

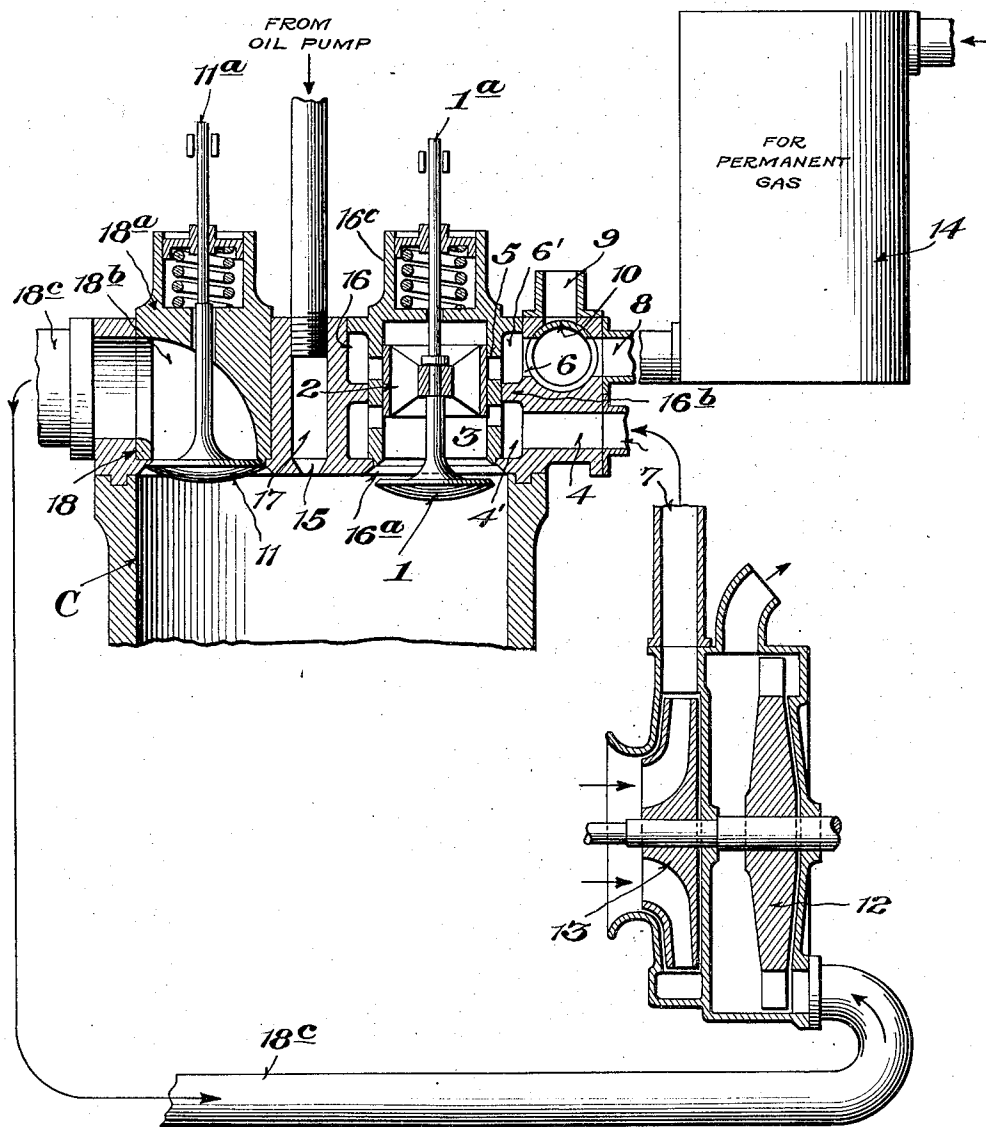
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A. SCHÜTTE

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COMBUSTION ENGINE

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Inventor

A. Schütte,

By Wilhelm H. Hoff,

Attorneys

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COMBUSTION ENGINE

Alfred Schütte, Augsburg, Germany, assignor to
Maschinenfabrik Augsburg-Nürnberg A. G.,
Augsburg, Germany, a corporation of Ger-
many

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1 Claim. (Cl. 123—27)

My invention relates to internal combustion engines and more especially to that type of combustion engine which may be selectively used either for operation as a gas or a Diesel motor. Such interchangeable motors have already come into use in plants in which a gas supply is not always available. Where a Diesel motor is converted into a gas motor, the fuel valves and fuel pumps must be removed, and in their places spark-plugs and an ignition device must be installed. Further, a gas conduit together with the necessary mixing devices and connections to the regulator must be installed, and the compression space must be correspondingly enlarged. While all these more or less minor changes can be made in a comparatively short time, there is the disadvantage that the output of the gas motor is not the same as that of the Diesel motor. If one were going to use a charge in the gas motor large enough to obtain the same output as in the Diesel motor, or if a charged Diesel motor were to be converted into a gas motor of the same output, considerable reconstruction would become necessary. While in a charged Diesel motor only a motor driven enclosed blower, or an exhaust turbo-blower for air is provided, there must be provided in a charged gas motor several conduits, several control elements and a special blower for the gas, not to mention the fact that the blower for the air is too large, when the motor operates as gas motor. All these changes are very extensive and would greatly increase the cost of an interchangeable motor.

To avoid this great drawback is the object of this invention, according to which in case the motor is used as a gas motor, after the scavenging of the cylinder with pure air, pure gas such as natural gas, is drawn in, followed by a charge of compressed air. When the motor is operated as a Diesel motor, instead of the pure gas air under atmospheric pressure is drawn in. Such a combustion engine can be converted with a minimum of time and labor from a gas motor into a Diesel motor, and vice versa. Besides the changes required in an uncharged interchangeable motor, to wit substitution of a fuel injection device for the ignition device and change of the compression, it is necessary only to sever the gas conduit from the gas supply and to connect it with the outside air. The charged interchangeable motor embodying the invention is considerably simple in construction.

In the appended drawing I have diagrammatically shown, by way of illustration, an embodiment of the invention.

It is to be understood that throughout the following specification and claim whenever the expressions "gas" or "pure gas" are used there is meant a permanent fuel gas, such as natural gas, illuminating gas or producer gas, as distinct from vapors from a liquid hydrocarbon fuel or a mixture of such vapor with air.

In the drawing, the engine cylinder is indicated by the letter C, having a cylinder head C'. This head is provided with three openings or passages 16, 17 and 18, one whereof, shown at 16, has a reduced lower end provided with a downwardly facing valve seat 16a. This passage 16 also has an internal rib 16b extending around its interior. In the passage 16 is fitted a valve cage 16c closing the upper end of the passage. The rib 16b provides an inner annular channel 4' and an outer annular channel 6', the cage being seated in the reduced lower end and having said rib 16b engaging its outer surface. The cage is provided with air inlet openings 3 and gas inlet openings 5. At 1 is shown the inlet valve. On the stem 1a of the latter is mounted a slide-valve shown at 2 adapted to control the air inlet openings shown at 3 and the gas inlet openings shown at 5. At 4 is shown the air supply port and at 6 the gas supply port. The ports 4 and 6 open respectively into the passages 4' and 6'. To the air supply port 4 is connected the air supply conduit 7, while to the gas supply port 6 is connected the gas supply conduit 8. At 9 is shown a short conduit connecting the gas supply port 6 with the outside air. In the gas supply port 6 is gas-tightly mounted a rotary three way valve shown at 10, which can be so adjusted that selectively either the gas supply conduit 8 leading to the gas tank shown at 14 or the conduit 9 leading to the outside air, can be cut off.

With the rotary three way valve 10 occupying the position shown in the drawing, the combustion engine can be operated as a gas motor. In that case, compressed scavenging air is first introduced into cylinder C through the air supply conduit 7, air supply port 4 and the inlet openings 3. Thereupon, the slide valve 2 is moved to cover up the air inlet openings 3 while uncovering the gas inlet openings 5, so that the descending piston (not shown) in cylinder C can draw in gas from the gas supply conduit 8 through the open rotary three way valve 10, the gas supply port 6 and the inlet openings 5. By a subsequent upward displacement of the slide-valve 2 the gas-inlet openings 5 are closed and the air inlet-openings 3 are opened again so that compressed air can be charged into cylinder C through the air-

supply conduit 7, the air-supply port 4 and the inlet openings 3. The air supply conduit 7 is connected to a turbo-blower shown at 13 and operated by the waste-gas turbine shown at 12.

5 The passage 17 forms a fuel inlet passage for operation of the engine as a Diesel engine. In the passage 18 is fitted a valve cage 18a wherein is formed an exhaust passage 18b controlled by a poppet valve 11, the stem 11a whereof passes
10 upwardly through the cage 18a. The passage 18b communicates with the turbo-blower 12 by means of a pipe 18c.

Now, if the combustion engine is to be operated as a Diesel motor, the rotary three way valve 10
15 is rotated in the clockwise direction with the result that the gas supply conduit 8 will be cut off and the gas supply port 6 is now brought directly into communication with the outside air through the conduit 9. In this position and with the slide-
20 valve 2 in the position shown in the drawing, first compressed scavenging air is introduced again into cylinder C through the air supply conduit 7, the air supply-port 4 and the air inlet openings 3. Then, after the downward displacement of the
25 slide-valve 2, the descending piston in cylinder C draws in outside air through the conduit 9, the gas supply port 6 and the inlet openings 5, and finally, after the slide-valve 2 through a corresponding upward displacement has closed the inlet
30 openings 5 again, pre-compressed air is introduced into cylinder C through the air-supply conduit 7, the air-supply port 4 and the air-inlet openings 3. At 15 is shown a fuel nozzle for introducing fuel into the compressed air for Diesel
35 operation.

While I have shown in the drawing an embodiment of my invention, the same is, of course, not limited thereto being capable of modifications coming within the ambit of the appended claim.

I claim:

5 In an internal combustion engine, a cylinder head having a set of three passages therethrough and extending from the outer face of the head to the inner face thereof, one of said passages having a reduced lower end forming a downwardly
10 facing valve seat, said passage having an internal annular rib intermediate its ends providing inner and outer annular channels, a cylindrical valve cage in said passage and closing the upper end thereof, said cage being seated on the reduced
15 lower end of the passage and having said rib engaging its outer surface intermediate its ends, said cage having a set of ports affording communication between the outer channel and the interior of the cage, and having a second set of
20 ports affording communication between the inner channel and the interior of the cage, said head having an upper and a lower lateral passage leading from respective channels for admitting gas and air to said channels, valve means in the upper
25 passage controlling gas flow therethrough, a sleeve valve slidable in said cage to open and close said ports, a stem carrying said valve, a poppet valve fixed to the lower end of said stem to open and close the lower end of the cage, the second
30 of said set of passages forming means for admission of Diesel fuel, said head having an exhaust port leading laterally from the third passage, and an exhaust valve fitted in said third passage.

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