(No Model.)

2 Sheets—Sheet 1.

J. RICHARDSON & W. NORRIS.

COMBUSTION CHAMBER FOR PETROLEUM OR HYDROCARBON ENGINES.

No. 500,674. Patented July 4, 1893.

FIG. 1

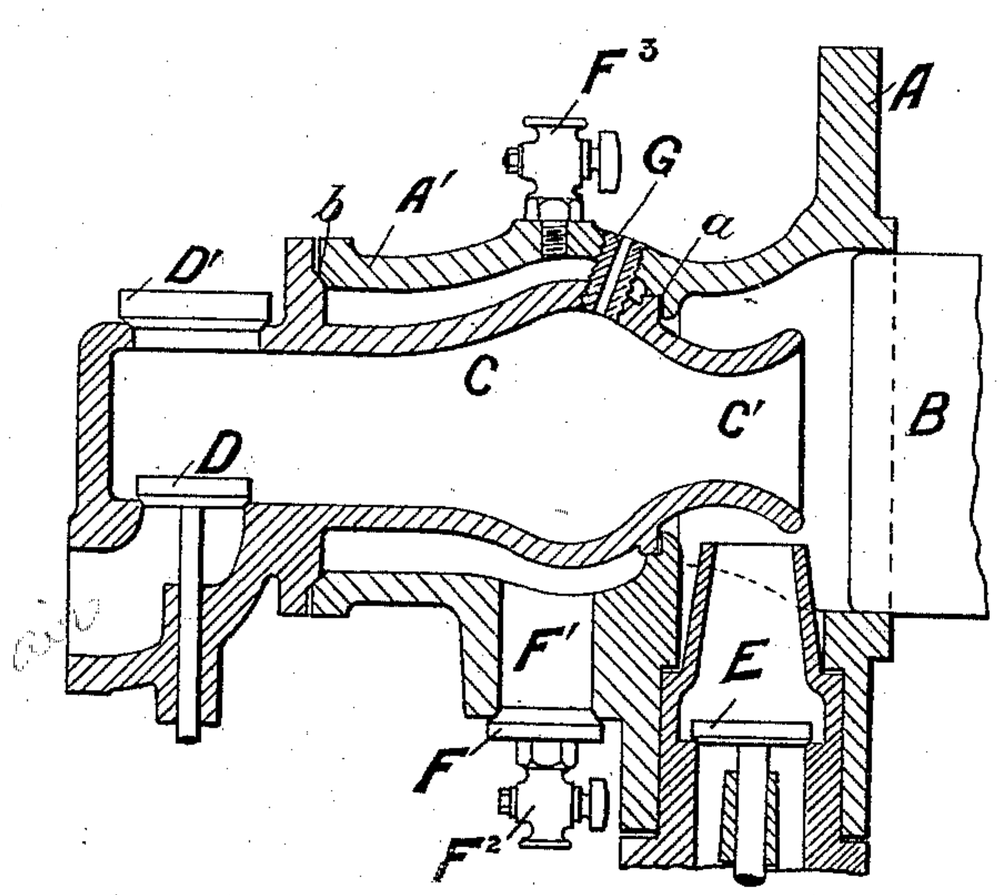
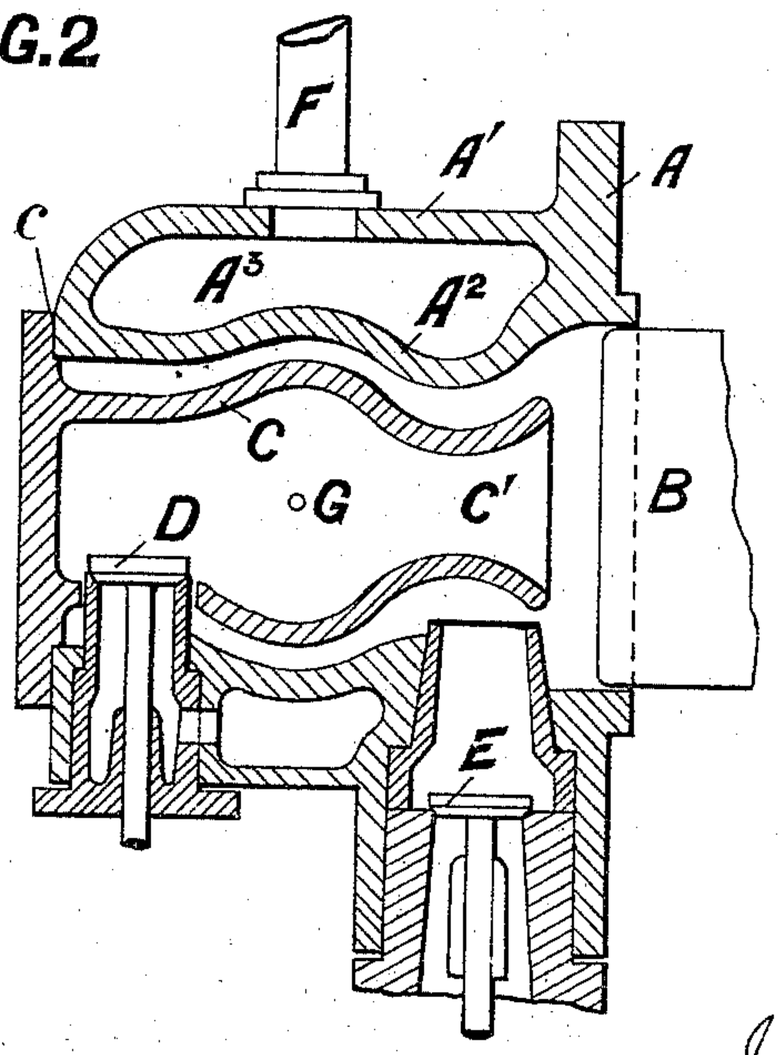


FIG. 2



Witnesses:
Walter Allen
Louis O. Thomasson

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Attorney

(No Model.)

2 Sheets—Sheet 2.

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FIG. 3

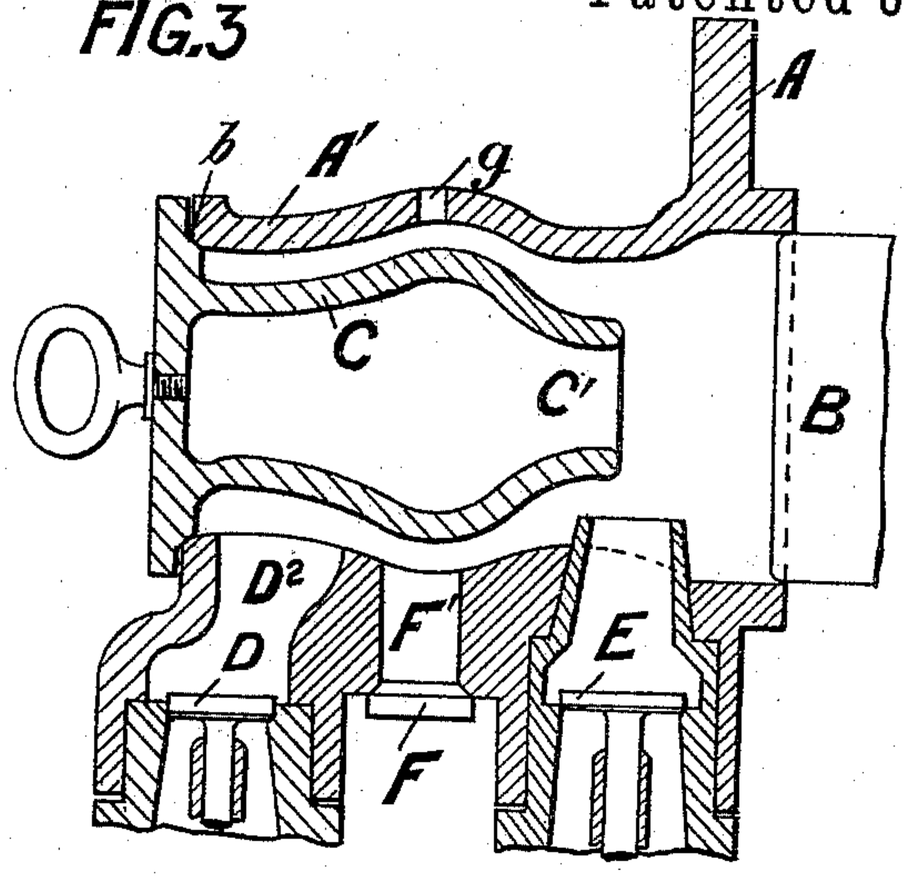


FIG. 4

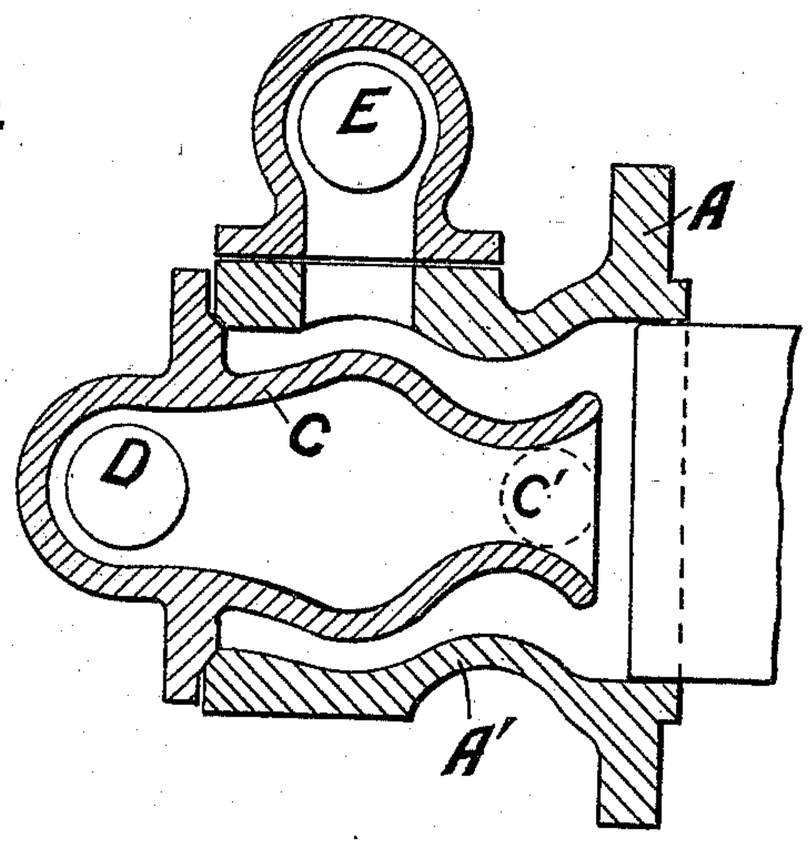


FIG. 5

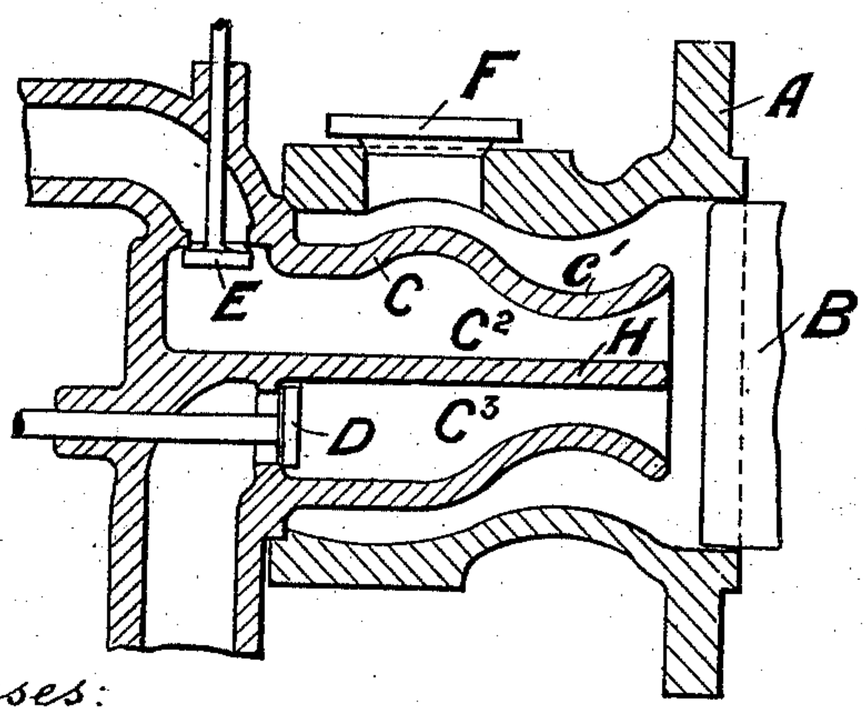
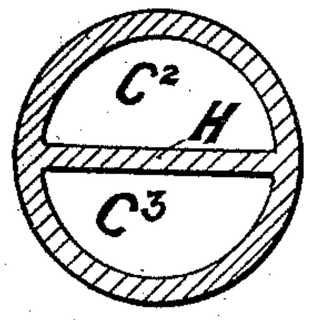


FIG. 6



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UNITED STATES PATENT OFFICE.

JOHN RICHARDSON AND WILLIAM NORRIS, OF LINCOLN, ENGLAND.

COMBUSTION-CHAMBER FOR PETROLEUM OR HYDROCARBON ENGINES.

SPECIFICATION forming part of Letters Patent No. 500,674, dated July 4, 1893.

Application filed March 12, 1892. Serial No. 424,646. (No model.)

To all whom it may concern:

Be it known that we, JOHN RICHARDSON and WILLIAM NORRIS, citizens of Great Britain, residing at Lincoln, in the county of Lincoln, England, have invented certain new and useful Improvements in Combustion-Chambers for Petroleum or Hydrocarbon Engines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to that type of petroleum or hydrocarbon engines in which a combustible mixture is vaporized by contact with the heated walls of a combustion chamber, and an explosive mixture subsequently formed by admixture with air is ignited under compression by contact with the said heated walls.

The objects of our invention are to so arrange our combustion chamber that the surfaces readily and completely vaporize the petroleum or hydrocarbon pumped upon them; that the surfaces retain a sufficient part of the heat of explosion to ignite the next explosive charge when in a state of compression; that the hottest part of the chamber may be readily withdrawn and replaced without disturbing the valve connections or inlet and discharge pipes; that the valve passages are conveniently accessible; and that arrangements are conveniently applied to heat up the combustion chamber for starting the engine.

In the drawings: Figure 1 is a longitudinal vertical section through a combustion chamber constructed according to this invention. Fig. 2 is a similar view, but shows a modification. Fig. 3 is also a similar view and shows a second modification. Fig. 4 is a longitudinal sectional view showing a third modification. Fig. 5 is a longitudinal vertical section, similar to Fig. 1, and shows a fourth modification. Fig. 6 is a cross section through the part C in Fig. 5.

In Fig. 1, the flange A carrying the casing A′ bolts to the end of the water jacketed engine cylinder. B is the engine piston and the air inlet valve D as well as the exhaust valve E are actuated from a valve shaft geared to the engine shaft to give the two to one action in any well known manner. The air inlet valve may be automatic if desired, but we prefer it to be opened and closed positively. The combustion chamber C is inserted within the casing A′ from behind, and is secured against the seat *b* and face *a* by suitable bolts. The valve cover D′ is bolted down and allows of ready access to the air inlet valve D. The aperture F′ and the seated cover plate F carrying a cock or valve F^2 permit flame from a blast lamp or other convenient source to be applied in the first instance to heat the combustion chamber C. F^3 is an outlet cock from the casing between A′ and C. When this chamber is sufficiently hot the engine is started and acts in the following manner:—The piston B on one out stroke draws a charge of air into the cylinder through the valve D opened as hereinbefore described in any suitable manner. After this suction stroke, or during it, petroleum or hydrocarbon is pumped into the combustion space through the aperture G, and the liquid immediately upon striking the hot surfaces evaporates, and mixing with the gases in the cylinder forms a combustible charge. This charge is compressed on the return stroke of the piston B into the chamber C, and coming into contact with the hot walls it ignites, when the said piston is at or near the in end of its stroke and so propels the piston on its next outward stroke. On the succeeding return stroke the exhaust valve E is opened and the burned gases discharge through it to the atmosphere. The heat of each explosion supplies sufficient heat to the walls of the chamber C to maintain a temperature high enough for effective explosion and evaporation.

In Fig. 2 the flange A bolts to the engine cylinder as in Fig. 1, but the flange carries a double casing A′, A^2 and the combustion chamber C is secured to A′, A^2 by a single joint *c* and suitable studs or bolts. Here also the air inlet and exhaust valves are respectively lettered D and E. The hydrocarbon is pumped either into the interior of C or upon the external surface of C within the casing A^2. The oil may be pumped in through the aperture G. The pipe F supplies air to the casing A^3, and the air is admitted by way of the valve D from the said casing in a somewhat heated state. The vapor of the oil, whether produced by the internal or external surface of the chamber C, ultimately mixes with the air

to form an explosive charge, which charge i ignited by the hot walls after compression. The chamber C, it is to be noted, can be very readily withdrawn by pulling down the valve box of the valve D and unscrewing the nuts holding the flange to the facing *c*.

In Fig. 3 a single casing A′ carries a combustion chamber C, and the chamber is arranged to bolt up to a facing *b* and may be readily removed by undoing one joint without disturbing the air inlet valve D or the exhaust valve E. The passage D^2 in this case leads from the air valve D to a space outside the chamber C. The oil is pumped into this external space through the aperture *g* and is evaporated by the external surface of the combustion chamber.

In Fig. 4 the chamber C carries the air inlet valve D and the exhaust valve E is arranged at the side of the casing. Fig. 4 is a plan.

In Fig. 5 the combustion chamber C′ carries the exhaust valve E and air inlet valve D. It is also divided into two chambers C^2, C^3 by a partition H. The oil may be injected into one of these divisions or on the external surface of the combustion chamber. In all these combustion chambers we prefer to narrow the entrance as shown at C′ throughout. By these arrangements we are enabled to construct effective combustion chambers for petroleum or hydrocarbon engines which are still readily accessible for cleaning and may be withdrawn without difficulty when required. At the same time, the arrangements are such that the heat of the explosions maintains the combustion chamber walls at a sufficiently high temperature, to perform the functions of igniting and evaporating.

What we claim is—

1. The combination, with the casing A′ adapted to be secured to the end of the cylinder, of a removable combustion chamber C provided with an enlarged middle portion and a contracted orifice C′ projecting within the air space of the said casing next to the cylinder, and having its rear end secured to the rear end of the said casing leaving an air space between the said combustion chamber and the casing, and an inlet for oil arranged opposite the said enlarged middle portion of the combustion chamber, substantially as and for the purpose set forth.

2. The combination, with the casing A′ adapted to be secured to the rear end of the cylinder, of a removable combustion chamber C provided with an enlarged middle portion, a contracted orifice C′ next to the cylinder, an inlet for oil at its middle portion and an inlet for air at its rear end, said combustion chamber having its rear end secured to the rear end of the said casing, substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN RICHARDSON.
WILLIAM NORRIS.

Witnesses:
HENRY OGLEY,
I. R. RAITHBY,
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