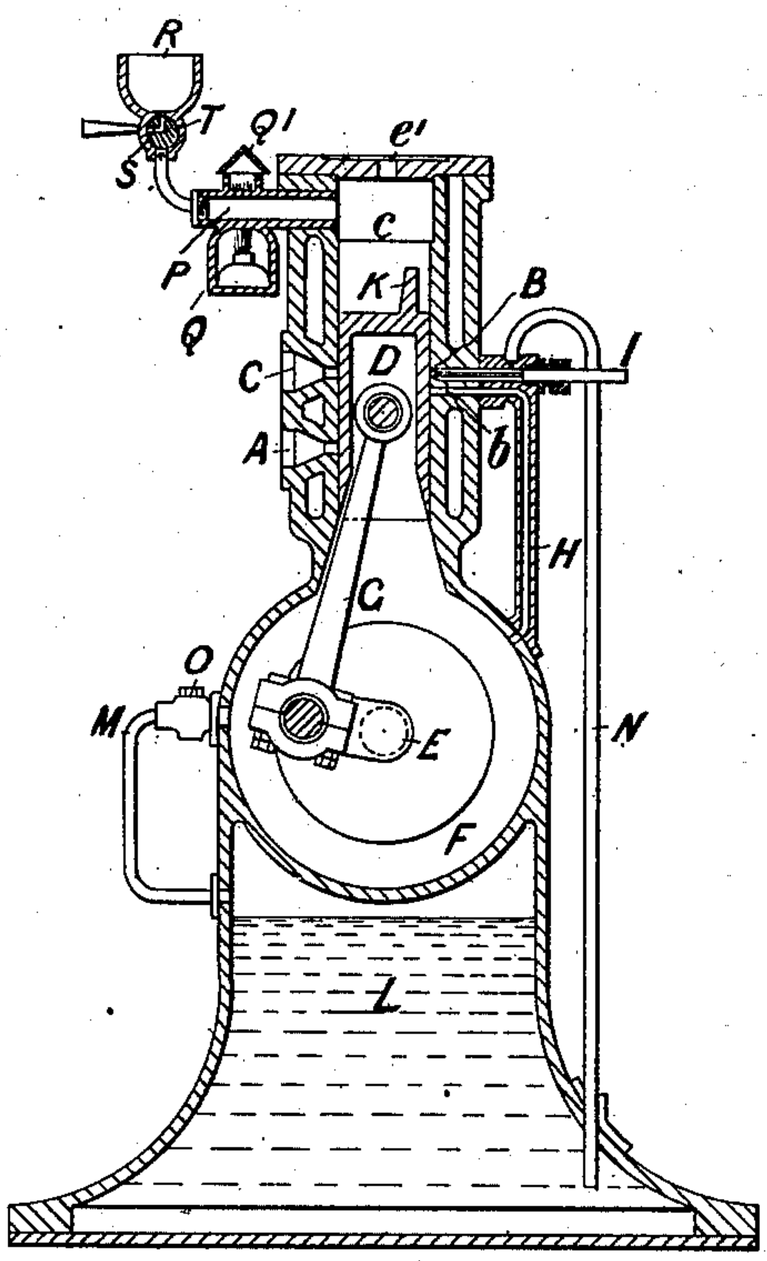
No. 661,599. Patented Nov. 13, 1900.

J. DAY.

OIL ENGINE.

(Application filed Dec. 28, 1897.)

(No Model.)



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JOSEPH DAY, OF WESTON-SUPER-MARE, ENGLAND.

OIL-ENGINE.

SPECIFICATION forming part of Letters Patent No. 661,599, dated November 13, 1900.

Application filed December 28, 1897. Serial No. 663,980. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH DAY, a subject of the Queen of Great Britain and Ireland, residing at Weston-Super-Mare, in the county of Somerset, England, have invented new and useful Improvements in Oil-Engines, (for which I have obtained patents in the following countries: Great Britain, No. 15,514, bearing date August 17, 1895; France, No. 258,058, bearing date July 13, 1896; Belgium, No. 122,489, bearing date July 13, 1896; Italy, No. 42,729, bearing date September 30, 1896, and Portugal, No. 2,319, bearing date July 16, 1897,) of which the following is a specification.

My invention has relation to hydrocarbon or like motive fluid engines; and it has for its object certain improvements whereby the construction of the engine is materially simplified and the space occupied thereby considerably reduced.

In the accompanying drawing I have shown by a vertical sectional view a vertical engine embodying my improvements, *c* indicating the power-cylinder, which is jacketed, as usual, for the circulation of a cooling agent and has formed therein four ports—namely, an air-intake port A and an exhaust-port C for the products of combustion and two ports *b* and B, the former for the admission of air under pressure into the combustion-chamber of the power-cylinder *c* and the port B for the admission into said cylinder of hydrocarbon.

The power-cylinder is secured to or has formed at its lower end an air-chamber F, and the hollow base for the engine constitutes the reservoir L for the liquid hydrocarbon, said reservoir being connected near its upper end with the air-chamber F by a by-path or pipe M, in which a suitable check-valve O is interposed.

The air-chamber F is preferably so constructed as to form a casing for the crank on the crank-shaft E, said chamber having fluid-tight bearings for said crank-shaft to which a hollow piston D, open at its outer end, is connected in the usual manner through a connecting-rod G.

The reservoir L is connected by a by-path or pipe N with a passage leading to port B in the power-cylinder *c*, which port is controlled by a needle-valve I, which is or may be operated in a well-known manner from the crank-shaft E, and the air-chamber F is connected through a by-path or pipe N with the air-distributing port B in said cylinder.

To the upper end of the power-cylinder *c* is connected a pipe P in communication with a cup R through a suitable pipe in which is interposed a stop-cock T, having a two-way passage S, and to said pipe P is attached a heater in the form of a lamp. In the upper or outer head of the power-cylinder is formed an opening *c'* for the igniter, which may be of any known description, as a hot tube, for example, which I have deemed unnecessary to illustrate.

The ports A C B *b* are arranged relatively to the travel of the piston D to cause the engine to operate as follows: In starting, the cup R is filled with liquid hydrocarbon and the lamp Q lighted to heat the pipe P. The piston D may now be moved to the limit of its downstroke, thereby uncovering ports C B *b*, air from the chamber F flowing through port *b* into the combustion-chamber of the power-cylinder above the piston D, the rotation of the crank-shaft being continued, thereby moving the piston inwardly and closing the ports C B *b*. If now the stop-cock T is manipulated to supply hydrocarbon to the highly-heated pipe P, vaporization will take place almost instantaneously, the vapor formed flowing into the combustion-chamber, which, together with the air therein, is compressed as the piston continues its upstroke, and before it reaches the limit of its inward movement the explosive compound is ignited, thus causing the piston to make its downstroke when the stop-cock T is closed. As the piston moves upwardly a partial vacuum is formed in the air-chamber F, and as the port A is uncovered air rushes into said chamber. The downstroke of the piston has for its result as follows: closure of the air-port A, compression of the air in chamber F, and the forcing of a portion thereof into the reservoir L, uncovering of exhaust-port C and of ports B and *b*, and admission of air to the power-cylinder through port *b*, which assists in expelling the products of combustion. At the next upstroke the first-described operations are repeated—namely, the stop-cock T is again opened to admit hydrocarbon to pipe P, the closing of the ports C B *b* and the opening of

the port A, and finally the ignition of the explosive charge in the combustion-chamber. A few revolutions of the crank-shaft E will suffice to raise the pressure in chamber F and reservoir L sufficiently to cause the engine to work automatically, the supply of hydrocarbon from cup R being then cut off and the engine supplied with hydrocarbon from reservoir L under the pressure therein and with air from the chamber F, as will be readily understood.

It will be observed that the air-port *b* and the hydrocarbon-port B are located almost diametrically opposite the exhaust-port C and that said three ports will be open at a certain point of the downstroke of the piston D, while the exhaust-port C will remain open for a short period during the upstroke of said piston, and as said ports B and *b* are located nearly opposite exhaust-port C a portion of the air and hydrocarbon supplied to the explosive-chamber of the power-cylinder is liable to escape therefrom with the products of combustion. To avoid this, I form on the inner face of the piston D proximate to said ports a ledge or projection K, which forms between it and the cylinder-wall a directing-passage that directs the air and hydrocarbon admitted to the combustion-chamber inwardly or upwardly toward the cylinder-head, so that the charge of air and hydrocarbon admitted under pressure will assist in driving out the products of combustion without danger of waste of explosive fluid. It will furthermore be observed that the port B for the admission of the hydrocarbon is located very near to and above the air-admission port *b*, so that the liquid hydrocarbon as it issues from port B is sprayed or atomized by the air and immediately vaporized by the heat radiated from the cylinder-walls and by the heated projection K, against which the hydrocarbon is projected as soon as port B is uncovered by the piston D while the air is more or less heated, thus forming an explosive compound, which when ignited drives the piston D. It may finally be observed that inasmuch as the air-chamber F is in direct communication with the hollow piston D the pressure in said chamber will in a measure assist the momentum of the fly wheel or wheels usually provided on the crank-shaft, but not shown, in effecting the instroke or upstroke of the piston.

Although I have illustrated my invention in its application to vertical engines, it is obvious to any engine-builder that said invention is applicable also to horizontal engines.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a hydrocarbon-motor, an oil-reservoir, an air-compressing chamber, a passage connecting the two, means for checking backflow of air from the reservoir to the chamber, the piston-cylinder having oil and air feed ports respectively in communication with said oil-reservoir and air-compressing chamber, means controlling the supply of oil to the cylinder, said oil-port proximate to, in line with and outwardly of said air-port, exhaust and air-intake ports in the cylinder practically opposite the aforesaid oil and air feed ports, said air-intake port adapted to be placed in communication with the air-compressing chamber, the piston whose movements control all of the aforesaid ports and a suitable igniter, substantially as and for the purpose set forth.

2. In a vertical hydrocarbon-motor, an oil-reservoir, crank-casing and power-cylinder arranged one above the other, said crank-casing serving as an air-compressing chamber, a passage connecting the latter with the oil-reservoir, a check-valve in said passage, oil and air feed ports in the cylinder respectively in communication with the reservoir and crank-casing, means controlling the supply of oil to said cylinder, said oil-feed port proximate to, in line with and outwardly of air-feed port, exhaust and air-intake ports in the cylinder practically opposite the aforesaid oil and air feed ports, the piston having a deflector on the side of said feed-ports, the movements of said piston controlling all of the aforementioned ports and acting as a compressor, said air-intake port located to communicate with the crank-casing at a certain point of the stroke of the piston, and a suitable igniter, substantially as set forth.

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Witnesses:
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