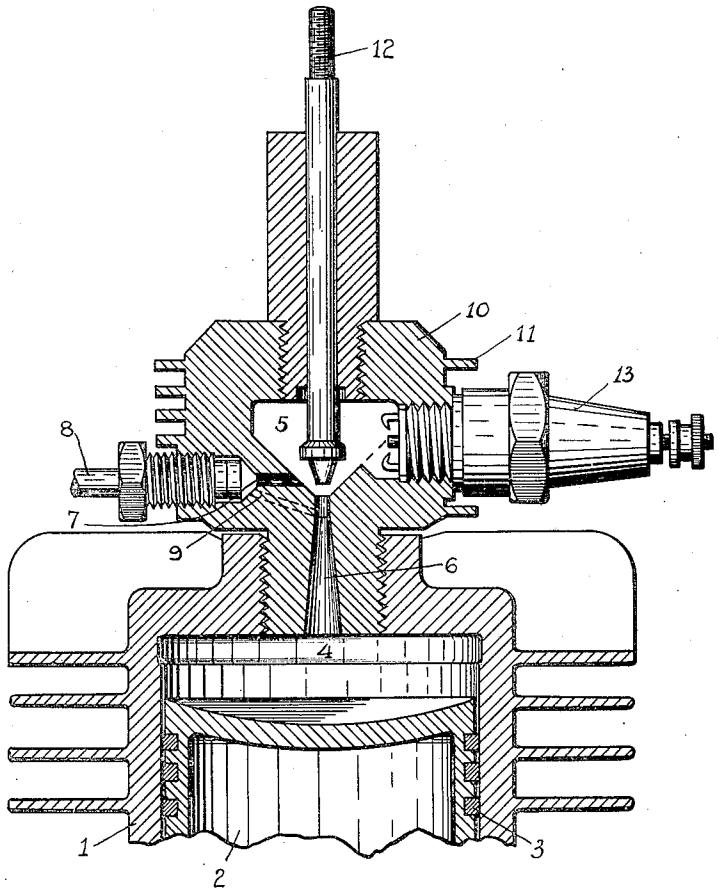
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INTERNAL COMBUSTION ENGINE

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INVENTORS.

Eugen Thomas and Robert Stuhr

BY

Alfred Allen

his ATTORNEY.

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UNITED STATES PATENT OFFICE

EUGEN THOMAS AND ROBERT STUHR, OF DUSSELDORF, GERMANY

INTERNAL COMBUSTION ENGINE

Application filed October 12, 1928, Serial No. 312,018, and in Germany June 25, 1928.

Our invention relates to internal combustion engines and more especially those used on motor cars, flying machines, and the like, and the object of our invention is to produce an engine in which heavy fuel oils can be used, instead of the highly volatile fuel oils, such as benzene, gasoline, and the like, which easily explode often resulting in serious accidents. Also, heavy fuel oils are notably cheaper in operation than the lighter fuel oils.

In the modern internal combustion engines used on motor cars, flying machines, and the like, the air is mixed with the fuel outside of the engine cylinder, the mixture being effected by the air current produced by the suction. This, however, requires easy gasification of the fuel, both when in a cold or heated state, and also requires that no residue is left behind which may result in stoppage, or other disturbances.

The combustion engine embodying the present invention, comprises as an inherent part of the engine a gasifier for gasifying heavy fuel oils, so constructed and arranged that the fuel, during the compression stroke, that is, after having previously been introduced into the engine, is atomized and gasified.

The appended drawing in which by way of illustration we have shown our invention, shows in section the head of a cylinder of an internal combustion engine embodying the invention.

In the drawing, 1 designated the engine cylinder and 2 the piston provided with the rings 3. At 4 is shown the compression space within the cylinder and at 5 is designated the explosion chamber which communicates with the compression space 4 through a bore 6 which preferably is of inwardly flaring or increasing cross sectional area toward the compression space, the explosion chamber on the other hand being of outwardly flaring formation at its inner end as shown. At 7 is designated a fuel supply bore opening into the explosion chamber 5 near its inner end and having connected therewith a fuel supply pipe 8 with which is connected a fuel injection pump (not shown). As illustrated, the bore 7 is disposed a slight distance outwardly with respect to the outer end of the bore 6 and opens into the explosion chamber through the outwardly flaring inner end portion of said explosion chamber. In addition, a bore 9 connects the bore 7 with the bore 6. Furthermore, the explosion chamber housing 10 preferably is provided with heat dissipating ribs 11 and with a threaded opening into which is screwed a spark plug 13, while adjustably mounted in any suitable manner in said housing, or in a part thereof, is a valve 12 the inner end of which is adapted for cooperation with the outer end portion of the bore 6 to reduce the effective cross sectional area thereof to facilitate starting of the engine. However, said valve is used only during starting and after the engine has commenced to operate the valve is substantially completely withdrawn from the explosion chamber.

The operation is as follows:

During the compression stroke of the piston 2, the air previously introduced into the cylinder 1 is compressed in the space 4 and forced through the bore 6 into the explosion chamber 5, entering said chamber in the form of a jet of air which has the effect of producing a suction action immediately adjacent to and around the outer end of the bore 6. Therefore, as fuel is simultaneously admitted at a certain time during the compression stroke into the explosion chamber through the bore 7, the suction produced by the air jet entering said chamber through the bore 6, combined with the weight of the fuel and the ountward flare of the explosion chamber, causes the fuel to spread around and to be caught by the air jet, atomized thereby and propelled therewith into the explosion chamber.

When the piston 2 is substantially at the outer end of its stroke the mixture of fuel and air within the explosion chamber is ignited, with the result of causing a high temperature and pressure within the explosion chamber and consequent propulsion of the gases of combustion at high speed through the bore 6 into the outer end of the cylinder 2 where,

after a very intimate mixture with the air therein, complete combustion takes place and the piston is driven inward.

Because of the throttling effect of the nozzle-like bore 6 the pressure in the cylinder 1 grows more slowly than in an ordinary internal combustion engine, with the result that the present engine operates without knocks.

While the compression of the fuel mixture may be carried to the point of self-ignition, normally the compression is carried only so far that self ignition is prevented, or is possible only when the engine is very hot, in which case the ignition by the spark plug 13 may be cut out.

In order to quickly start the engine when the same is cold the effective cross sectional area of the bore 6 is initially decreased by the valve 12, the result being a particularly thorough atomization of the fuel by the increased high velocity flow of the air jet entering the explosion chamber at the outer end of the restricted bore 6. After the engine has started the valve 12 is as aforesaid substantially completely withdrawn from the explosion chamber to permit an uninterrupted flow of air through the bore 6 into the explosion chamber and to render available substantially the full capacity of the explosion chamber to receive fuel and air.

The bore 9 provides for the supply of a certain amount of fuel directly into the bore 6.

An internal combustion engine embodying the present invention has the following advantages:

1. The engine can be operated with any kind of a fuel, the explosion of the mixture being insured.

2. Low compression with the result that the piston can be easily kept tight.

3. The nozzle-like bore between the explosion chamber and the compression space having a throttling effect prevents a sudden pressure increase in the engine cylinder insuring quiet operation.

4. The operation of the engine is safe, because the fuel pump introduces the fuel at low pressure as it does not have to atomize the fuel.

5. The engine starts easily, as compared with an engine of the Diesel type, because a spark-plug is provided for igniting the mixture.

While we have particularly described and illustrated an embodiment of our invention, we do not limit ourselves thereto, as our invention in the broader sense permits of variations without a departure from the essence of the invention.

We claim:

1. An internal combustion engine comprising a cylinder having a compression space at its outer end, a piston reciprocal within said cylinder, a housing provided with an explosion chamber in communication through a bore with said compression space, said housing having a fuel supply passage opening into said explosion chamber outwardly of the outer end of said bore, and manually operable means for reducing the effective cross sectional area of said bore to facilitate starting of the engine.

2. An internal combustion engine comprising a cylinder having a compression space at its outer end, a piston reciprocal within said cylinder, a housing provided with an explosion chamber in communication at its inner end through a bore with said compression space, said bore being of increasing cross sectional area toward the compression space, the inner end portion of said explosion chamber being of outwardly flaring form, and said housing having a fuel inlet passage opening into said explosion chamber through the outwardly flared inner portion of the latter adjacent to the outer end of said bore.

3. An internal combustion engine comprising a cylinder having a compression space at its outer end, a piston reciprocal within said cylinder, and a housing provided with an explosion chamber in communication at its inner end through a bore with said compression space, said housing further having a fuel inlet passage opening into said explosion chamber adjacent to and outwardly of the outer end of said bore and substantially at right angles to said bore.

4. An internal combustion engine comprising a cylinder having a compression space at its outer end, a piston reciprocal within said cylinder, and a housing provided with an explosion chamber in communication at its inner end through a bore with said compression space, the inner end portion of said explosion chamber being of outwardly flaring form, and said housing further having a fuel inlet passage opening into said explosion chamber through the outwardly flared inner end portion thereof adjacent to and substantially at right angles to said bore.

5. An internal combustion engine as set forth in claim 1 in which the fuel passage is directly connected by another passage with the bore.

6. An internal combustion engine according to claim 3 in which a manually operable valve is provided for reducing the effective cross sectional area of the bore.

In testimony whereof we affix our signatures.

EUGEN THOMAS.
ROBERT STUHR.