

No. 636,452.

Patented Nov. 7, 1899.

J. W. RAYMOND.

STARTING DEVICE FOR GAS ENGINES.

(Application filed Nov. 17, 1898.)

(No Model.)

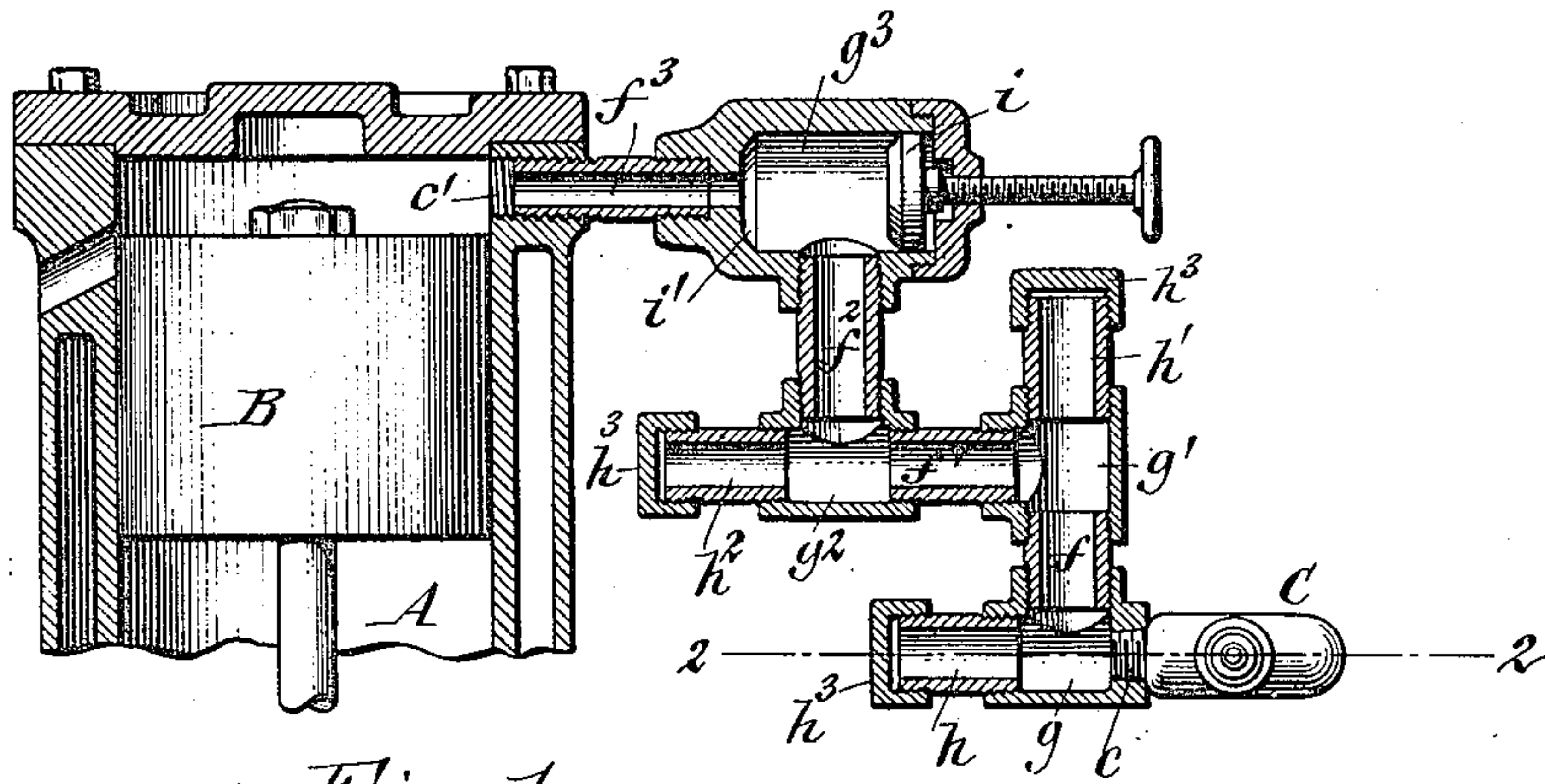


Fig. 1.

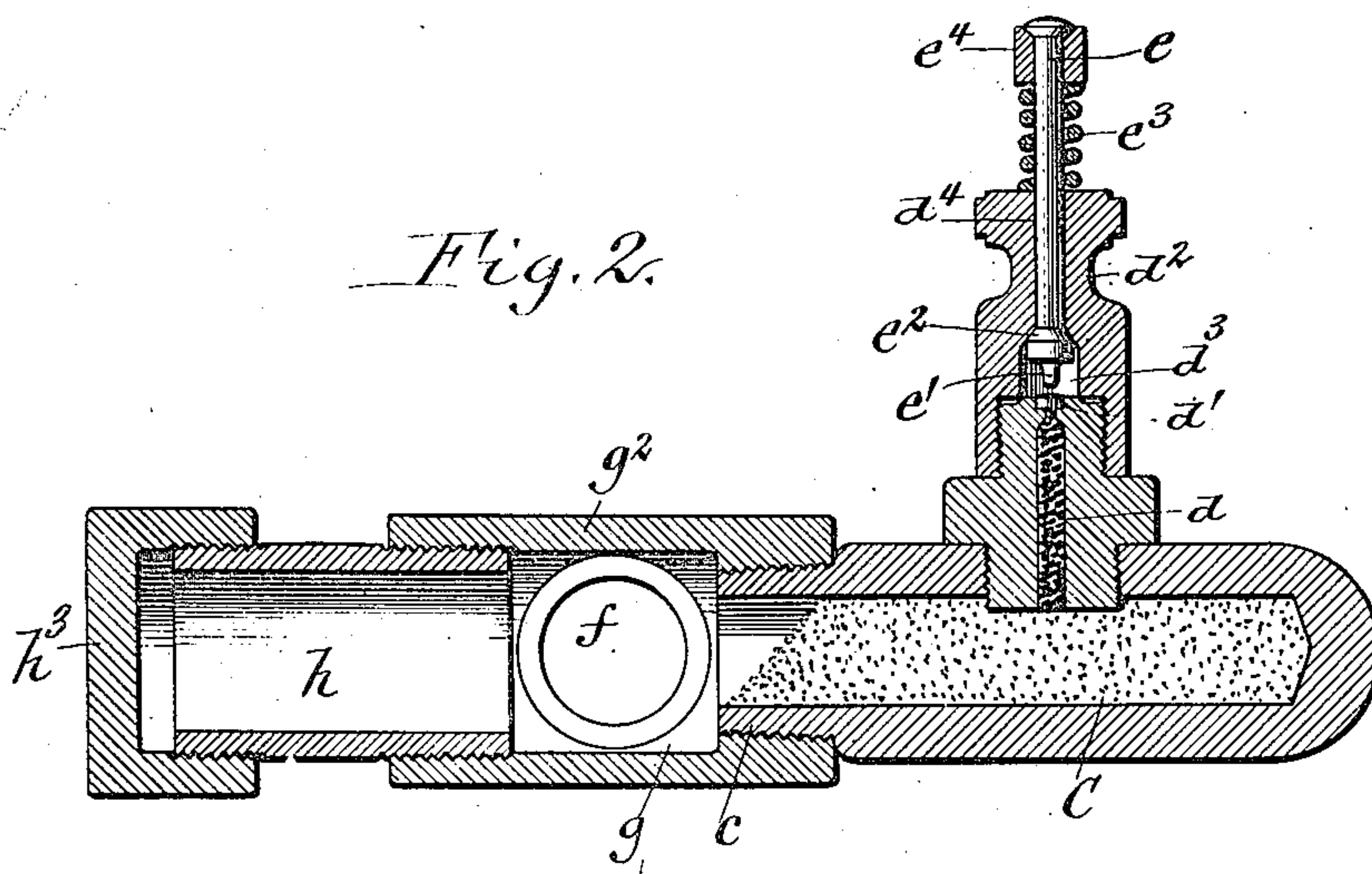


Fig. 2.

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UNITED STATES PATENT OFFICE.

JOHN W. RAYMOND, OF OIL CITY, PENNSYLVANIA, ASSIGNOR TO THE
STANDARD AUTOMATIC GAS ENGINE COMPANY, OF SAME PLACE.

STARTING DEVICE FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 636,452, dated November 7, 1899.

Original application filed February 21, 1898, Serial No. 671,193. Divided and this application filed November 17, 1898. Serial No. 696,679. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. RAYMOND, a citizen of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented a new and useful Improvement in Starting Devices for Gas-Engines, of which the following is a specification.

This invention relates to a starting device for gas-engines, and has for its object to produce a device for this purpose which permits of using loose powder as the motive agent and which prevents the residue of the burned powder from entering the working cylinder and interfering with the operation of the engine.

This application is a subdivision of an application for patent filed by me February 21, 1898, Serial No. 671,193.

In the accompanying drawings, Figure 1 is a fragmentary horizontal section of the cylinder and piston of a gas-engine provided with my improved starting device. Fig. 2 is a vertical section thereof, on an enlarged scale, in line 2 2, Fig. 1.

Like letters of reference refer to like parts in both figures.

A represents the cylinder of the gas-engine, and B the piston arranged therein.

C represents a main horizontal powder chamber or barrel provided on one side with a screw-threaded outlet-nipple *c*, which is connected by a conduit with an opening *c'* in one end of the cylinder so as to establish communication between the cylinder and the main powder-chamber.

d is a small auxiliary or priming powder-chamber which is arranged vertically and screws with its lower or inner open end into the upper side of the main powder-chamber. The upper open end of the auxiliary chamber is provided with an outwardly-facing seat *d'* for the reception of a percussion-cap.

*d*² is a guide-sleeve which screws upon the outer end of the auxiliary chamber and which is provided above the seat for the percussion-cap with a cavity *d*³ and a guide-opening *d*⁴, leading from this cavity to the upper end of the sleeve.

e is a vertically-movable plunger or rod

guided in the opening *d*⁴ of the sleeve and provided within the cavity of the sleeve with a firing pin or needle *e'* and with an upwardly-facing conical shoulder *e*², which engages with the correspondingly-shaped top of the cavity. The plunger and its needle are normally held in an elevated position by a spring *e*³, surrounding the plunger and bearing with its ends against the top of the sleeve, and a collar *e*⁴, arranged on the upper end of the plunger.

Preparatory to starting the engine the piston is moved so as to stand ready to begin its forward stroke, a quantity of slow-burning powder is placed in the main powder-chamber, a quantity of quick-burning powder is placed in the auxiliary chamber, and a percussion-cap is placed on the seat on the auxiliary chamber. The percussion-cap is placed on its seat by removing the guide-sleeve from the auxiliary chamber and replacing the same after the percussion-cap is on its seat. The slow-burning powder and the quick-burning powder may be poured into their respective chambers upon unscrewing the auxiliary chamber from the main chamber. Upon depressing the plunger quickly by the blow of a hammer or otherwise the firing-pin is driven into the percussion-cap, whereby the latter is exploded and the quick-burning powder is ignited. The combustion of the quick-burning powder ignites the slow-burning powder, and the expansion of the latter forces the piston forward with a working stroke. By employing slow-burning powder as the motive agent the engine may be started gradually and without injuriously jarring the engine, and the employment of a small quantity of quick-burning powder in the manner described reliably ignites the slow-burning powder, which is impractical when the ignition of the slow-burning powder depends upon the firing of a percussion-cap. The gas is prevented from leaking through the starter because the conical shoulder of the plunger-rod is pressed by the spring *e*³ against the shoulder on the guide-sleeve, thereby forming a check at this point.

It has been found in practice that the combustion of the slow-burning powder leaves a

residue. This residue, if permitted to enter the cylinder, fouls the same and the piston and becomes heated to an incandescent state by the repeated explosions in the cylinder, whereby a premature explosion of the charge of fuel in the cylinder is liable to take place. For the purpose of preventing the residue of the powder from entering the cylinder this residue is eliminated from the gases of the burned powder before the same reaches the cylinder by the following mechanism:

$f f' f^2 f^3$ represent the sections of an angular conduit or passage, whereby the nipple c of the starter is connected with the opening c' in the cylinder and which consist, preferably, of short pipes. Each of the conduit-sections is preferably arranged at right angles to the adjacent sections, so that the products of combustion of the powder are compelled to make sharp or abrupt turns in passing from the starter to the cylinder. The first conduit-section f is connected with its inlet by a T-coupling g to the outlet-nipple of the starter. The second section f' is connected with its inlet to the outlet of the first section by a T-coupling g' . The third section f^2 is connected with its inlet end to the outlet of the second section by a T-coupling g^2 , and the fourth section f^3 is connected with its inlet to the outlet of the third section f^2 by a valve-casing g^3 , while its outlet is connected with the engine-cylinder.

$h h' h^2$ represent pockets which open into the starter conduit or passage and which receive the residue of the spent powder, so that only the gas passes to the cylinder. The first pocket h is arranged in line with or faces the nipple of the main powder-chamber and is connected with the T-coupling g on the opposite side of the first conduit-section f . The second pocket h' faces the outlet of the first conduit-section f and is arranged on the opposite side of the second section f' , and the third pocket h^2 faces the outlet of the second section f' and is arranged on the opposite side of the third section f^2 . Each of these pockets consists, preferably, of a short piece of pipe, which is screwed into the adjacent T-coupling, and a screw-cap h^3 applied to the outer end of the pipe. Upon firing a charge of powder the gas and residue issuing from the starter rush through the conduit toward the cylinder. As the gas changes its course in passing from one conduit-section to another, the residue, owing to its greater momentum, tends to hold its course, whereby the residue is separated from the gas, and the latter, in a purified state, enters the cylinder. When the gas turns at right angles from the

outlet of the starter into the first conduit-section, the bulk of the residue is separated therefrom and deposited in the first pocket h . The residue separating from the gas in passing from the first section to the second section is deposited in the second pocket h' , and the remaining portion of the residue in the gas is separated therefrom and deposited in the third pocket h^2 as the gas passes from the second to the third conduit-section. After the engine has been started the fuel in the cylinder is prevented from passing into the entire starter-conduit by a valve i , arranged in the valve-case g^3 and adapted to bear against a valve-seat i' in the valve-case. Upon unscrewing the caps h^3 of the pockets $h h' h^2$ the residue may be removed therefrom.

I claim as my invention—

1. The combination with the engine-cylinder, of a horizontal starting-barrel containing a main powder-chamber which is closed at its outer end and open at its inner end and adapted to contain loose powder, a removable upright plug secured in the upper side of said barrel between the ends thereof and containing an auxiliary powder-chamber which opens at its lower end into the horizontal main chamber and has at its outer end a seat for the percussion-cap, a guide-sleeve mounted on the outer end of said plug, and a starting-rod guided in said sleeve and provided at its inner end with a firing-pin, substantially as set forth.

2. The combination with the engine-cylinder and the powder-chamber of the starting device, of a conduit connecting said powder-chamber and cylinder and consisting of a number of sections, each section being deflected or arranged at an angle with reference to the adjacent sections, and pockets opening into the conduit and each pocket facing the outlet of one of said sections, substantially as set forth.

3. The combination with the engine-cylinder and the powder-chamber of the starting device, of a conduit connecting said powder-chamber and cylinder and consisting of a number of sections, each section being arranged at an angle to the adjacent sections, pockets opening into the conduit and each pocket facing the outlet of one of said sections, and caps closing the outer ends of said pockets, substantially as set forth.

Witness my hand this 9th day of November, 1898.

JOHN W. RAYMOND.

Witnesses:

R. S. GRAY,
W. E. BLANEY.