(No Model.)

L. H. NASH.

IGNITOR FOR GAS ENGINES.

No. 386,212. Patented July 17, 1888.

Fig. 1.

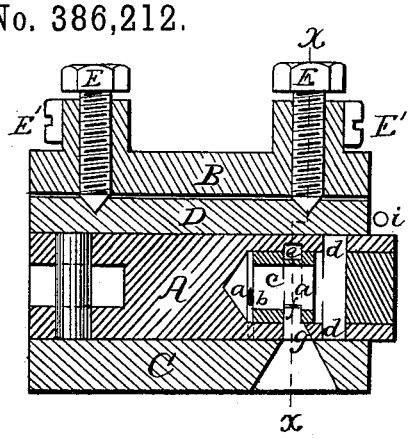


Fig. 2.

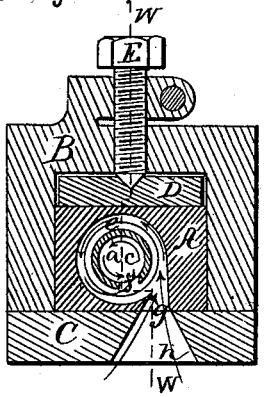


Fig. 3.

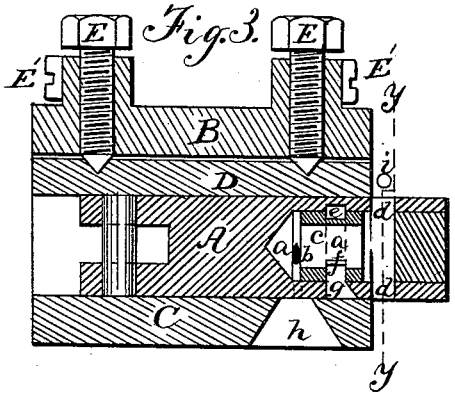


Fig. 4.

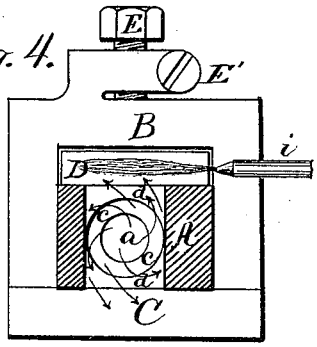


Fig. 5.

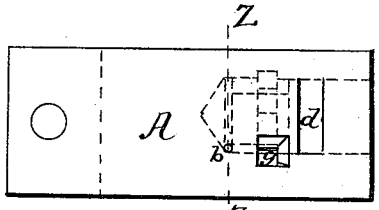


Fig. 6.

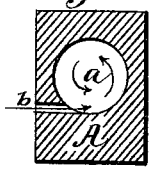


Fig. 7.

Fig. 8.

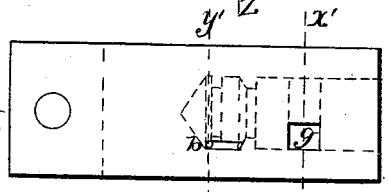


Fig. 10.

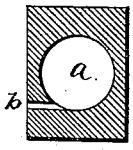


Fig. 11.

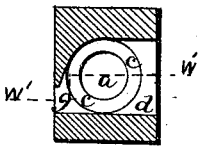
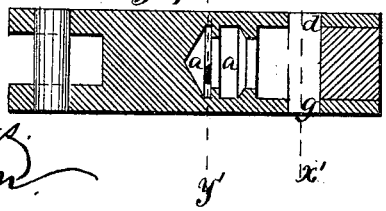


Fig. 9.



Witnesses:
A. B. Rawlings.
L. Bacon.

Inventor:
Lewis Hallock Nash,
by Johnson & Johnson.
Attys.

UNITED STATES PATENT OFFICE.

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

IGNITOR FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 386,212, dated July 17, 1888.

Application filed January 20, 1886. Renewed June 21, 1887. Serial No. 242,064. (No model.)

To all whom it may concern:

Be it known that I, LEWIS HALLOCK NASH, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Ignitors for Gas-Engines, of which the following is a specification.

I have produced an improved ignitor device for gas-engines, my improvements being directed to particulars of construction and combination, whereby to avoid the binding of the ignitor slide or valve upon its seat by reason of its expansion within the ignitor-case from the heat generated by the ignitor-flame, and to provide for a certain and steady flame for the igniting device, whereby the charge is ignited with regularity and precision.

My invention embraces provision whereby the ignitor slide or valve inclosing-case has a greater rate of expansion than the ignitor slide or valve to maintain a free movement of the slide or valve, and my invention embraces a construction and combination of ignition-chamber and ignition-port which operates to direct the inflowing gases in a whirling movement within said chamber to render it certain to maintain the flame to ignite the charge.

In an application for a patent filed by me July 14, 1887, under Serial No. 244,262, I have shown, described, and claimed a supply-valve and ignitor for gas-engines, wherein a circular ignition-chamber has a supply-passage opening tangentially into said chamber, so that the gaseous mixture rotates in a rapidly-whirling flame-jet which cannot be extinguished easily. The construction of the ignitor in my said application is such that the circular-jet chamber is arranged with its axis perpendicular to the face of the valve-port which communicates with the charge in the power-cylinder. An important change which I have made in such construction is arranging such ignition-chamber so that when the ignition-port opens communication with the cylinder in the operation of the valve-port the gases will flow into and whirl about the ignition-chamber, and burn therein with a whirling flame until the ignitor-port is opened wide enough by the movement of the slide or valve to ignite the cylinder-charge under all constructions in the working of the engine or velocity of the flowing gases.

An ignitor device constructed to accomplish the foregoing objects is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section taken on the line *w w* of Fig. 2, which is a cross-section of the same taken on the line *x x* of Fig. 1. In these views the ignitor-slide ports are shown closed with the external lighter and the ignition-chamber in communication with the charge-igniting port. Fig. 3 is a view like that of Fig. 1, but showing the slide ignition-ports open to the external lighter-jet. Fig. 4 is a cross-section on the line *y y* of Fig. 3. Fig. 5 shows the ignitor-slide from the under side, and Fig. 6 a cross-section on the line *z z* of Fig. 5. Fig. 7 shows in side view the bushing within which the slide ignition-chamber is formed. Figs. 8, 9, 10, and 11 show the ignition-valve in different views, having a modified form of ignition-chamber.

I have shown the igniting device as being independent of the engine-valve; but it may be combined with any form of supply-valve. As an independent device, the ignitor-slide A is fitted upon a seat, C, of a case, B, open at both ends, upon which seat the slide is closely held by a bearing-piece, D, which is adjusted as required by screws E E, which are locked when adjusted by binding-screws E'.

As shown, the adjusting-screws are socketed in the bearing-piece D, to hold the latter from endwise movement, and the binding-screws act to clamp split arms of the case upon the adjusting-screws. The ports of the ignitor-slide operate ports in the case-seat which communicate with the combustion-chamber of the engine.

As the heat from the ignitor-flame will heat the slide and its case, I provide against the binding of the slide by making it of a metal having a less co-efficient of expansion than the case, as for instance, a steel slide and a brass case. This construction causes both parts to expand together; but since the slide will be hotter than the case it is necessary that the latter should be made of metal having a greater expansibility than the slide, in order that the case shall expand as fast as the slide; and since the case will lose its heat by conduction and radiation it will always be somewhat cooler than the slide. By thus making

the slide and case of metals having different rates of expansion I provide an ignitor-slide free from binding and avoid the necessity of using springs to hold the slide upon its seat.

The ignitor proper consists of a chamber, *a*, preferably of circular form, and preferably arranged with its axis at right angles with the supply-port, and having a supply-passage, *b*, which enters it in such manner as to cause the gases to whirl about said chamber, and communicates with lighter-ports *d*, through which the jet is lighted by the external lighter-jet, *i*, when the slide is in the position shown in Figs. 3 and 4. This chamber may be formed in the casing of the slide and its ports operated by the engine-valve; but, as shown, it is formed within a slide by a hollow ring-bushing, *c*, having a circumferential ignition-port, *f*, as seen in Fig. 7. This ignition-chamber forming bushing is fitted in the slide so as to cover a circular passage, *e*, therein, which communicates with the ignition-chamber by its port *f*, and with the cylinder combustion-chamber by the case-port *h* and slide-port *g*, when the valve is in the position shown in Figs. 1 and 2, to give a free flow of the combustible mixture from the cylinder into the ignition-chamber to supply the ignitor and light the charge. The external lighter, *i*, is placed at the end of the case, so as to project its jet-flame across one end of lighter-port, which extends through the slide and opens at *d d* at each side thereof, so as to form an opening in direct communication with that end of the ignition-chamber next to the said lighter-port. The other end of the ignition-chamber communicates with the supply-passage *b*, which is formed in the slide so as to open in its seat-face by the side of the port *g* and into the ignition-chamber tangentially, as stated, as in Figs. 5 and 6. The ignition-port *g* is formed in the seat-face of the slide and opens into the annular passage *e* at one side, so as to direct the gas-supply tangentially into the said passage and to cause it to whirl, as shown by the arrows, so as to pass from said passage through the port *f* into the chamber *a* in a manner to cause the gas-supply to continue its whirling course therein and into the communicating lighter-space, as shown in Figs. 2 and 4. By this construction the supply for the ignitor from the cylinder is caused to travel in circular lines within the ignition-chamber to the open air at the outside lighter-jet, while the supply for igniting the charge in the cylinder is caused to travel first in circular lines around the outside of the ignition-chamber and then in circular lines within its closure, flashing the flame instantly into the cylinder for the combustion of the charge. For this purpose I prefer to have the ports *g* and *f* in such relation and rear proximity that the supply entering the port *g* will complete its course in the annular passage *e* before entering its tangential course in the chamber *a*, as shown in Fig. 2. The object of this relative arrangement of the ports of the supply-passage and ignition-chamber is to cause the inflow of the supply into the ignition-chamber when closed, as in Figs. 1 and 2, in such manner as to prevent all danger of extinguishing the flame carried in the chamber *a* from the external lighter when the said chamber is closed with the external lighter; and to accomplish this result it is not necessary that the ignition-chamber should be perfectly circular or that it should be formed within a bushing, or that the supply should be actually tangential, but only that the gases shall flow into it, so that they will pass around it in contact with its walls and thereby give the gases a rotary course within said chamber of flame so as not to put it out.

Figs. 8, 9, 10, and 11 represent a modified form of chamber, the ignition-chamber being without the bushing above described. Fig. 8 is a bottom view of the igniter-slide; Fig. 9, a horizontal section thereof on the line *w' w'* of Fig. 11; Fig. 10, a cross-section on the line *y' y'* of Fig. 8, and Fig. 11 a cross-section on the line *x' x'* of Fig. 8. In this modification the gases enter the ignition-chamber directly through the supply-port *g*, and in a quick-moving valve it is not necessary to prolong the flow of the gases through said port. This construction is best adapted for a quick-moving valve, and the entrance of the port *b* is made oblong.

Referring to Figs. 3 and 4, the ignitor supply-passage *b* is in position to receive the combustible mixture from the cylinder by the case-port *h*, and after whirling around in the chamber *a* they pass out of the ports *d d*, are ignited by the lighter, and the flame is flashed back into the said chamber and burns therein with a revolving jet. The slide then moves into the position seen in Figs. 1 and 2, closing the exterior ports, *d*, and opening communication between the ports *g* and *h*, so that the gases from the cylinder rush into and around the annular passage *e* with great velocity and pass through the port *f* into the ignition-chamber, wherein they burn with a rapidly-rotating flame. On account of their great velocity the gases in chamber *e* are not ignited at this instant; but as soon as the ignition-chamber *a* is filled the flow of the gases through the port *g* ceases, and the flame is communicated through the port *f* to the passage *e*, and thence through the port *g*, which is now open sufficiently, to the passage *h*, igniting the charge.

The object of the bushing having the small port *f* formed therein is to retard the lighting of the gases in the passage *e* until the port *g* has opened the port *h* wide enough for the flame to be communicated through them to the charge.

My invention is not limited to the precise construction and combination of devices shown, as equivalent devices and combinations of devices may be employed without departing from the spirit or scope of my invention.

Certain features of invention described or shown, but not claimed in this application, are covered by pending applications.

I claim—

1. An ignitor for gas-engines having an ignition-chamber provided with a jet-supply passage conveying the gases in a tangential whirl within said chamber, and having an ignition-port formed at one side of the ignition-chamber to direct the inflowing gases in a whirling movement within said chamber, substantially as described, for the purpose specified.

2. An ignitor for gas-engines having an ignition-chamber, *a*, provided with a tangential supply-passage, *b*, an exterior ignition-port, *d*, and a tangential port, *g*, having the relation and operating substantially as described, for the purpose specified.

3. The combination, in an ignitor for gas-engines, of the ignition-chamber *a*, having a tangential jet-passage, *b*, and an exterior ignition port, *d*, with an annular passage, *e*, encircling said ignition-chamber, and a tangential port entering said annular passage in communication with the combustion-chamber of the engine.

4. An ignitor device for gas-engines, consisting of a case having a port, *h*, communicating with the cylinder, a permanent external lighter, *i*, and a slide having an ignition-chamber, *a*, the tangential jet-passage *b*, and the tangential charge-ignition passage *g*, substantially as described.

5. The combination, in an ignitor for gas-engines, of a case having the port *h* and the external lighter, *i*, with the slide A, having an interior chamber forming ring-bushing *c*, having the port *f*, and forming a cover for an annular passage surrounding said bushing, a tangential jet-passage, *b*, and a tangential supply-port, *g*, substantially as described, for the purpose specified.

6. An ignition-chamber for a gas-engine igniting device, having a tangential supply-port, *g*, and an ignition-chamber arranged with its axis parallel to the face containing the acting ports, substantially as described, for the purpose specified.

7. In an ignitor for gas engines, an ignitor-slide, and an inclosing-case therefor constructed of metals having different rates of expansion, substantially as described, for the purpose specified.

8. The combination, in an ignitor device for gas-engines, of an ignitor slide or valve, with an inclosing-case therefor, having a greater rate of expansion than the slide or valve, for the purpose specified.

9. The combination, in an ignitor device for gas-engines, of an ignitor slide or valve and a bearing-piece for the latter, with an inclosing-case formed of metal having a greater rate of expansion than said slide or valve, and an adjustable connection between said bearing-piece and case, substantially as described, for the purpose specified.

10. In a gas-engine, the combination of an ignitor-chamber, a power-chamber in valved communication therewith, and a device for causing a whirling jet of combustible mixture within said chamber supplied from said power-chamber, substantially as described.

11. In a gas-engine, the combination of a power-cylinder in valved communication with a lighter device, an ignitor-chamber provided with a tangential passage through which communication for the passage of the flame is established with said power-cylinder, and means, substantially as described, for igniting the charge contained in said ignitor-chamber.

12. In a gas-engine, the combination of an ignition-chamber, a device for causing a whirling jet of combustible mixture within said chamber, an ignitor, a combustion-cylinder in valved communication with said chamber, said whirling jet of combustible mixture being augmented by the charge entering said chamber from the combustion-cylinder, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LEWIS HALLOCK NASH.

Witnesses:

H. W. BRINCKERHOFF,

WILLIAM C. WESTERVELT.