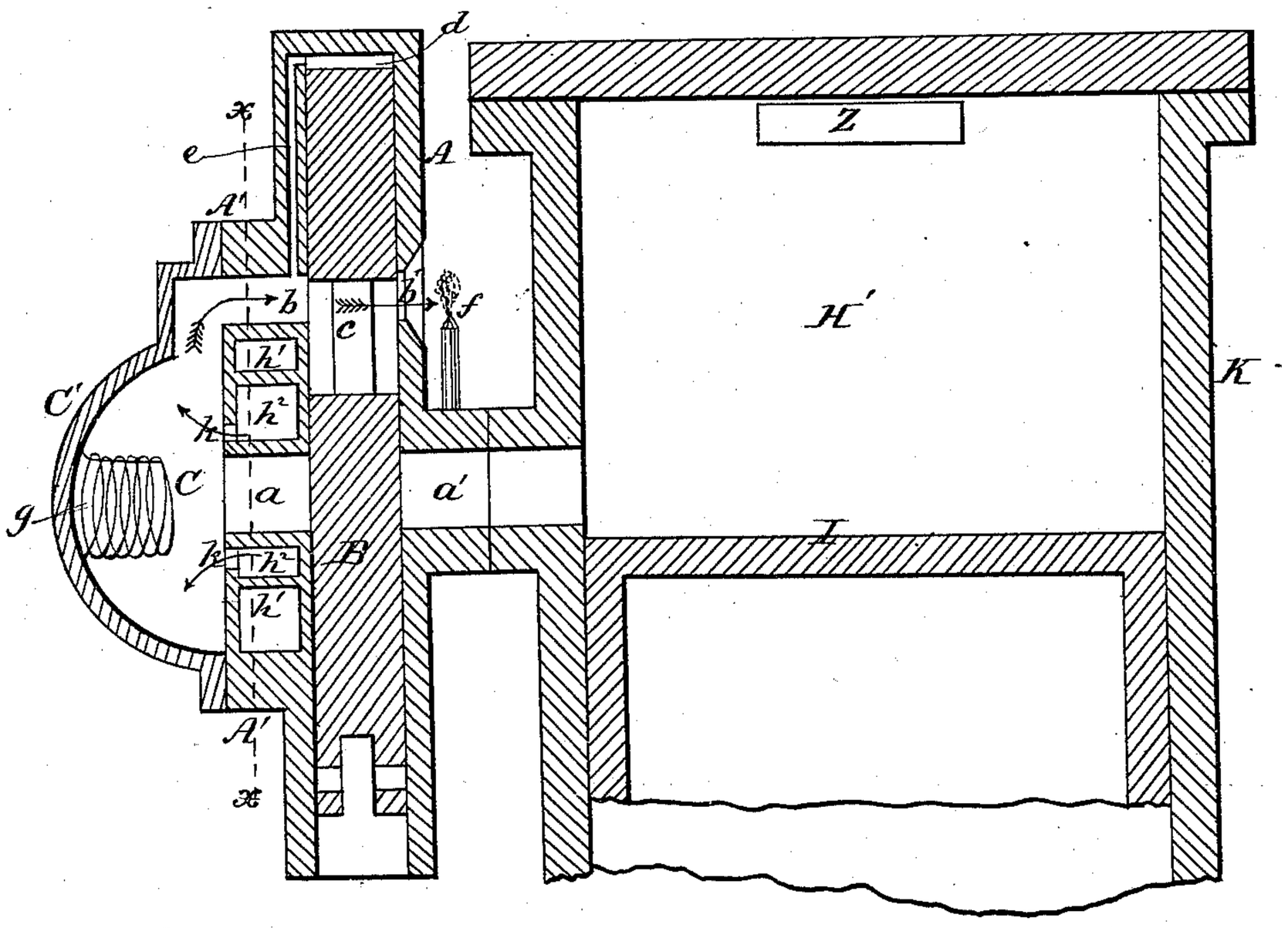
(No Model.) 2 Sheets—Sheet 1.

L. H. NASH.

IGNITER FOR GAS ENGINES.

No. 312,499. Patented Feb. 17, 1885.

Fig. 1.



Witnesses:
R. F. Huntemann.
W. E. Stearns

Inventor:
Lewis Hallock Nash
by Johnson & Johnson
Attys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

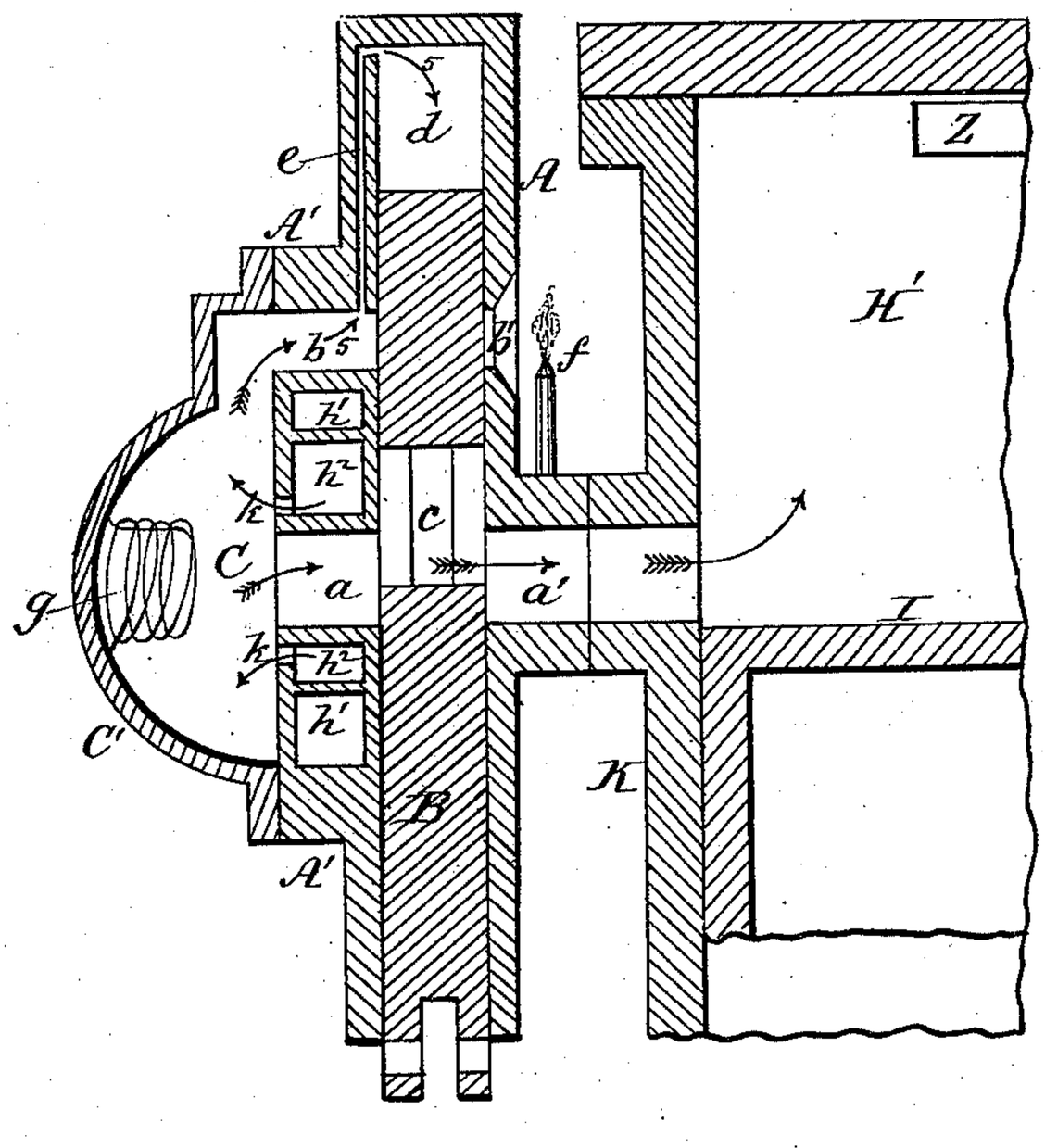


Fig. 3.

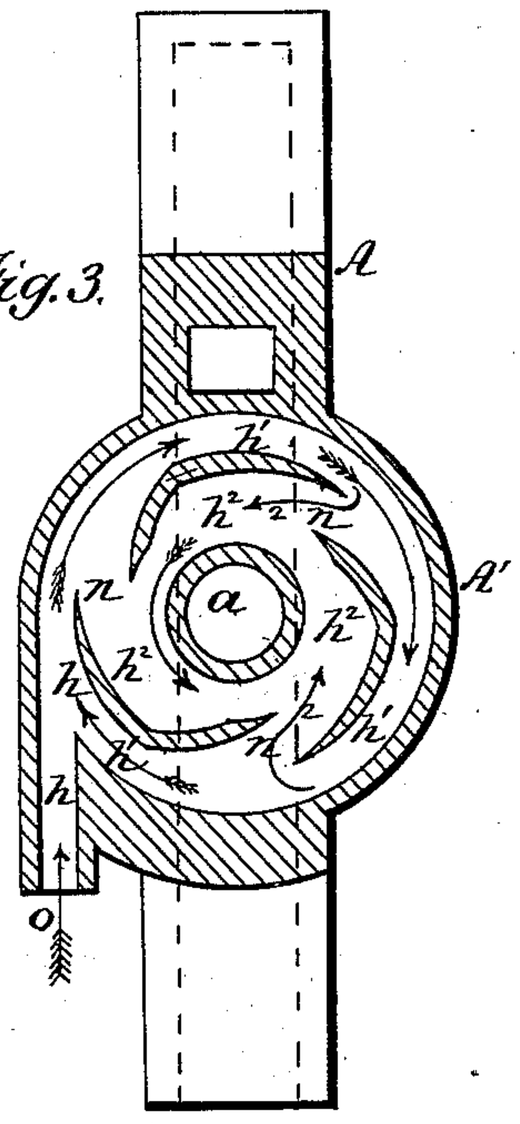
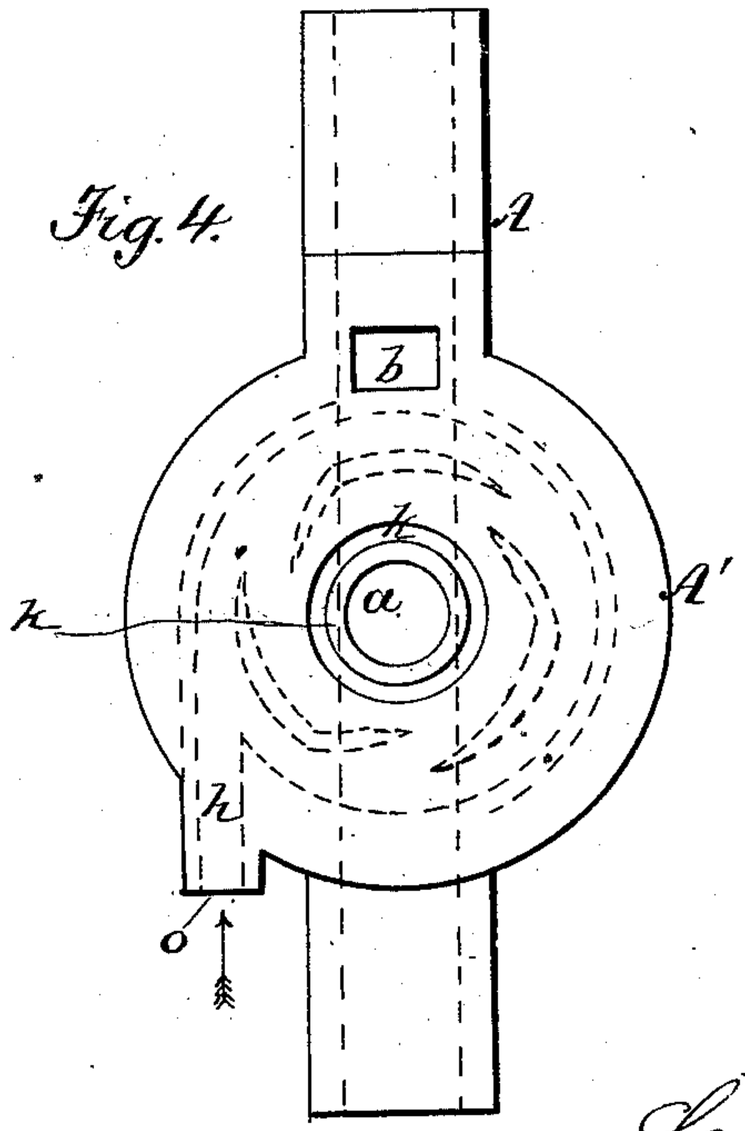


Fig. 4.



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UNITED STATES PATENT OFFICE.

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

IGNITER FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 312,499, dated February 17, 1885.

Application filed July 22, 1884. (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 Igniters for Gas-Engines, of which the following is a specification.

My invention relates to igniters for gas-engines in which gas is employed as the medium for lighting the charge within the power-cylinder; and the object of my improvement is to combine with a gas-engine an igniter for the charge having the following objects: first, to provide for supplying the gas in a rotary, curvilinear, or spiral current to an interior intermittent burner, for the purpose of retarding its flow and cause it to remain near the burner-orifice and burn at the issuing-point with less danger of being extinguished by the velocity of the flow than if it issued in a straight line; second, to convert the current of gas flowing to the internal burner in a rotary or curvilinear direction into a jet having a circular conical form, for the purpose of increasing its constancy during variations of pressure and in the proportions in which the gases composing the charge are mixed; third, to maintain a constant flow of gas into the igniting-chamber without regard to the communication of the latter with the power-cylinder; fourth, to provide a gas-igniter in which the issuing jet has an annular conical form and the flow thereto a rotary motion within a chamber having communication through said annular burner with the power-cylinder; fifth, to provide the passage which supplies the gas to the igniter with means whereby the flow is retarded before it reaches the burner-orifice; sixth, to provide means for relighting the internal gas-jet in case it should be extinguished by a temporary stoppage of the gas-flow or from other cause when cut off from communication with the permanent burner and before lighting the charge in the power-cylinder.

It is important in a gas-engine to retard the flow of gas to the internal intermittent burner to prevent the gas from blowing away from the burner at the moment of firing the charge in the cylinder, and such action may be effected by causing the gas to pass to the burner in a rotary direction, in which the inflowing current is caused to return in the same direction, and thus pass into and from the burner with a motion which concentrates it in a conical form around the burner-orifice and over the passage leading to the power-cylinder.

In connection with the internal intermittent burner, the external permanent burner, and a valve which controls the lighting of said intermittent burner, I employ a platinum coil in such relation to said intermittent internal burner as to be maintained in an incandescent condition by the direct heat therefrom, and thus serve, in fact, as a permanent interior burner to relight the intermittent burner should it, from any cause, be extinguished after it had been lighted by the external permanent burner.

An important object of my improvement is to provide a separate ignition-chamber, in which the intermittent burner is arranged so as to have communication with the permanent external burner and with the power-cylinder to fire the charge, the latter communication being effected through the center of a flame of circular form and having a motion concentric with its center, and the said communications being controlled by a valve which forms a part of the igniting device.

Referring to the accompanying drawings, Figure 1 represents a longitudinal section of my improved igniter as applied to the power end of the cylinder of a gas-engine, showing the ignition-chamber in communication with the external permanent burner to light the gas-jet of the internal intermittent burner; Fig. 2, a similar section showing the ignition-chamber in communication with the power end of the cylinder and cut off from the external burner; Fig. 3, a similar section taken on the line *x x* of Fig. 1, showing the circular form of the ignition-chamber and the manner of producing a rotary motion of the flow of the gas to the intermittent burner and of retarding the flow thereto; and Fig. 4, a side view of the igniter with the cap or cover of the ignition-chamber removed, showing the annular internal burner and the central part thereof which communicates with the power-cylinder.

The casing A A′ for the igniter is preferably a single casting, forming a chamber, *d*, for a slide-valve, B, and having ports *a a′ b b′* in its

opposite sides, and a separate cap, C′, forms the igniting-chamber C, which is on the outer side, A′, of the casing. The valve B has a port, *c*, and is fitted to have a movement in the case-chamber *d*, so as to bring its port alternately in communication with the opposite case-ports, *b b′* and *a a′*, in the operation of igniting the charge in the cylinder. The igniting-chamber C is preferably dome-shaped, and at its base and upon the outer side, A′, of the casing A is formed the internal intermittent burner, *k*, preferably in central relation to the dome-cap and of annular or circular form, similar to the well-known Argand burner. The inner walls of this Argand burner form the exit-port *a* for the igniting-flame for the charge, and for this purpose opens into the igniting-chamber. The annular burner *k* is surrounded by an inclosed space or passage, which forms the conduit for the gas to the internal annular burner, and within which space the gas is caused to have a rotary motion from the point of entrance to the burner-orifice, so that the gas-supply conduit is inclosed within the ignition-chamber, but has communication therewith only through the burner-orifice. At one side of this inclosed gas-conduit is the port *b* in the outer wall of the casing A, and this port has communication with the valve-chamber *d* by a channel or passage, *e*, formed in the inner side of its outer wall, extending to and opening into the upper closed end of said valve-chamber. This port *b* also communicates with the outer air by the outside port, *b′*, through the valve-port, while the Argand-burner port *a* has communication through said valve-port with the combustion-chamber H′ of the power-cylinder K by the port *a′*, which is on the inner side of the casing A, and directly opposite to the burner-port *a*.

At the outside case-port, *b′*, is placed the master or permanent burner *f*, supplied from any proper source, so that its flame will ignite the gas in the ignition-chamber. The gas-supply conduit is preferably of circular form, and the gas-supply pipe opens tangentially therein, at *o* in Fig. 3, by the passage *h* on the side A′ of the casing, and extends entirely around the Argand burner, as shown in Figs. 1 and 3, so that the gas will travel in a circuit or curvilinear direction and return upon the entering current, so as to impinge upon and retard its velocity to the burner-orifice. This retarding action will be effected in a degree by the diversion of the current from a straight line, because as the gas enters in a tangent the circular wall of the conduit or passage to the burner will deflect it and cause it to circulate within said conduit, to impact upon and compress itself, and escape in a rotary motion at the burner-orifice. To obtain this action and result to its fullest extent, I prefer to arrange partitions *h′* within this gas-conduit around the burner. These partitions may be of any form, number, and arrangement that will give the best effect for the object stated. They are preferably in sections, arranged so as to form openings *n* between their ends, as shown in Fig. 3, with one portion of each section concentric with the burner-case, while the other portion stands inward nearer the center. One of these partitions has its concentric part along one side of the passage *h* of the entrance, so as to form a continuation of the same. This arrangement gives a way or passage, *h′*, between the partitions and the inner wall of the burner-case for the return current upon itself, and a way or passage, *h²*, between the partitions and the outer wall of the annular burner for a reverse current to the burner-orifice. The openings *n* are formed between the concentric parts and the inward-deflected ends of the partitions, and they are equidistant from the center of the burner. The effect of this construction is to cause the gas issuing from the burner to have a certain degree of constancy of flow. The gas enters the burner conduit or passage tangentially at *o* from any suitable source of supply. If it enters with comparatively little pressure, it will circulate slowly around the partitions in the passage *h′*, as indicated by the arrows 1, and pass through the openings *n* into the passage *h²* in such manner as to cause its circulation and direction to be reversed, as indicated by the arrows 2, and issue from the annular burner *k* with a rotary or curvilinear motion, winding out and assuming the form of the frustum of a cone. This form of gas-jet is well suited for the intermittent burner, because it is not so easily extinguished by the inflowing gas. A flow under greater pressure will have increased velocity and circulate more rapidly around the outer passage, *h′*, and impinge violently upon and impede itself at the point of entrance. Passing in its circuit through the partition-openings *n*, it will be violently deflected therein in a reverse direction, and its momentum thereby reduced. Now, as the currents in the divided passages of the burner-case flow in opposite directions, and said passages are full of gas, the currents will mutually impede and retard each other, and much less gas will be delivered at the burner-orifice than if the same had uninterrupted flow. The rotary motion given the burner-jet of gas will cause it to flow out more slowly, and the flame to remain at the circular orifice without danger of being blown away and extinguished. Centrally attached to the inner wall of the cap or dome of the ignition-chamber is a coil of platinum, *g*, or a body of asbestus, or any substance capable of becoming heated to incandescence without burning, the purpose of which is to form a perpetual lighter for the internal burner, supplementary, of course, to the external permanent burner, aiding it always, but rendered of special importance in case the internal flame should be extinguished at the moment communication with the permanent burner is cut off.

The object of the passage *e*, which opens into the ignition-chamber and forms a communication of said chamber with the valve-

chamber *d*, is to allow for a continuous flow of the gas into the ignition-chamber C when the communication of the latter with the power-cylinder is cut off, and thus always insure a full supply of gas in the ignition-chamber, and therefore a certainty in lighting the charge in the power-cylinder. This continuous flow is produced by the action of the valve B drawing the gas into its chamber *d* as it moves to open communication between the ignition-chamber and the combustion-chamber of the power-cylinder, and to close the air-inlet and igniting-port *b'*, as shown by the arrows 5 in Fig. 2.

The igniter may be arranged in any suitable manner upon the power-cylinder, so that the port *a'* will communicate with the combustion-chamber H', and the igniter-valve B may have any suitable connection with the engine-shaft. Z is the inlet-passage for the combustible charge into the cylinder and the outlet for the products of combustion from the cylinder, and I is the piston having suitable connection with the shaft. The valve B being in the position shown in Fig. 1, the gas enters the igniting-chamber by the tangential passage *h*, and filling said chamber flows out through the port *b*, the valve-port *c*, and the port *b'*, and is ignited by the permanent-burning gas-jet *f*, and in turn ignites the gas in the ignition-chamber and the jet issuing from the annular orifice. The valve then moves to the position shown in Fig. 2, closing the port *b'*, cutting off the exit-port *b*, and allowing the gas to flow into the valve-chamber *d* through the passage *e* from the ignition-chamber C, so that the flow into the ignition-chamber will be continuous. The valve in moving to this position, after it has closed port *b'*, opens communication by its port *c* with the chamber H' of the cylinder by the port *a'*, and with the ignition-chamber C by the burner-port *a*, and thereby ignites the charge in the cylinder by the flame from the annular burner passing through its center port. The gas is supplied to the internal burner under pressure by suitable connection with the engine, and therefore the pressure of the supply will be as great as that of the compressed gases in the power-cylinder, and as they will issue from the passage *h* with a velocity proportionate to such pressure, the retarding action to deliver the gas to the burner under a reduced velocity is of considerable importance in giving certainty and constancy to the internal charge-igniting flame.

The object of the incandescent body is not to maintain the internal gas-jet perpetually lighted, for when the explosion of the charge takes place in the cylinder the internal jet will always be extinguished, because the back-pressure would stop the flow of the gas to the burner; nor do I depend upon the incandescent body to relight the internal jet when the gas is next supplied to it, for the incandescent body would not do this under all conditions. The office of the incandescent body is simply to prevent the internal jet from being extinguished when the valve closes communication with the external lighter, and to keep it lighted until the explosion of the charge.

My invention is essentially an igniter for a gas-engine, and the novel features thereof may be used in any of the various forms of lighter devices in which an interior jet is used.

I am aware that an incandescent body placed within a chamber has been heated by a gas-jet exterior to the chamber, and therefore the said body must transmit the heat from the exterior to the interior surface of the body; but in my igniter the incandescent body is heated by a jet within the ignition-chamber.

I claim—

1. The combination, with a gas-engine, of a separate ignition-chamber, a burner having an annular jet-orifice opening therein, and a valve operated to control the communication of said burner-jet with the charge in the power-cylinder, substantially as described, for the purpose specified.

2. The combination, with a gas-engine, of a separate ignition-chamber, an external burner-jet communicating therewith, an internal burner-jet having an annular jet-orifice opening into said ignition-chamber, and a valve operated to control the communication of said annular burner-jet with the power-cylinder, and also the communication of the ignition-chamber with the external burner-jet, substantially as described.

3. The combination of a gas-engine with a separate ignition-chamber, an annular burner-orifice opening therein, and a valve opening communication with the power-cylinder through said annular burner.

4. The combination, with a gas-engine, of an igniter having an ignition-chamber of circular form having a tangential inlet and an annular burner, whereby to produce a rotary motion of the lighter-jet issuing from said burner within said chamber, for the purpose specified.

5. The combination, with a gas-engine, of a separate ignition-chamber and an interior burner, through the center of which the ignition-chamber fires the cylinder-charge, substantially as described.

6. The combination, with a gas-engine, of an igniter having an interior annular burner for the charge-igniting jet, and a circular, spiral, or curvilinear conduit leading thereto, whereby a rotary movement is imparted to the issuing jet of said burner concentric with its center.

7. The herein-described method of retarding the flow of the gas to the charge-igniting burner of a gas-engine by making the current to said burner revolve and impinge upon and impede itself at one or more points in its passage to said charge-igniting burner.

8. The combination, with a gas-engine, of an igniter having a separate ignition-chamber divided into curved passages, an annular burner,

a tangential gas-supply pipe opening into said chamber, and an exit-port for the charge-igniting flame in the center of said burner, substantially as described, for the purpose specified.

9. The combination, with a gas-engine, of an igniter having an interior burner having an annular jet-orifice for igniting the cylinder-charge, and an igniting-chamber inclosing said burner, having ports by which it communicates with the air and with the power-cylinder, so arranged that when the one is closed the other will be open, substantially as specified.

10. The herein-described method of preventing the current of inflowing gas to the igniter of a gas-engine from intermitting when its port to the air is closed, which consists in drawing the incoming gas within the chamber of the valve which controls the firing of the charge in the power-cylinder as the said valve moves to open the charge-firing port and to close said air-port.

11. The combination, with a gas-engine, of an igniter having an ignition-chamber, C, a burner-opening therein, the slide-valve B, and igniter-casing A, having a wall-passage opening into the ignition-chamber and into the valve-chamber *d* behind the upper end of said valve, substantially as described, for the purpose specified.

12. The combination, with a gas-engine, of an igniter having the valve B, a permanent external gas-burner, a retarding-chamber for the gas-supply, and an igniting-chamber having communication with the retarding-chamber, substantially as specified.

13. The combination, with a gas-engine, of an igniter having its inflow-passage provided with retarding vans or partitions forming communicating passages for opposite currents, and a burner centrally arranged within said passages, substantially as described, for the purpose specified.

14. The combination, with a gas-engine, of an igniter having an internal burner of circular form, an inclosed communicating supply-passage, divided as described, and an ignition-chamber inclosing said burner, substantially as described, for the purpose specified.

15. The method of maintaining a continuous current of gas into the igniter-chamber of a gas-engine, which consists in drawing the gas from the igniter-chamber into an inclosed port of the valve-chamber by suction produced by the movement of the valve in opening communication of the igniter with the combustion-chamber of the power-cylinder, as described.

16. The combination, with the gas-engine, of a separate igniting-chamber, C, having an internal gas-jet adapted to be ignited by a permanently-burning exterior gas-jet when the air-port of said igniting-chamber is open, and a valve that alternately opens and closes the ports of the igniting-chamber leading, respectively, to the combustion-chamber of the engine and to said permanent burner, substantially as specified.

17. The combination, with a gas-engine, of an igniting-chamber provided internally with a body of platinum wire or other substance capable of becoming incandescent, an internal gas-jet, a permanently-burning gas-jet adapted to light said interior jet when the air-port of the igniting-chamber is open, and a valve adapted to open and close alternately the ports of the igniting-chamber that lead, respectively, to the combustion-chamber and to the air, substantially as specified.

18. The combination, with a gas-engine, of a chamber in which the gas is made to move in circular currents by entering tangentially, and an igniting-chamber having an annular opening from said current-directing chamber, whereby the gas-jet from the latter chamber will pass into the former chamber with a rotary or spiral motion, substantially as specified.

19. The combination, with a gas-engine, of an igniter having an incandescent platinum body, and a burner arranged within an ignition-chamber, and a permanent burner arranged to communicate with said interior burner, substantially as described, for the purpose specified.

20. An igniting device consisting of a separate igniting-chamber, C, a retarding-conduit or supply-passage leading thereto, a burner interposed between said ignition-chamber and its supply-conduit, and an external burner combined with a gas-engine, and a valve operating to control the ignition of the cylinder-charge, substantially as described.

21. The combination, with the power-cylinder of a gas-engine, of an igniter having an annular burner, a separate ignition-chamber, and a charge-igniting port passing centrally through said burner, substantially as described.

22. The supply-conduit of a gas-igniter of circular form having curved vanes, and an annular burner, *k*, arranged centrally therewith, having a central port, *a*, in combination with an ignition-chamber inclosing said supply-conduit, the burner and its central port, the power-cylinder of a gas-engine, the permanent burner *f*, and a slide-valve interposed between said burner-port and its communication with the power-cylinder, substantially as described, for the purpose specified.

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

LEWIS HALLOCK NASH.

Witnesses:
H. W. BRINCKERHOFF,
CHRISTOPHER C. WHITTEMORE.