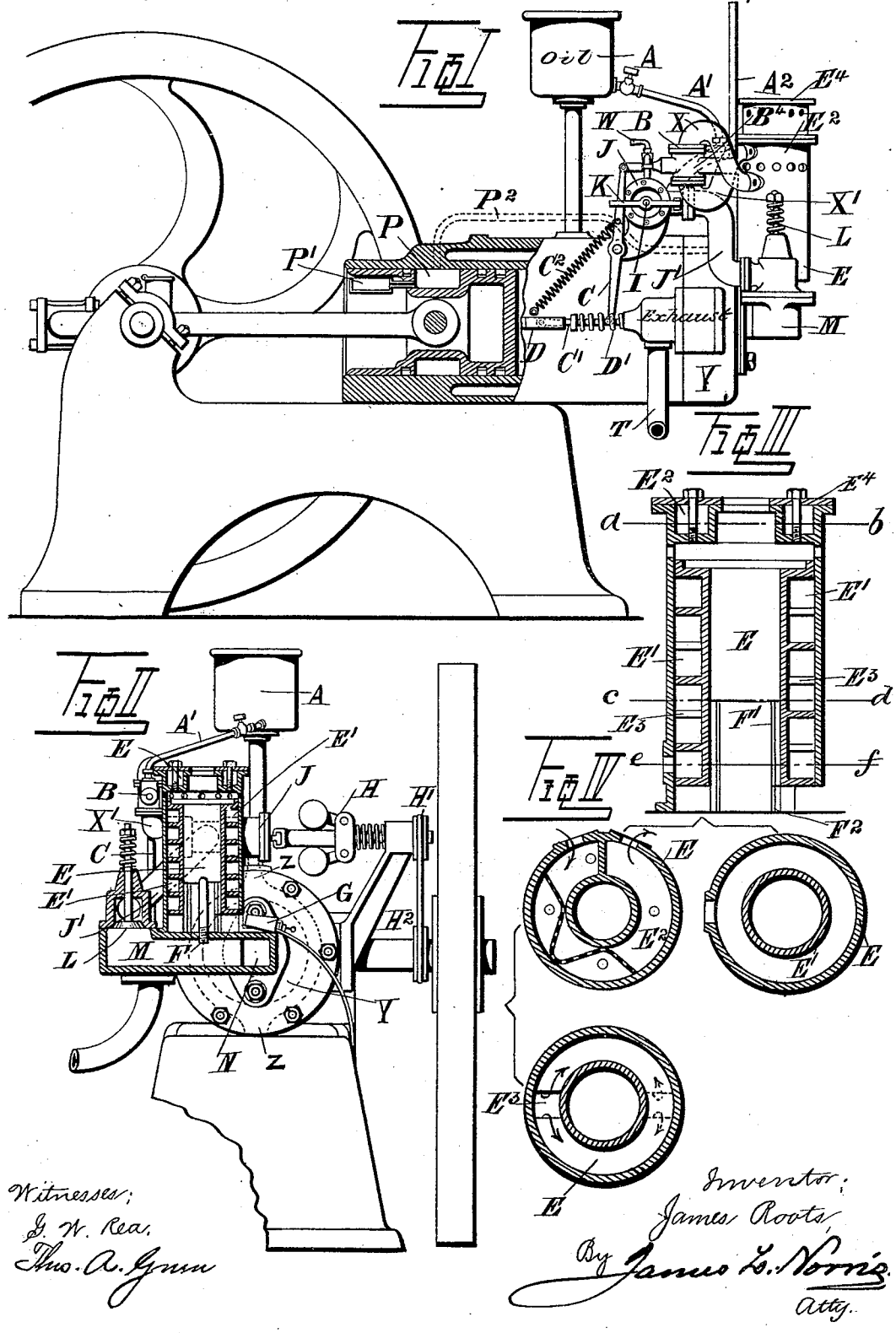
(No Model.) 2 Sheets—Sheet 1.

J. ROOTS.

PETROLEUM OR LIQUID HYDROCARBON ENGINE.

No. 511,651. Patented Dec. 26, 1893.



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(No Model.)

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Fig. I.

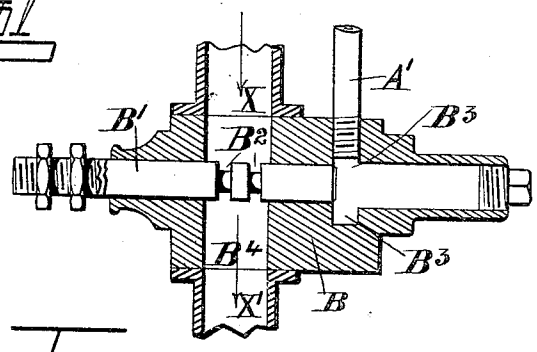


Fig. II.

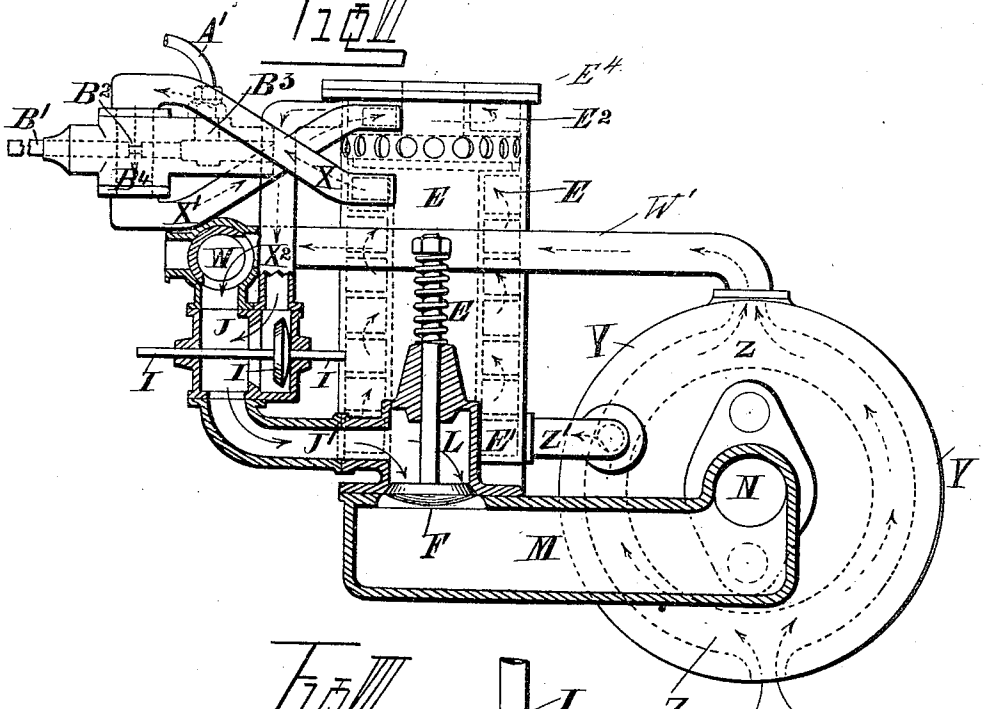
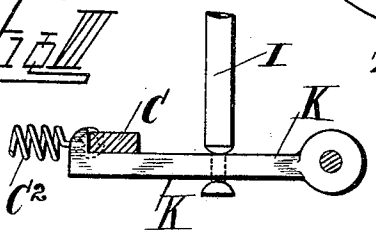


Fig. III.



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UNITED STATES PATENT OFFICE.

JAMES ROOTS, OF LONDON, ENGLAND.

PETROLEUM OR LIQUID-HYDROCARBON ENGINE.

SPECIFICATION forming part of Letters Patent No. 511,651, dated December 26, 1893.

Application filed July 24, 1893. Serial No. 481,300. (No model.) Patented in England November 7, 1891, No. 19,275; in France September 12, 1892, No. 224,291; in Belgium October 3, 1892, No. 101,588, and in Italy November 30, 1892, XXVII, 33,075, LXV, 62.

To all whom it may concern:

Be it known that I, JAMES ROOTS, a subject of the Queen of Great Britain, and a resident of Holborn Place, 261 High Holborn, London, England, have invented certain new and useful Improvements in Petroleum or Liquid-Hydrocarbon Engines, (patented in Great Britain, No. 19,275, dated November 7, 1891; in France, No. 224,291, dated September 12, 1892; in Belgium, No. 101,588, dated October 3, 1892, and in Italy, Vol. XXVII, No. 33,075, Vol. LXV, No. 62, dated November 30, 1892,) of which the following is a specification.

This invention consists in the features of construction and novel combinations of parts in a petroleum or liquid hydrocarbon engine as hereinafter described and claimed.

Figure 1, is an elevation and part section showing the parts as arranged. Fig. 2, is an end elevation and part section of the same. Fig. 3, is a vertical section of the ignition tube casing which forms the air heater and vaporizer. Fig. 4, shows cross sections of Fig. 3 on lines *a, b; c, d;* and *e, f.* Fig. 5, is a view on a larger scale of the oil feeder and groove or grooves. Fig. 6, is a diagram for the purpose of more clearly showing the action of the invention, the arrows indicating the passage of the air or oil and air. Fig. 7 is a detail view of the clutch or hook governing the oil feed.

The oil flows from the reservoir A when the stop cock is opened to the feeder B within which is fitted the rod plunger B′ provided with the groove or grooves B^2. The rod or plunger B′ is thrust in by the lever C the other end of which is connected by a slotted link C′, Fig. 1, to the reciprocating side shaft D operated in the usual manner to open the exhaust valve D′. The spring C^2 which is fixed to a stationary pin fixed in the side of the cylinder returns the lever C which pulls out the grooved plunger B′.

B^3 is the oil space and B^4 the air channel into which the oil is delivered by the groove B^2.

E Figs. 3 and 4 is the ignitor tube casing. Air only passes through the lower channels E′ of the ignition tube casing E and air and oil through the upper channel E^2 only.

Alternate portions of the dividing ribs as shown in Figs. 3 and 4 are cut away to form a port so that the air traverses the whole of the channels successively, half the air passing round one side and half on the other of the same channel, the two currents of air meeting at the next port or part cut away E^3, and traversing in the same way the next channel.

E^4 Figs. 1, 3 and 6, is a casing or cover placed over the top of the channel E^2 to retain more of the heat of the flame by preventing radiation and deflecting the flame over the top of E^2.

F is the ignition tube kept hot by the flame from the burner G.

F′ is a loose tube or casing carrying an asbestus lining fitting within E having a hole or port F^2 in it through which the flame is directed from the burner G. The object of F′ is to enable a new ignition tube to be readily screwed in without taking off the casing E. F′ slides up within E and enables a pair of pliers to be used upon the tube F.

H is the governor driven by a strap from the crank shaft by the pulleys H′ and H^2 or by any other convenient method. When the speed becomes excessive the centrifugal action of the governor pulls the valve spindle I and closes the valve in the valve box J thus cutting off the mixture of oil and air. The other end of the valve spindle I is provided with a collar, which passes through the small rod K pivoted at one end and provided with a hook or clutch at the other. The clutch or hook is pulled forward at excess speed simultaneously with the closing of the valve I and prevents the outward or normal movement of the lever C and the plunger B by means of the spring C^2. This is shown on a larger scale at Fig. 7.

Fig. 6 is a diagram for the purpose of showing the working of the invention but in which the parts are not in their exact relative positions in order to render the working more clear, the arrows indicating the direction of the air and working charge. The air enters a channel Z preferably cast in the cylinder cover Y and passing into the tube Z′ enters the lower channel of the casing E and thence through all the channels E′. It then passes through the pipe X to the air space B^4 in the

feeder B, the groove B^2 delivering its feed of oil into the air space during the suction stroke by means of the spring C^2 shown in Fig. 1. The air sweeps off the charge of oil and both together then pass through the pipe X′ to the top or vaporizing channel E^2 a portion of which may be fitted with a piece of gauze as shown at Fig. 4. A piece of gauze not shown may also be fitted in B^4 under the groove to receive the oil. The air and oil together heated and mixed in E^2 pass through the pipe X^2 to the valve box J when if the valve I be open the mixture passes by the pipe J′ and by the admission valve L to the explosion channel M and by the port N into the cylinder. After the engine has been running for a short time the two way valve W is opened by hand, and heated air passes through the channels Z in the cover, then by the pipe W′ through the valve W as shown to further dilute the oil and air mixture passing into the valve box J by the pipe X^2. The valve W may be turned so that half heated and half unheated air is permitted to flow through W. Only one valve is shown on the valve spindle I but in larger engines a second valve is fitted on the same spindle to balance the resistance to the action of the governor. On the return stroke of the piston the charge is compressed into the hot tube F and fired.

A^2 is an air pipe for conveying away the air displaced from the oil groove in the feeder B, but which is not necessary if the pipe A′ be large enough to readily convey the displaced air to the oil reservoir.

In Fig. 1 is shown the condensing space or chamber P in the piston to which is attached the small cooling chamber P′ connected by pipe with it. The cooling chamber P′ is closed on all sides and provided with thin walls. Being arranged to move with the piston, in and out, in contact with the air it is kept cool and thus condenses the vapors in the communicating chamber.

P^2 is the pipe in dotted lines which when connected with the admission channel may be used to draw the uncondensed vapor from the piston space P.

It will be observed in the oil feeder Fig. 5 that the construction is such that neither gland nor any packing is required and yet there is no leakage. In the only working part where there could be leakage *i. e.* the outside guide of the plunger B′ there is a tendency for air to be drawn through during the suction stroke.

What I claim, and desire to secure by Letters Patent, is—

1. In an oil engine, the combination with the ignitor F, and burner G, of the air and oil heater E, having partitions provided with intercepting channels E′, for air and with channels E^2, for oil and air, substantially as shown and described.

2. In an oil engine, the combination with the oil reservoir A, and the air and oil heater E, of the oil feeder B having oil chamber B^3 and air chamber B^4, the pipe A′ through which the oil reservoir and oil feeder communicate the grooved plunger B′, and tubes through which the oil feeder communicates with the oil and air heaters, substantially as described.

3. In an oil engine, the combination with the cylinder and its exhaust valve D′, of the oil feeder B provided with plunger B′, the lever C provided with a central fulcrum and having its ends connected with said plunger and exhaust valve, and means for actuating said lever, substantially as described.

4. In an oil engine, the combination with the ignition tube F, the casing E, and the burner G, of the asbestus lined tube F′ surrounding the ignition tube and provided with an opening F^2 opposite the burner, substantially as described.

5. In an oil engine, the combination of the casing E having channels E′, E^2, the cylinder cover Y provided with air channels Z, the tube Z′ leading from the channel Z to the air channels E′ of the casing E, the valve box J provided with valve I, the oil feeder B having tubes X, X′ connecting with the casing E, the pipe J′ leading from the valve box J to the lower part of the casing E, the ignitor F and the valves W and L, substantially as described.

6. In an oil engine, the combination with the cylinder and piston, of the condenser P and closed cooling chamber P′ carried by the piston and communicating with each other, substantially as described.

In witness whereof I have hereto set my hand this 20th day of June, 1893.

JAMES ROOTS.

In presence of—

RICHARD CORE GARDNER,
Patent Agent, 166 *Fleet Street, London, England.*

MARTIN BROWN,
1 *London Street, Fulham, England.*