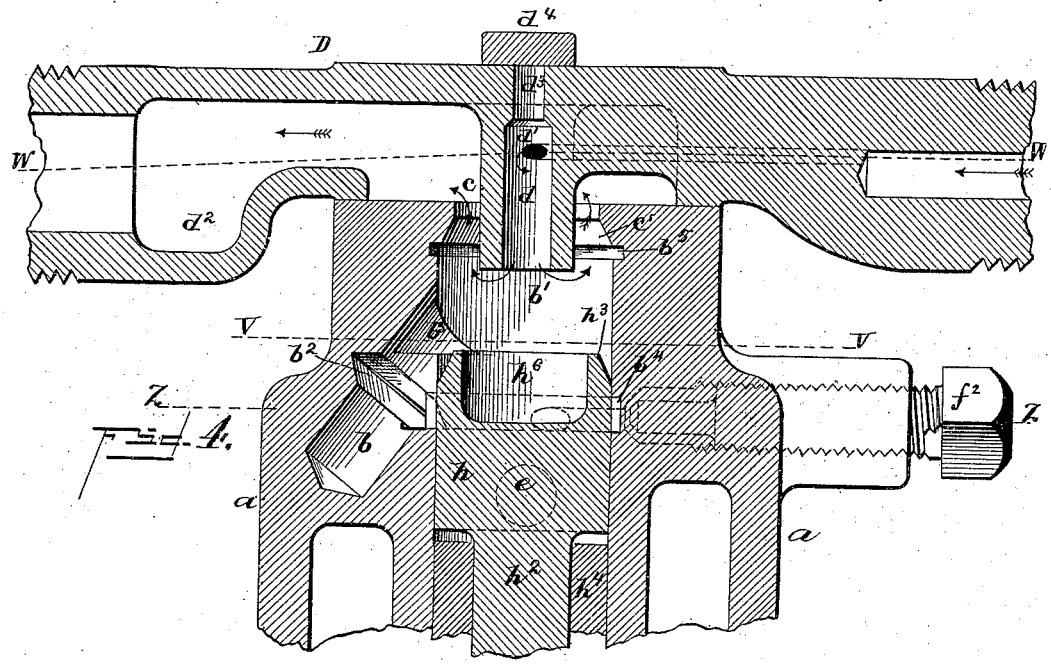

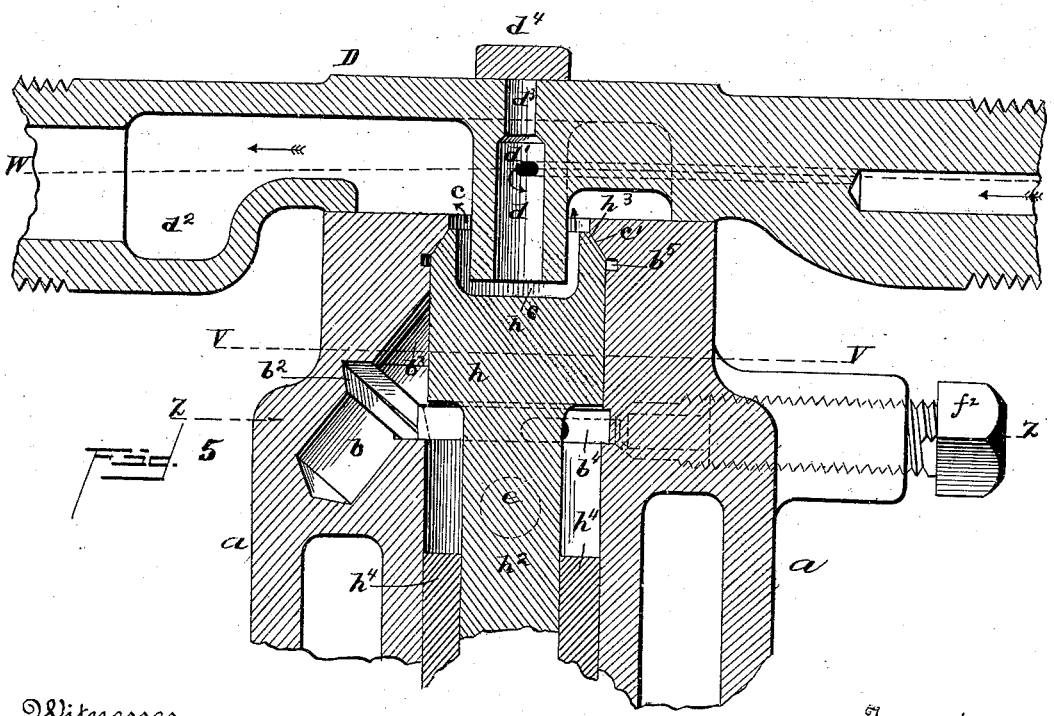

Witnesses
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(No Model.) 4 Sheets—Sheet 4.

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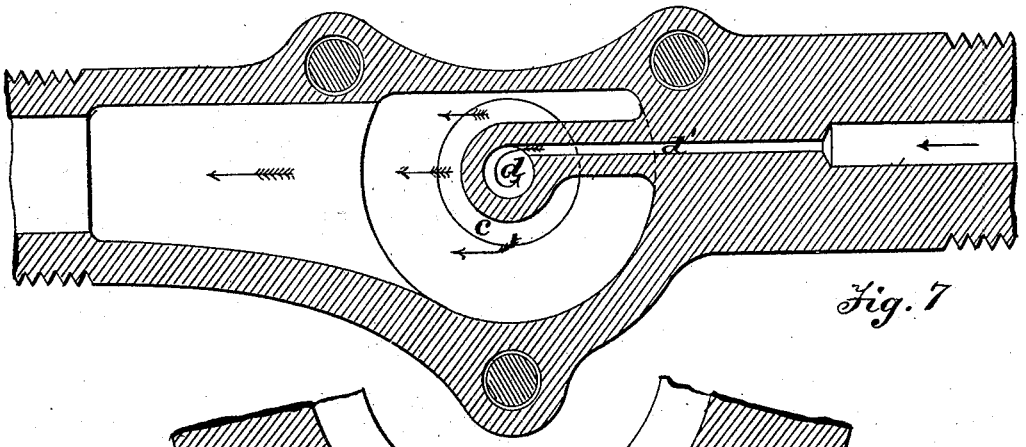


Fig. 7

Fig. 8.

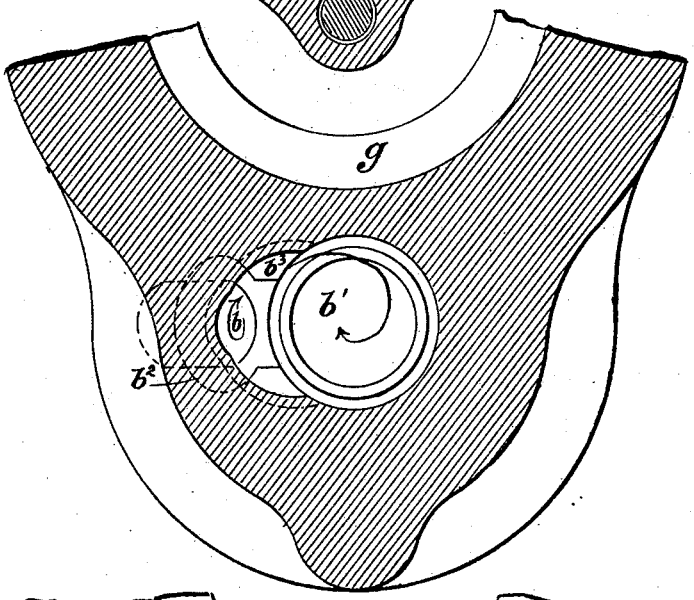
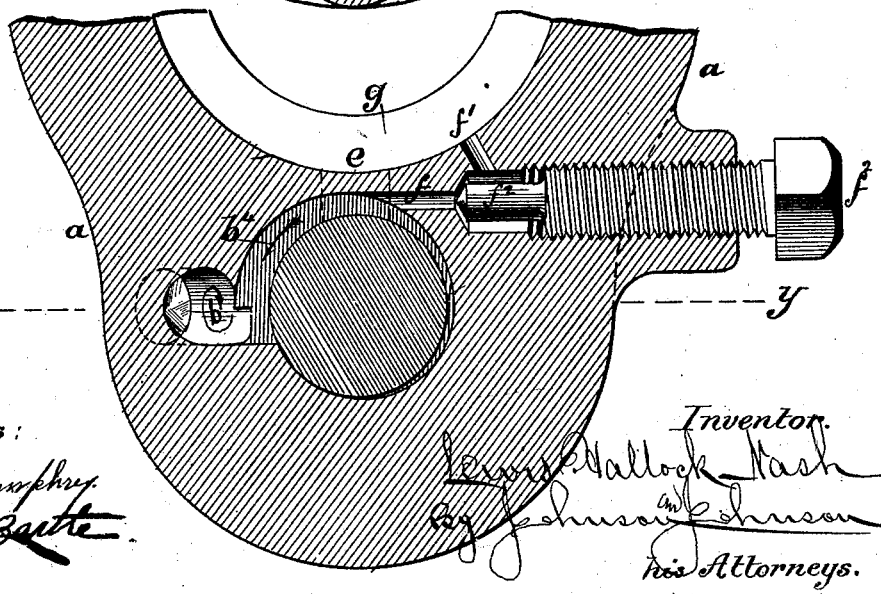


Fig. 6



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UNITED STATES PATENT OFFICE.

LEWIS HALLOCK NASH, OF SOUTH NORWALK, CONNECTICUT, ASSIGNOR TO THE NATIONAL METER COMPANY, OF NEW YORK, N. Y.

IGNITOR FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 418,419, dated December 31, 1889.

Application filed June 29, 1888. Serial No. 278,510. (No model.)

To all whom it may concern:

Be it known that I, LEWIS HALLOCK NASH, a citizen of the United States, residing at South Norwalk, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Ignitors for Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention consists of certain novel parts and combinations of parts constituting improvements in ignitors for gas-engines and their attendant devices.

The specific points of novelty will be designated in the claims concluding this specification.

The following is a description of the accompanying drawings, in which are illustrated a gas-engine having applied thereto an ignitor device, showing one form in which my several present improvements in combination may be embodied in operative and effective form.

Figure 1 illustrates a gas-engine in elevation with my several improvements applied thereto. Fig. 2 is a top view of the same. Fig. 3 is a vertical section of said engine. Fig. 4 represents my improved ignitor device in vertical central section enlarged and taken at right angles to the section in Fig. 3, showing the valve open. Fig. 5 is a similar view showing the valve closed. Fig. 6 is a horizontal section taken on the line Z of Fig. 4, showing the communication of the ignition-chamber with the passage leading to the engine-cylinder. Fig. 7 is a horizontal section taken on the line W of Fig. 4, showing the supply-passage for the permanent lighter-chamber. Fig. 8 is a horizontal section taken on the line V of Fig. 4, showing the enlarged open end of the ignition-chamber; and Fig. 9, Sheet 1, shows the valved communication of the pipe which also forms the storage-reservoir E for the permanent lighter-chamber.

h is a combined slide and puppet valve for controlling the ports of the ignitor device arranged to operate within a chamber b' of a case a. Said chamber opens at c at its top, and the permanent lighter device d is in communication with the ignitor-chamber when the valve is in the position illustrated in Fig. 4, but is isolated therefrom when the valve is in the position shown in Fig. 5. The ignition-chamber b is formed within the valve-case, so as to open at one side of the valve-chamber, and is shown inclining downward and outward from said valve-chamber.

The valve h is of cylindrical form and has a stem h^2 fitted in a bushing h^4. The upper end of the valve has a conical bearing h^3, and the wall of the valve-chamber at its top opening has corresponding seat-forming surface c', with which the valve makes contact when closed, as shown in Fig. 5. The valve-chamber opens into a top passage d^2 of the case, through which the waste products escape to a pipe leading away from the engine, so that there is no smell from the engine. The valve-chamber communicates with the power-cylinder through the passage e. (Shown in Figs. 3 and 6.) This passage is closed by the valve h when in the position illustrated in Fig. 4, and is open when the valve is in the position shown in Fig. 5. By this construction the puppet-valve has the function of a plunger-valve and without sliding friction, since at the time the valve is closing the passage to the cylinder the pressure therein is low, and the gases that may leak by said valve will be from the charge and may be utilized as a portion of the supply for the ignition-chamber, as I will presently state. When the valve closes upon its seat c', a perfect joint is effected at the moment of the ignition of the charge through the passage e, and the pressure within the valve-chamber below the valve acts to press it upon its seat. The ignition-chamber is cylindrical and has a circumferential groove b^2 below its open end.

b^4 is a groove in the valve-chamber which opens into the ignition-chamber. The other end of this chamber-groove opens into a passage f, which, by a lateral passage f', communicates with the supply-passage g for the cylinder, whereby the ignition-chamber is supplied with a stream of combustible mixture from the charge directed with a whirling motion into said chamber. A screw-plug f^2 controls the flow into this passage f, as may be desired. Into the passage b^4 the gases that leak past the valve will collect and pass into

the ignition-chamber, for the purpose stated.

In order that the ignition-chamber may intersect the valve-chamber without sharp corners, I have shown a recess or groove b^3 partially around such intersection, so as to give an easy passage for the gases and flame into and from the ignition-chamber, as seen in Figs. 4 and 8. At the base of the valve-seat c', I have shown an annular groove b^5, for collecting particles of dirt and dust that may come into the chamber with the gas.

I have shown in Figs. 4, 5, and 7 one form of device capable of sustaining a torch-flame or permanent lighter, and I prefer to use a portion of the charge as a means for maintaining such lighter, and while I prefer to use a whirling jet for such supply as being a reliable form of torch-jet, yet my invention of course is not confined to the particulars of construction of the device shown.

I will now describe the construction of the permanent lighter illustrated in the drawings.

d is the lighter-chamber, closed at its top by a removable or pivoted cap d^4 and open at its lower end in all portions of the valve h. Within this chamber a flame constantly burns. This chamber is intersected by a passage d', through which the gaseous mixture is supplied and directed into the chamber d, preferably in a whirling flame, the waste products passing out through the valve-seat port c, as shown by the arrows. As a means of maintaining a constant supply of gas under pressure for this inclosed lighter or torch flame, I have shown a reservoir E, Fig. 1, which has a valved communication with a compression chamber or reservoir which supplies the engine. The device is shown as applied to an engine of the type described and claimed in applications filed by me October 6, 1886, under Serial Nos. 215,419 and 215,420, in which the compression-chamber is in free communication with the gas-supplying reservoir. The pressure in the latter is therefore intermittent. The supplemental reservoir provided with the check-valve e^2, Fig. 9, has the function of supplying the permanent lighter with a supply of gas under approximately uniform pressure. The relation of the valve-chamber, the ignition-chamber, and the torch-flame chamber is such as to ignite the charge with absolute certainty and prevent the entrance of dust to the valves and the escape of bad odors from the engine.

The following is the operation of the ignitor device described: The valve h being in the position shown in Fig. 4, the gases will flow through the passage b^4 into and through the ignition-chamber with a spiral or whirling motion and are ignited by the permanent flame in the lighter d. They remain burning in the ignitor-chamber while the valve is moving to the position shown in Fig. 5. The gases from the cylinder-charge will then flow into the valve-chamber below the valve, and, reenforcing the flow in the passage b^4, pass with it into the ignition-chamber, whirling and burning therein until the valve seats itself, when the flame will flash back to the charge in the cylinder through the port e, igniting the charge. For this purpose the port e is in direct communication with the combustion-cylinder. The valve t controls the admission of the charge to the power-cylinder. It is of the puppet form, to form a perfect joint and sustain the back-pressure from the cylinder. When such form of valve is used, the gas-supply pipe M will enter a chamber N below the valve-seat, while the upper end of said seat will open into the passage g, which communicates with the combustion-chamber.

In Fig. 3 I have shown the operating connections of the crank-shaft with the ignitor-valve by the rod i, with the charge-admission valve by the rod i^2, and with the piston by the rod i^3, and the strokes of these parts are adjusted for the proper operation of the engine.

Referring to the gas-supplying reservoir of the engine shown and the compressor therefor, which are more fully described in my said applications, it will be understood, referring to Fig. 3, that the forward end of the power-cylinder opens into a casing G of the frame, which forms the compression supply-chamber F for the engine of which the piston is the compressor. Suitable provision is made for supplying this reservoir with a mixture of gas and air, which is supplied to the engine-valve by a pipe M, which opens into the reservoir F and into a chamber N below the valve, as shown by dotted lines in Fig. 1. The pipe E also opens into this reservoir and leads to the passage d', Fig. 7, which supplies the permanent lighter. Now, as the supply for the permanent lighter must be constant, and as the operation of the piston in the engine shown subjects the gases in the reservoir to pressure and suction alternately, it is obvious that such a condition could not give a constant supply of gas to the ignitor. Therefore I have shown a supplemental reservoir (the pipe E) provided with the valve e^2, placed therein, so that the action of the compressor fills the pipe E, while the valve therein closes by the sucking action of the compressor. In this way the reservoir for the ignitor is supplied by the operation of the engine, so as to insure a constant supply to the ignitor.

The use of the permanent lighter shown is not dependent upon using the engine-piston as the compressor, as I may use an independent compressor for supplying both the engine and the ignitor.

The supply for the permanent lighter is illustrated in the drawings entering the passage d' and impinging upon one side of the cylindrical wall of the inclosed chamber d. It is caused thereby to rotate therein, passing out its open end into the valve-chamber, while the supply for the ignition-chamber is also shown as entering tangentially and caused thereby to rotate therein, passing out its open end into the valve-chamber, so that the flow of gases from both the ignition and

the lighting chambers meet in whirling currents of similar direction or otherwise within the valve-chamber at the time the latter is open.

An important feature of my invention resides in the permanent-lighter device. I have described and shown an efficient means for maintaining a permanent whirling or eddying flame; but other equivalent means may of course be substituted for that shown and described without departing from the spirit of my invention.

Among the advantages of a permanent lighter such as described, which is one of the prominent features of my present invention, it will be seen that dust and dirt may thus be excluded from the working parts, that the combustible mixture may be burned in a closed chamber without the addition of atmospheric air, and that it may be supplied under a pressure great enough to prevent the flame being extinguished by drafts, and that it is more permanent and reliable than ordinary lighters. Besides, such lighter is almost absolutely free from objectionable odors.

Having described, in connection with the accompanying drawings, an engine embodying in substance all the features of my present invention in operation and in the preferred form and in combination, I will now proceed to specifically designate the novel features which I desire to protect by these Letters Patent. Before doing so I desire, however, to remark that my invention is not limited to the precise devices and combinations of devices shown and described, since many modifications may be made without departing from either the spirit or scope of my invention, and my several improvements may be used separately as well as in combination.

I claim—

1. In a permanent lighter for gas-engines, a suitable device, substantially as described and shown, by means of which a permanent whirling flame for igniting the combustible charge is produced.

2. In a gas-engine, a suitable device, substantially as described and shown, by means of which a permanent whirling flame for igniting the combustible charge is produced, combined with a chamber inclosing said flame.

3. In a gas-engine, a compression-chamber, a reservoir constantly in free communication therewith, and a reservoir in valved communication therewith, combined with a lighter supplied from the combustible charge contained in said valved reservoir, substantially as described.

4. In an ignitor device, the combination of a valve-chamber with a communicating ignition-chamber having an inclined relation to said valve-chamber, and a puppet-valve controlling the communication of said ignition-chamber with a permanent lighter and with the cylinder-charge, substantially as described.

5. In an ignitor device, the combination of a valve-chamber and an ignition-chamber with a suitable device, substantially as described, by means of which a permanent whirling flame for igniting the combustible charge is maintained within said ignition-chamber, said ignition-chamber being formed in the casing opening into the side of said valve-chamber, with a puppet-valve controlling the supply and exhaust ports of the valve-chamber and the said ignition-chamber.

6. The combination, in an ignitor device for gas-engines of a valve-chamber with an ignition-chamber formed in the valve-casing opening into said valve-chamber and having one or more circumferential grooves, and a valve controlling the supply and exhaust ports of both chambers, substantially as described.

7. In an ignitor device for gas-engines, the combination, with a valve for operating said device, of a valve-casing having a valve-chamber open at one end, a permanent-lighter chamber open at one end, and an ignition-chamber open at one end, the said chambers intersecting, substantially as described, for the purpose specified.

8. In combination, in an ignitor device for gas-engines, a valve-casing having a valve-chamber open at its upper end, an ignition-chamber opening into said valve-chamber at its side and a permanent-lighter chamber opening into the top of said valve-chamber, and a valve adapted to operate to close said valve and ignition chambers, substantially as described.

9. In an ignitor device for gas-engines, a chamber containing a combustible charge, a suitable device, substantially as shown, by means of which a permanent whirling flame for igniting the combustible charge is produced, and a suitable device, substantially as described, by means of which an intermittent whirling flame for igniting the combustible charge is produced, said flame being in separate chambers, and combined with a valve for periodically opening communication between the chamber containing the intermittent lighter, the chamber containing the permanent lighter, and the charge.

10. In an ignitor device for gas-engines, a valve-containing casing having a permanent-lighter chamber opening into the valve-chamber and having a tangential passage communicating with a source of supply, substantially as described, for the purpose specified.

11. In an ignition device for gas-engines, a chamber containing a valve-containing casing having an ignition-chamber provided with a tangential passage leading into the cylinder supply-passage, and a permanent-lighter chamber having a tangential passage leading to a constant source of supply, substantially as described.

12. In an ignitor device for gas-engines, a valve-containing casing having three intersecting chambers *b*, *b'*, and *d*, the chambers *b*

and d opening into the chamber b', combined with a valve adapted to control the chambers b and b' and the passage e, as herein set forth.

13. In an ignitor device for gas-engines, a valve-containing casing having three intersecting chambers b, b', and d, the chamber b opening into the side of the chamber b', and the case part forming the chamber d extending into the open end of the chamber b', combined with a valve adapted to telescope with the said chamber forming case part d in closing the chambers b and d, substantially as described, for the purpose specified.

14. In an ignitor device for gas-engines, a valve-containing casing having three intersecting chambers—a valve-chamber, an ignition-chamber, and a permanent-lighter chamber—the chamber d having a tangential supply-passage d', and the chamber b having a tangential side opening intersecting a semicircular passage b^4, having a tangential branch leading to the cylinder supply-passage, as herein set forth.

15. In an ignitor device for gas-engines, a valve-containing casing having three intersecting chambers, an inclosed permanent-lighter chamber provided with a passage adapted to direct the supply of gas and flame in a whirling course therein, an ignition-chamber having a passage adapted to direct the supply of gas and flame therein in a whirling direction, and a valve-chamber within which the whirling flame-currents meet, combined with a valve for operating the ignitor, substantially as described.

16. In an ignition device for gas-engines, a permanent-lighter device consisting of a hollow cylinder having a tangential supply-passage and opening into the valve-chamber, whereby under the pressure of the inflow of gas the flame is projected from said permanent lighter as the means of lighting the charge, substantially as described.

17. In an ignitor device for gas-engines, a valve-containing casing having an ignition-chamber in perpetual communication with the supply-passage for the engine, in combination with a case part forming an inclosed permanent-lighter chamber having a constant supply entering said chamber tangentially, substantially as described.

18. In an ignitor device for gas-engines, a valve-containing casing having an ignition-chamber intersecting the valve-chamber at an angle at one side of the latter and having the angle of such junction recessed or cut away, for the purpose stated.

19. In an ignitor device for gas-engines, the valve-casing having the valve-chamber b', opening into a top exhaust-passage d^2, an ignition-chamber b, opening into the side of the valve-chamber, and having a hollow cylinder depending from the top of the casing into the said valve-chamber and having suitable supply-passages for said chambers, in combination with a valve adapted to operate the ports of said chambers, substantially as described.

20. In an ignitor device for gas-engines, a permanent lighter consisting of a hollow cylinder having a tangential supply-passage, said cylinder arranged to open into the valve-chamber which is in communication with the outer air, substantially as described.

21. The combination, in an ignitor device for gas-engines, of a compressor for the gaseous mixture and a reservoir in valved communication therewith, with a valve-containing casing having an ignition-chamber and a permanent-lighter chamber which is in communication with said reservoir, substantially as described.

22. A permanent ignitor for gas-engines, consisting of an inclosed chamber having a tangential inlet and a lighting-passage closed by a removable cap, substantially as described.

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

LEWIS HALLOCK NASH.

Witnesses:
JNO. H. NORRIS,
PERCY MACCALLUM.