

No. 640,395.

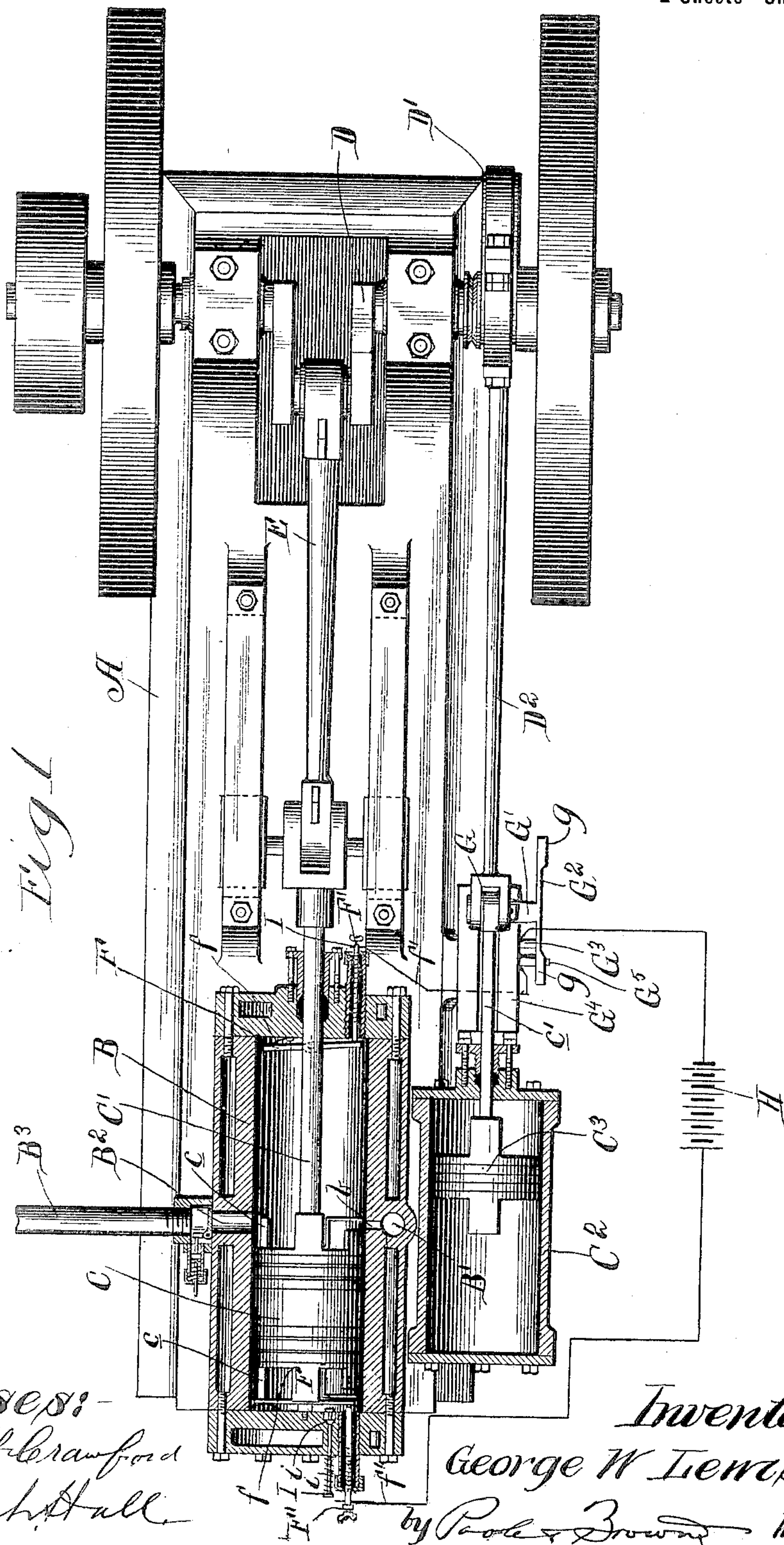
Patented Jan. 2, 1900.

G. W. LEWIS.  
GAS ENGINE IGNITION DEVICE.

(Application filed June 21, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:  
Carl H Crawford  
William H Hall

Inventor:  
George W Lewis

by Pool & Brown Attys

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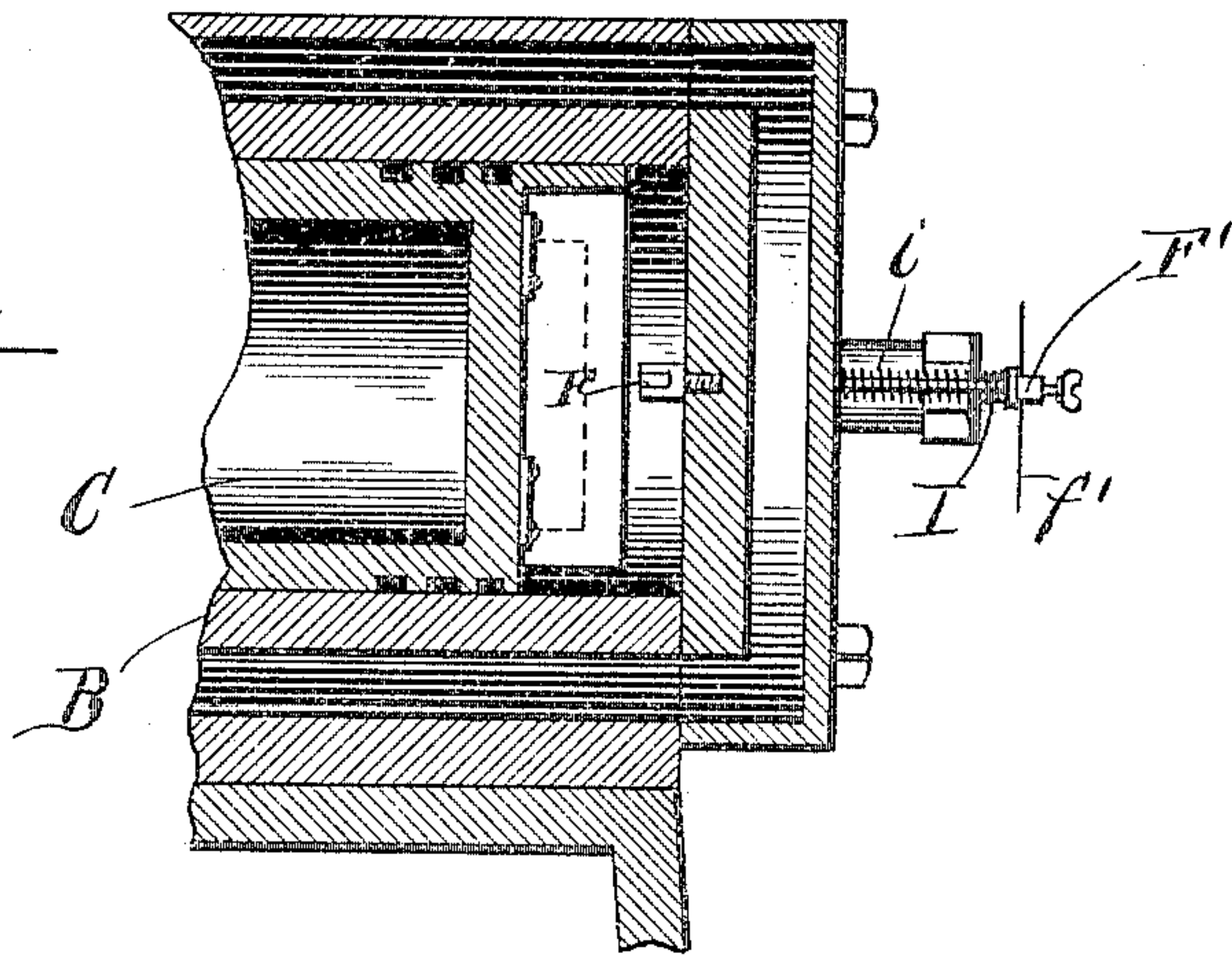
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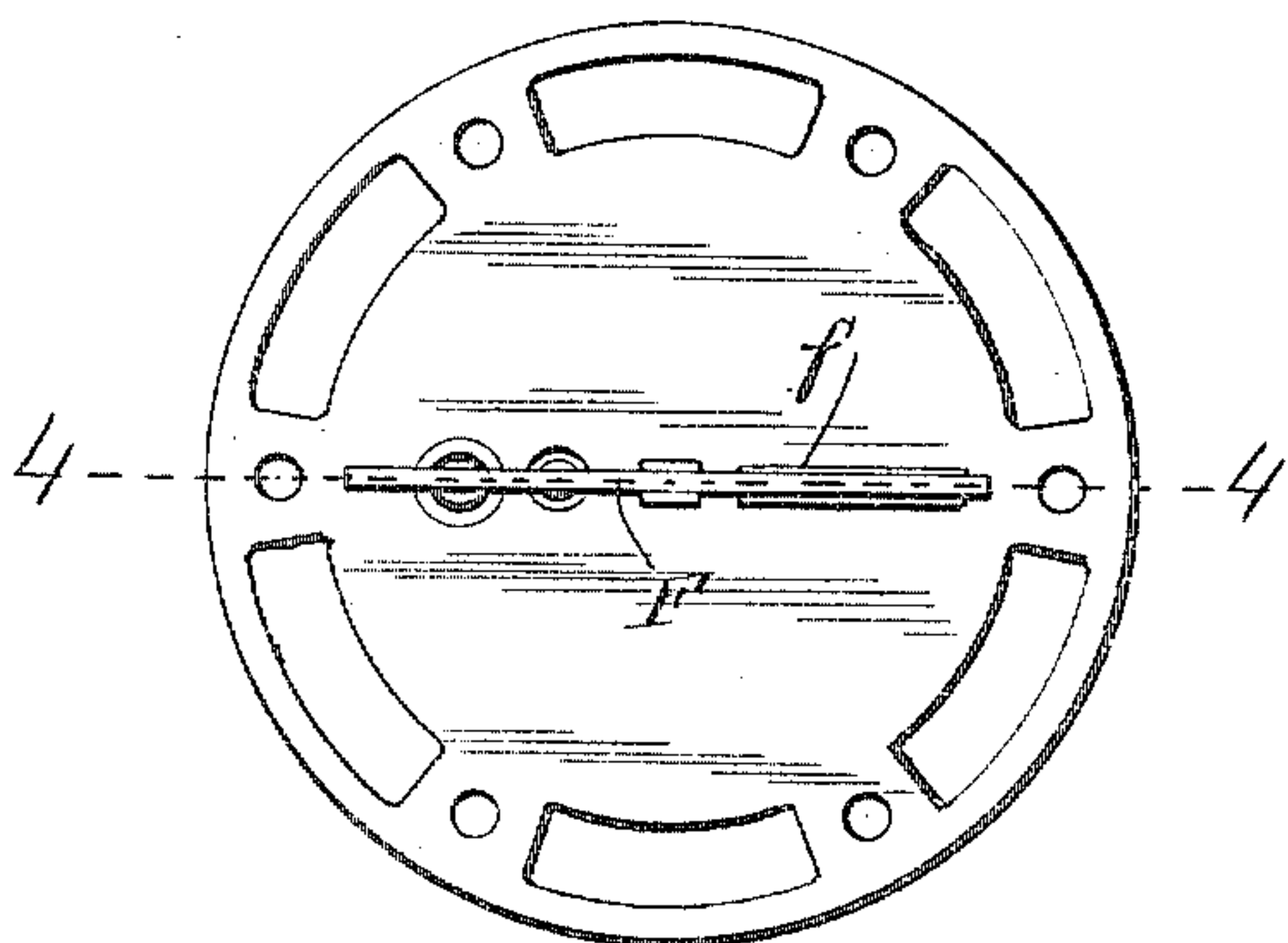
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2 Sheets—Sheet 2.

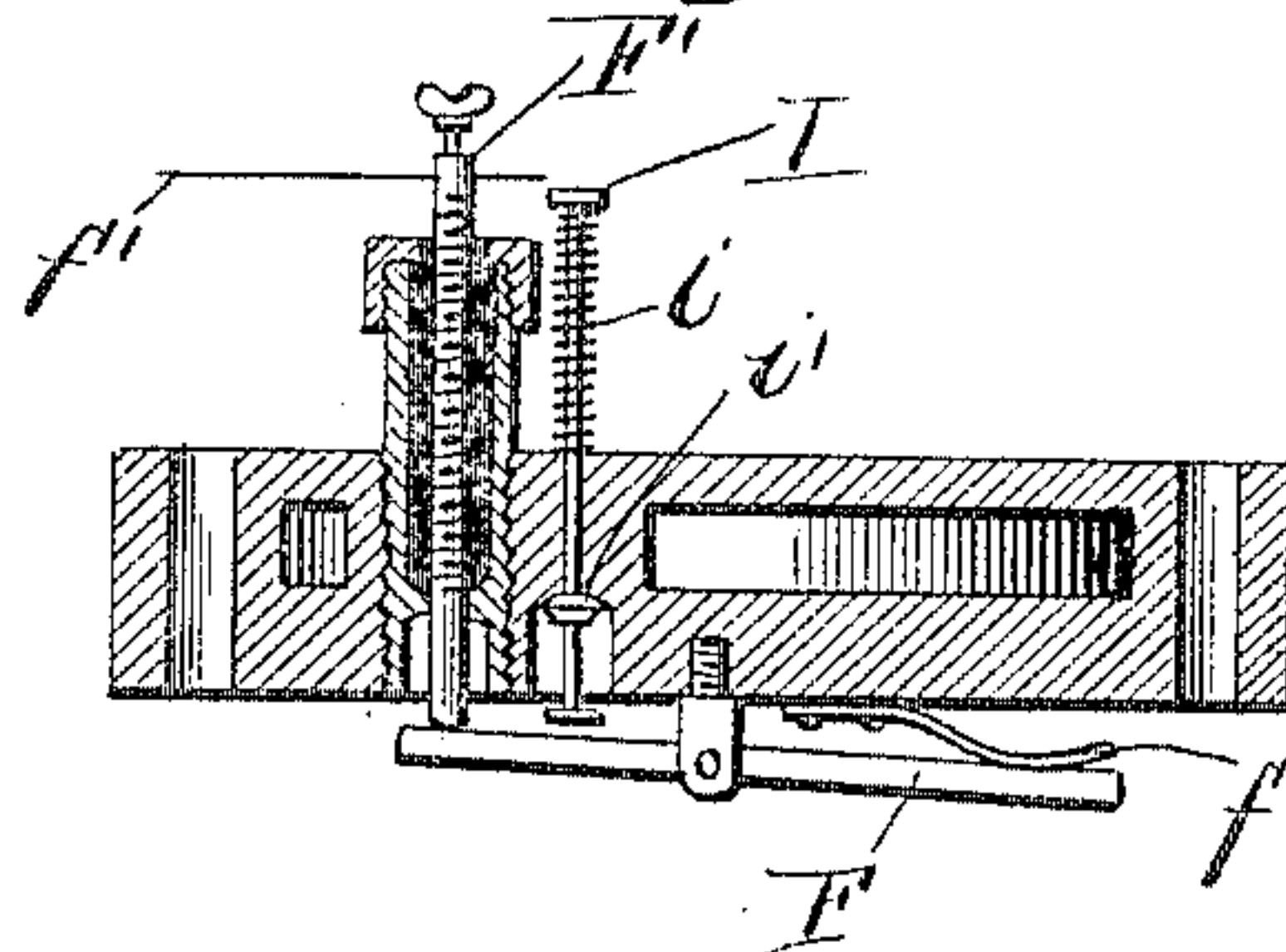
*Fig 2*



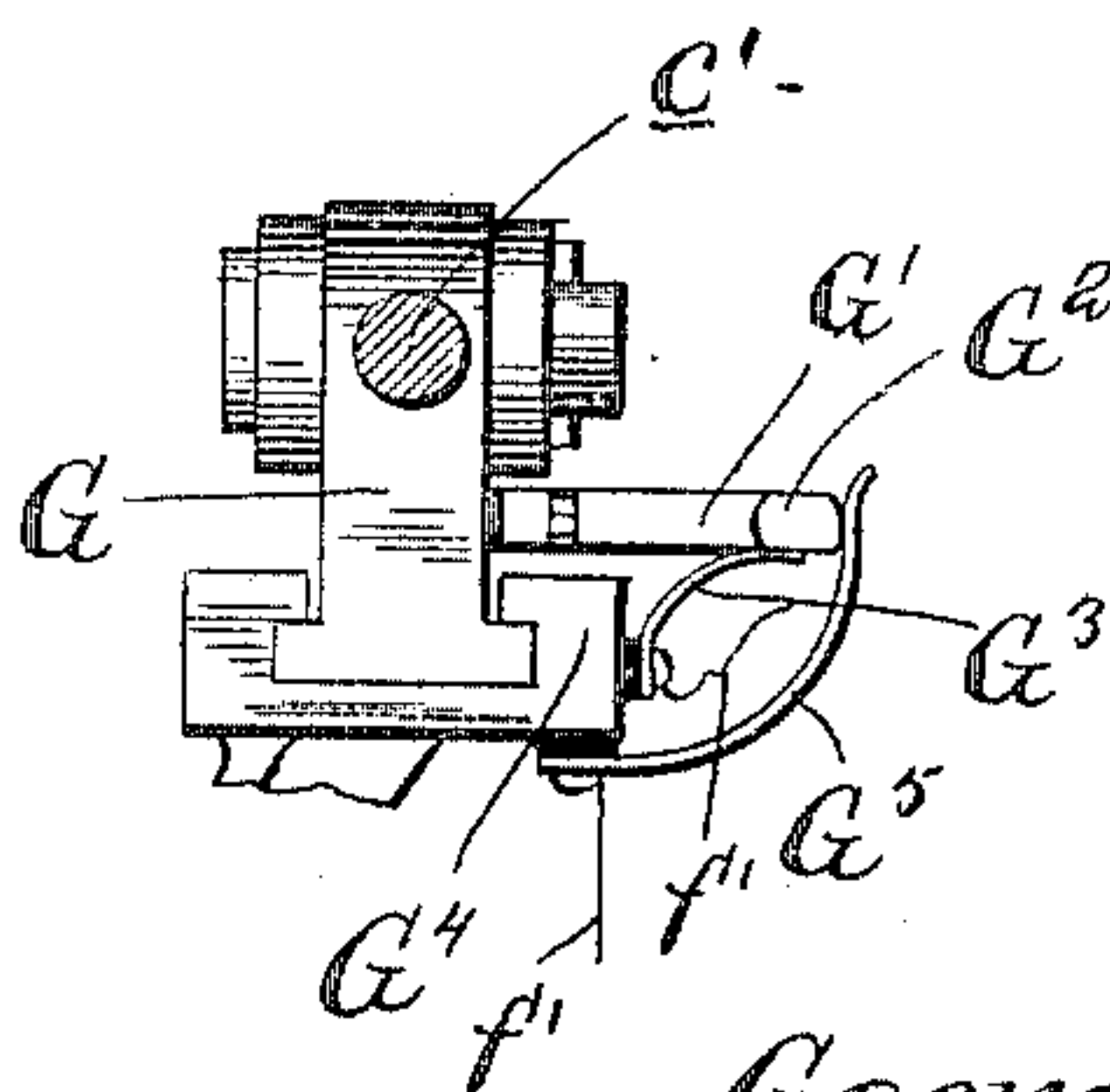
*Fig 3*



*Fig 4*



*Fig 5*



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# UNITED STATES PATENT OFFICE.

GEORGE W. LEWIS, OF PHILADELPHIA, PENNSYLVANIA.

## GAS-ENGINE IGNITION DEVICE.

SPECIFICATION forming part of Letters Patent No. 640,395, dated January 2, 1900.

Original application filed August 17, 1894. Renewed September 22, 1898, Serial No. 691,628. Divided and this application filed June 21, 1899. Serial No. 721,378. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. LEWIS, of the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, (formerly of Chicago, in the county of Cook and State of Illinois,) have invented certain new and useful Improvements in Gas-Engine Igniting Devices, (Case D;) 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 improvements in gas-engines, being a division of an application originally filed by me on the 17th day of August, 1894, and renewed September 22, 1898, Serial No. 691,628, and refers more particularly to an improved electrical igniting or sparking mechanism for producing an explosion of the admixture of gas or vapor and air within the power-cylinder.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a plan view, partly in horizontal section, of an engine provided with my invention, the section being taken in the axial plane of the cylinder. Fig. 2 is an axial section of one end of the power-cylinder, taken in a vertical plane. Fig. 3 is an elevation of one of the power-cylinder heads, showing the inner face thereof and the vibratory lever of the igniting device. Fig. 4 is a horizontal section taken on line 4 4 of Fig. 3. Fig. 5 is an end view of the slide belonging to the piston-rod of the charging-cylinder and also a view of the stationary guides for said slide, said figure showing means for opening and closing the electric circuit belonging to the igniting mechanism.

As shown in said drawings, A designates the frame or body of the engine; B, the power-cylinder of a double-acting engine; C, a piston therein; D, a crank-shaft, and E a pitman connecting said crank with the rod C' of the piston.

C<sup>2</sup> designates a charging-cylinder which is in communication with the power-cylinder through a passage B' and ports b, connected therewith, which open into said power-cyl-

der midway between its ends. B<sup>2</sup> designates a central exhaust-port connected with an exhaust-pipe B<sup>3</sup>. Within said charging-cylinder is contained a piston C<sup>3</sup>, which is actuated from the crank-shaft through the medium of a cam D' on the crank-shaft and connecting-rod D<sup>2</sup>.

The foregoing parts of the engine are like similar parts shown and claimed in my prior application for United States Patent, Serial No. 691,628, filed September 22, 1898, of which this is a divisional application.

For clearness of illustration the valve mechanism and fuel-supplying devices are herein omitted; but it will be understood that they may be of any familiar or convenient form.

Referring now to the igniting mechanism which constitutes the present invention, F F are centrally-pivoted levers, one at each end of the cylinder B, each of said levers having a vibratory movement in a horizontal direction and normally standing in the inclined position shown in Figs. 1 and 4 under the force of a spring f, arranged behind one of its ends, as shown more clearly in Fig. 4. In this inclined position of either lever F it bears at its retracted end against an insulated electrode F', from which, exterior to the cylinder-head, proceeds an electric conducting-wire f'. A pin c projects from either end of the piston C and is arranged in position to strike the outstanding end of the lever F, so as to vibrate the latter out of contact with the electrode F', and thus produce a spark within the cylinder between said electrode and lever.

An electric circuit may be maintained through the electrodes F' and the levers F and their metallic connections, to be broken only by the tappets or pins c when the spark is to be produced; but for economy I prefer the construction illustrated and next described, in which the circuit is complete and in action only when the piston C is near one or the other end of the cylinder B. In such construction the sliding head G (which connects the piston-rod c' of the piston C<sup>3</sup> within the charging-cylinder C<sup>2</sup> with the connecting-rod D<sup>2</sup>, which sliding head is shown in detail in Fig. 5) carries an arm G', provided at its outer end with a bar G<sup>2</sup>, arranged parallel with



the piston-rod  $c'$ . Said bar  $G'$  is insulated from the slide  $G$ , as indicated in Fig. 5, and has at its extremities projecting surfaces  $g$   $g$ .

$G^3$  is a contact-piece having insulated connection with the guide  $G^4$  of the slide  $G$  or with other suitable support, as indicated more clearly in Fig. 5, said contact-piece  $G^3$  being continuously in contact with a suitable surface on the reciprocating bar  $G^2$ .  $G^5$  is a contact-piece also having insulated connection with the guide  $G^4$  or with its other support and arranged to bear only upon the projecting surfaces  $g$   $g$  of the bar  $G^2$  as said bar shall be carried back and forth along the slide  $G$ . The contact-pieces  $G^3$   $G^5$  are severally connected with the electrodes  $F'$  by the wires  $f'$ , and a suitable battery or other source of electricity being presented, as indicated at  $H$  in Fig. 1, an electric circuit will be closed through the electrodes and metallic connections whenever the bar  $G^2$  is in position to give contact to one of its surfaces  $g$  with the contact-piece  $G^5$ . This will occur at the opposite ends of the stroke of the charging-piston  $C'$ , and the eccentric  $D'$  is so timed with reference to the crank of the shaft  $D$  that this closure of the circuit will commence when the power-piston  $C$  is approaching and proximating with either end of the power-cylinder. The current being in action, therefore, at each end of the power-piston, the pin  $c$  upon said power-piston will vibrate the lever  $F$  away from the adjacent electrode and give a spark at the proper time to secure the desired explosion and expansive action of gas behind said piston.

A lengthwise-movable rod  $I$  extends through the cylinder-head opposite to the inwardly-directed end of the lever  $F$  and enables a spark to be produced by hand in starting the engine by pushing said rod  $I$  inward, said rod being provided with a head or valve  $i'$ , adapted to close the aperture around the rod, and thereby prevent the escape of gas in the regular operation of the engine. Preferably a retracting-spring  $i$  is also provided, whereby the valve  $i'$  is normally pressed outwardly to its seat.

It will be observed in the construction shown that the spark for igniting the explosive mixture in the power-cylinder is produced and the ignition effected upon the instroke of the piston, though very near the completion of such instroke. This is found in practice to be highly advantageous, since the explosive force of the ignited mixture is not instantaneously exerted. It will be further observed that the electrodes  $F'$   $F'$  are adjustable as to their protrusion into the power-cylinder, so that the time of sparking with respect to the position of the piston may be

varied to any degree of nicety. From the foregoing description it will be seen that an explosion takes place behind the power-piston at each end of its stroke in either direction.

While the invention has been shown herein embodied in a double-acting engine, it will be obvious that it may be equally well used in connection with a single-acting engine, in which event but one projection  $g$  on the bar  $G^2$  will be required and one of the circuit-wires  $f'$  will be connected directly with the power-cylinder.

I claim as my invention—

1. In a gas-engine, the combination with a double-acting power-cylinder provided with electrodes exposed within the opposite ends of said cylinder, means operated by the piston for breaking the electric circuit through said electrodes, and means introduced into the circuit for holding the circuit open except when the piston approaches the end of its stroke, comprising a longitudinally-reciprocating metallic bar having projecting lugs at its opposite ends, a metallic spring connected with one of the circuit-wires and constantly engaging the bar, and a metallic part connected with the other circuit-wire and adapted to engage said projecting lugs at the opposite extremities of the movement of the bar.

2. In combination with a sparking device within the power-cylinder, lengthwise-movable rod, as  $I$ , for operating the sparking device by hand, said rod passing through the cylinder-wall and carrying a valve fitted to a seat surrounding the aperture through which the rod passes, whereby the aperture is closed against escape of gases.

3. In a gas-engine, the combination with a power-cylinder, an electrode exposed in the end of said cylinder, means operated by the piston for breaking the electric circuit through said electrode, and means introduced into the circuit for holding the circuit open except when the piston approaches the end of its stroke, comprising a longitudinally-reciprocating metallic bar having a projecting lug, a metallic spring connected with one of the circuit-wires and constantly engaging the bar and a metallic part connected with the other circuit-wire and adapted to engage said projecting lug at the extremity of the movement of the bar.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 1st day of June, A. D. 1899.

GEORGE W. LEWIS.

Witnesses:

H. F. REARDON,  
F. E. BECHTOLD.