

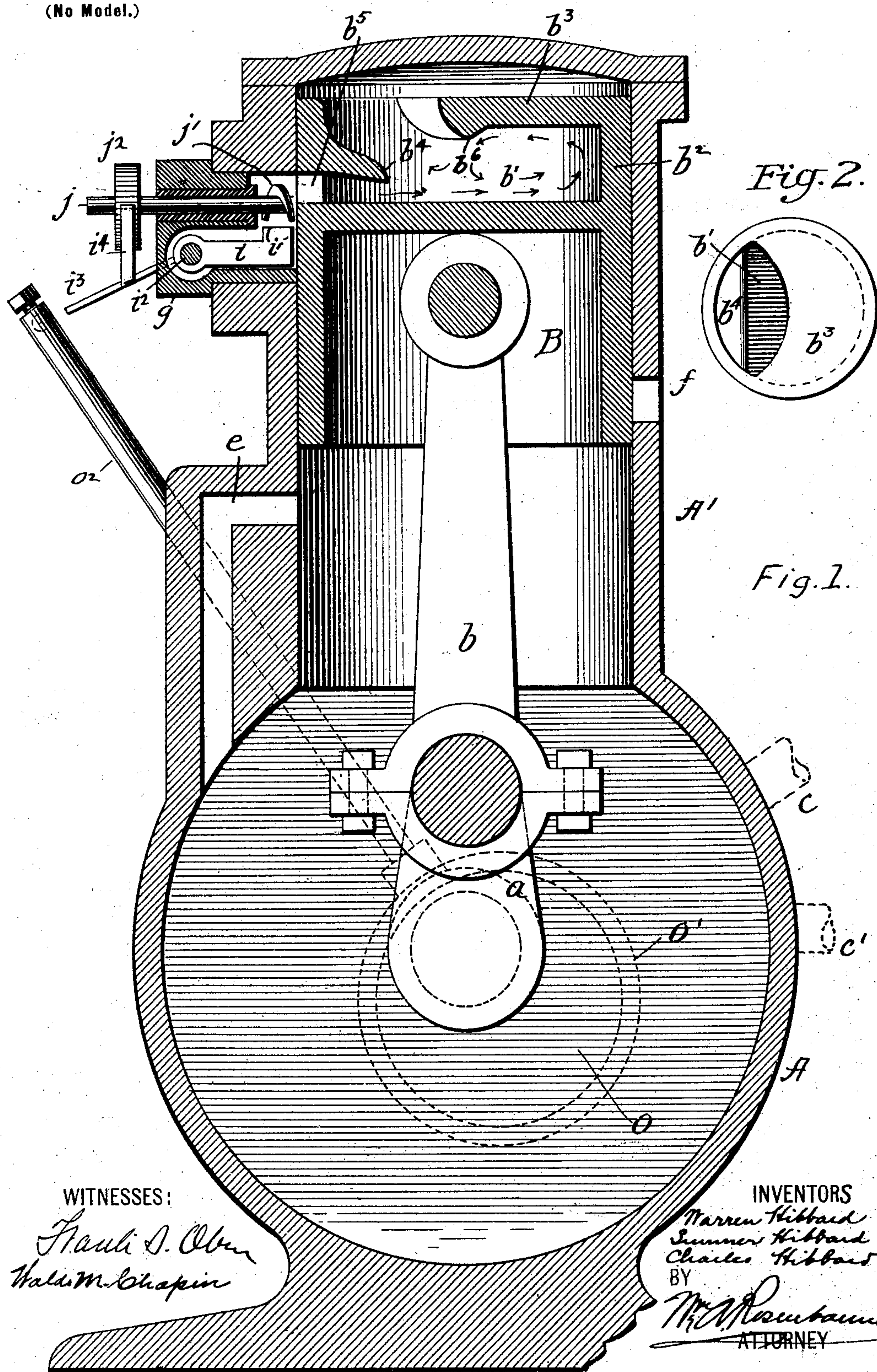
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Patented Feb. 25, 1902.

W., S. & C. HIBBARD.
EXPLOSIVE ENGINE.

(Application filed Feb. 2, 1901.)

(No Model.)



WITNESSES:

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EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 694,016, dated February 25, 1902.

Application filed February 2, 1901. Serial No. 45,687. (No model.)

To all whom it may concern:

Be it known that we, WARREN HIBBARD, SUMNER HIBBARD, and CHARLES HIBBARD, citizens of the United States, residing at Sandyhill, in the county of Washington and State of New York, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a full, clear, and exact description.

10 This invention relates to explosive-engines, the object being to provide a construction of engine which will run smoothly, which will not skip explosions, and in which the igniting-spark will always occur in the presence
15 of fresh gas or explosive material.

In carrying out our invention we provide a mixing-chamber surrounding a crank-shaft, from which one or more cylinders radiate, said cylinders opening into the mixing-chamber, and a passage leading from the mixing-chamber to a point above the piston when the latter is at the inner end of its stroke, whereby the piston will act in the nature of a valve to control the supply of gas to the cylinder.

25 Our invention also comprehends a novel construction of piston wherein the fresh gas is entrapped and confined until an igniting-spark is created in its presence.

The invention also consists of other details, all of which will be fully hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical central section of our improved gas-engine, and Fig. 2 is a plan of the end of the
35 piston.

A is a casing for crank *a*, the shaft of which projects through the sides of the casing.

A' is a cylinder formed, preferably, integrally with the casing A and containing a
40 piston B, connected with the crank *a* by the piston-rod *b*.

The casing A will be fitted with suitable pipes *c* and *c* (indicated in dotted lines) to admit fuel. The cylinder is provided with
45 an inlet-port *e*, which extends from the mixing-chamber to a point in the side of the cylinder. The cylinder is also provided with an exhaust-port *f*, located at a point to be uncovered by the piston at the end of its inner
50 stroke. In the side of the cylinder, near the

outer end thereof, is fitted a plug *g*, containing two electric terminals *i* and *j*, respectively. The terminal *i* is a lever having an elongated contact edge *i'* and mounted to swing with a shaft *i*², which passes outward through the
55 plug and carries a spring-tailpiece *i*³. By moving this tailpiece the terminal *i* can be moved toward and away from the corresponding terminal *j*. Terminal *j* is in the form of a shaft having a spiral flange *j'* at its end, the
60 edge of which is adapted to make contact with the edge *i'* of the terminal *i*. This flange makes one complete turn around the shaft, so that when one end of it has passed beyond the edge *i* the other end will come into position to act thereon. The shaft carries on its
65 outer end a ratchet-wheel *j*², which is moved by the pawl *i*⁴, carried by the spring-arm *i*³. The chamber containing the sparking terminals opens into the cylinder.

The piston B is provided on its forward or outer end with a trap *b'*, formed by the extended sides of the piston *b*² and the two lips *b*³ and *b*⁴. Under or below the lip *b*⁴ is a port *b*⁵, opening through the side of the trap, and the
75 gas which passes through this port from the passage *e* is directed diametrically across the piston, the current of gas being then deflected back again under the lip *b*³, and by means of the inclined edge *b*⁶ on said lip the
80 current is caused to whirl, as indicated by the arrows, and after filling the trap the excess finds its way out into the cylinder and fills the same.

On the crank-shaft outside of the casing A
85 is an eccentric *o*, the strap *o'* of which is attached to a rod *o*² for engaging the tailpiece *i*³ to operate the sparking devices.

The operation of the engine is as follows: The piston is now shown in about the position at which the explosion takes place. The
90 electric terminals *i* and *j* have just separated, causing a spark, which ignites the gas above the piston, and the explosion sends the piston downward or inward. At the lower limit of
95 its stroke the exhaust-port *f* is uncovered and the spent products of combustion are allowed to pass out. At the same time the port *b*⁵ in the piston is brought into line with the port *e*, leading from the mixing-chamber, and fresh
100

gas flows into the trap, fills the same, and immediately fills the cylinder above the piston. Owing to the construction of the trap nothing but fresh gas can be let in during the return or upward stroke of the piston. During its upward stroke the gas is compressed until finally the port b^5 is again brought opposite the open chamber containing the sparking terminals. The fresh gas from the trap flows into the chamber containing the terminals, so that the spark which then takes place is in the presence of the fresh gas. In the rotation of the crank-shaft the eccentric causes the rod o^2 to make a reciprocation, which causes the pin o^4 at the end of the rod to strike the upper side of the spring-arm i^3 and throw terminal edge i' into contact with the presented portion of the spiral j . Further movement of the rod o^2 causes the pin to slip off from the end of the arm i^3 , thus permitting the terminal i to fall by gravity out of contact with the spiral or to be pushed out of contact therewith by the spring, (not shown,) and thus create a spark, which ignites the charge and forces the cylinder downward. At the same time that the arm i is deflected by the rod o^2 the pawl i^4 pulls upon the ratchet-wheel and rotates the shaft, so that a new portion of the spiral j' will be presented to the edge i' . When the arm i is released, the pawl moves back to a new position upon the ratchet-wheel.

It will be seen that our engine eliminates all valve mechanism, the flow of the gas to the cylinder being controlled entirely by the piston, the construction of which insures that the spark shall always be created in the

presence of fresh gas, thereby insuring an explosion at every stroke.

It is obvious that our engine is adapted to multicylinder-engines or to engines in which the cylinders themselves move while the crank remains stationary. We therefore do not wish to be limited to the special construction illustrated.

A special construction of the sparking devices is not claimed herein, but is shown merely as an example of a necessary part of such an engine.

Having described our invention, we claim—

1. In an explosion-engine, the combination of a cylinder, a piston therein provided with a trap for fresh gas, an inlet-port adapted to communicate with said trap when the piston is at one end of its stroke, and a sparking-chamber adapted to communicate with said trap when the piston is at the other end of its stroke through the same opening by which the fresh gas enters the trap.

2. In an explosion-engine, a piston having a trap for gas, on its explosion side, said trap being formed by the extended sides of the piston and by two lips approaching each other in different planes from opposite sides of the piston, and a port opening into said trap.

In witness whereof we subscribe our signatures in presence of two witnesses.

WARREN HIBBARD.
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Witnesses:

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