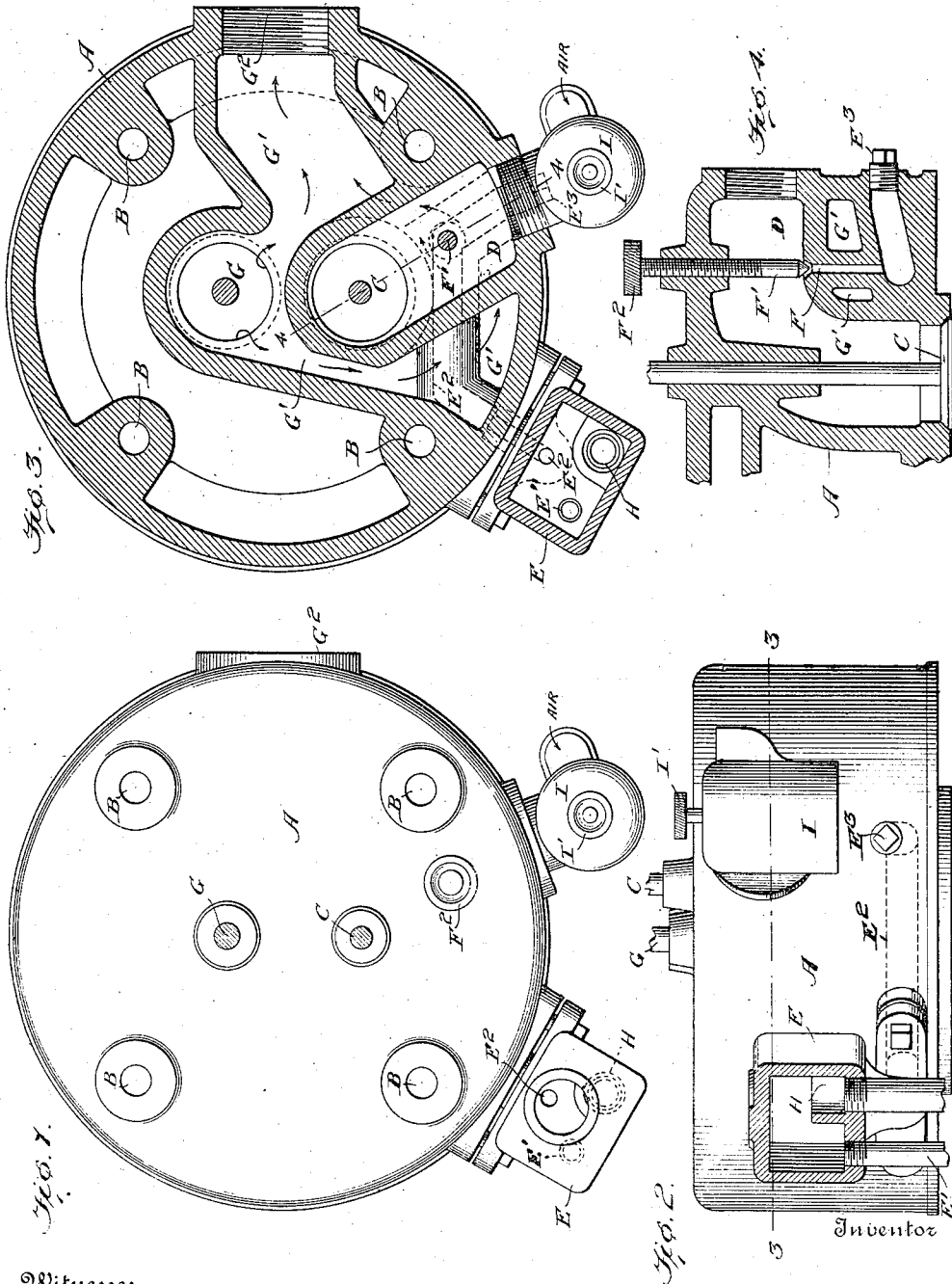


W. F. FREIDAG.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED JULY 9, 1910.

1,013,759.

Patented Jan. 2, 1912.



Witnesses
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INTERNAL-COMBUSTION ENGINE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM F. FREIDAG, citizen of the United States, residing at Freeport, in the county of Stephenson and State of Illinois, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

The general object of this invention is to provide an improved internal combustion engine adapted to use heavy hydrocarbon fuel, the special devices employed preferably being such that they may replace analogous parts of the ordinary engine of similar type using gasoline or the like light hydrocarbon.

The novel features are found in the cylinder head and attachments thereof, the head being provided with an exhaust chamber in which lie both a heavy oil passage and an air and fuel channel leading to the interior of the cylinder.

In the accompanying drawings, Figure 1 is a plan view of the cylinder head and certain attachments, other accessories not involved in the invention not being shown. Fig. 2 is a side elevation of the same devices. a certain small reservoir adjacent to the head being shown in vertical section. Fig. 3 is a section on the line 3—3, Fig. 2, a second small reservoir being shown in plan view. Fig. 4 is a section on the line 4—4, Fig. 3.

In these views, A represents a hollow cylinder head provided with bolt holes B, B by which it may be secured to the ordinary cylinder. In the lower wall of the head is a valve C to which a fuel and air passage D leads from the margin of the head. Without the head is a small open reservoir E into which heavy oil from any suitable source is introduced by a pipe E' and from which a small channel E² in the body of the head leads inward and again outward, its end opposite the reservoir being closed by a screw plug E³, or the like, which permits opening the passage for cleaning. This channel passes below the passage D and communicates therewith by means of a passage F, controlled by a valve F' operated by a hand wheel F² or the like. In order that the liquid in the reservoir may be discharged uniformly into the passage D, whether or not the supply to the reservoir is invariable,

the latter is provided with an overflow passage H through which the liquid escapes as soon as it reaches a predetermined level a little above the plane of the lower wall of the passage D. The lower wall of the head is also provided with an exhaust valve G which admits the exhaust gases from the cylinder into a large chamber G' whence they pass out through an opening G². This chamber extends around both the passage D and the fuel channel E², so that these receive the heat of the gases and transmit it to the material on its way to the admission valve. I also provide a second reservoir I, without novelty, for gasoline or light hydrocarbon liquid. This reservoir is provided on one side with a large nipple or tubular projection which is screwed into the outer open end of the passage or mixing chamber D, which as appears from Figs. 2 and 4 is near the top of the head, above a portion of the exhaust chamber G', (Fig. 4) and still farther above that portion of the passage E² which is closed by the plug E³. As indicated in Figs. 1, 2, 3, air enters the chamber D through the structure I and its nipple, and a valve I' admits or cuts off gasoline so that the entering air is carbureted or otherwise. Such carbureting devices being very common and well known are not here shown in detail, the only thing here important being that air enters the chamber D freely and that it may at will be supplied with gasoline by any ordinary device for such purpose. Owing to the fact that the liquid in the constant-level open reservoir E is always a little above the outlet of the passage E² that passage is normally full; and even if the liquid should be vaporized while in the passage, no harm could result since the reservoir is a sort of expansion tank.

It is obvious that since the exhaust gases at every impulse sweep over the conduit E² and around the chamber D, and since the conduit lies between the exhaust chamber and the cylinder space from which the gases come, the chamber D and the conduit are always highly heated when the engine is running. If the engine be started as a gasoline engine, the valve F' being closed and the valve I' being open, the oil in the conduit E² is quickly heated, and if the valve I' be then closed and the valve F' be opened, the heavy oil is instantly substituted for the

gasolene, as the motor fuel; and obviously the reverse substitution may thereafter be made at any time.

Ordinarily the head is a single piece cored out to form the working passages and to avoid unnecessary weight, and it is a matter of practical moment that it can replace the head of other constructions, when it is desired to change from light to heavy fuel, without great expense. In such case it is only necessary to bolt the new head in the place of the old one and suitably connect the two pipes of the constant level reservoir.

What I claim is:

1. The combination with a cylinder head provided with an internal exhaust chamber, with a mixing chamber within the exhaust chamber, and with a heavy oil conduit leading from without the head through the exhaust chamber into the mixing chamber, a valve controlling the delivery end of said conduit, means for supplying air to the mixing chamber, and valve controlled means for supplying light hydrocarbon liquid to the mixing chamber.
2. The combination with a cylinder head provided with an internal mixing chamber communicating with the external air, with a heavy-oil conduit leading from without the head into said chamber, and with an exhaust chamber adapted to permit exhaust gases to pass over the exterior surfaces of said mixing chamber and conduit before escaping from the head, a hand valve for closing the discharging end of said conduit, a heavy-oil reservoir communicating with the intake end of said conduit and arranged to keep the latter filled, and hand controlled means for supplying light hydrocarbon liquid to said mixing chamber.
3. The combination with a one-piece cylinder head having an internal exhaust chamber, a mixing chamber projecting into the upper part of the exhaust chamber, and

a conduit leading from without along the lower part of the exhaust chamber and into said mixing chamber, of a reservoir secured to the head in position to supply heavy oil to said conduit, a hand valve controlling the delivery of oil by said conduit, a gasolene reservoir also carried by the head and arranged for delivering its contents to said mixing chamber, and a hand operated valve controlling such delivery.

4. The combination with a cylinder head having internal exhaust chamber and a mixing chamber within the exhaust chamber, of a constant-level heavy oil reservoir fixed to the head, a conduit leading from said reservoir through said exhaust chamber, at a lower level than that of the liquid in said reservoir, and opening into the mixing chamber, a valve controlling the passage from said mixing chamber to the cylinder, and a valve for closing the discharge end of said conduit.

5. The combination with a one-piece cylinder head having an internal exhaust chamber, a mixing chamber projecting into the upper part of the exhaust chamber and a conduit projecting into the lower part of the exhaust chamber and leading from the exterior of the head through the bottom of the mixing chamber, of a valve controlling the discharge end of the conduit, a heavy-oil reservoir fixed to the head and arranged to keep said conduit filled, a second reservoir for supplying gasolene to said mixing chamber, and a hand valve for controlling the supply of gasolene passing from the second reservoir.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM F. FREIDAG.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."