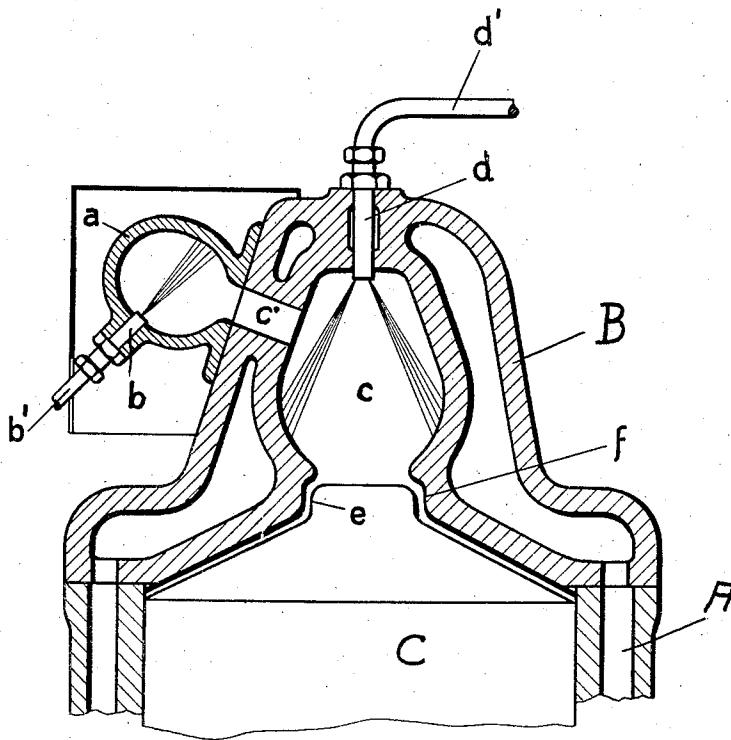


J. LEMAIRE.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED MAY 27, 1921.

1,406,877.

Patented Feb. 14, 1922.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,406,877.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOSEF LEMAIRE, a citizen of Germany, residing at Koln-Dellbruck, No. 555 Bensberger-Marktweg, Rhenish Prussia, Germany, have invented certain new and useful Improvements in Internal-Combustion Engines, (for which I have filed applications in Germany July 8, 1919, No. L. 48,538; Austria, Dec. 3, 1920, No. A. 6,667/20; Hungary, Dec. 29, 1920, No. 17-437; Great Britain, Jan. 10, 1921, No. 1,582/21; Sweden, Mar. 16, 1921, No. 1,011; the Netherlands, Mar. 18, 1921, No. 18,442, and in Belgium, Mar. 31, 1921, No. 236-317); and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to internal combustion engines of the type in which the cylinder is provided with an ignition chamber.

It is a well-known fact that these engines are very delicate as regards the conditions of temperature. For every load there exists only one favorable wall-temperature at which an almost complete combustion is obtained without soot and shocks being produced. The variable cooling as it is now generally in use for obtaining the proper temperature and which consists in the injection of more or less water, is only an imperfect method, since if the load suddenly changes, the change of the water quantity admitted cannot be brought into accordance with the wall-temperature which changes more slowly because of the heat capacity.

Now, the present invention has for its primary object to provide an engine of the character stated in which the ignition chamber is subjected to a constantly uniform temperature.

Another object of the invention is to provide an engine in which a primary constant fuel charge is injected into the heated ignition chamber and an additional variable fuel charge is injected into the combustion chamber in such a manner as to cause the last-mentioned charge to be ignited by the first-mentioned one.

A still further object of the invention is to provide for an effective mixing of the additional fuel charge with the compressed air contained in the combustion chamber, in

order to secure a profitable and complete combustion.

With these and other ends in view my invention consists in the arrangement, construction and combination of the parts to be hereinafter described and shown in the accompanying drawing.

The drawing illustrates a partial longitudinal section through an engine constructed in accordance with the invention.

Referring now to the drawings in particular, A designates the engine cylinder, B the cylinder head and C the piston. For the purpose of cooling, the cylinder A and its head B are provided with a water jacket in the ordinary way. The cooling may also be effected in any other approved manner.

The cylinder head B is preferably of the form shown and has arranged laterally upon its outer side an ignition chamber *a*. Mounted in the wall of the chamber *a* is a fuel injecting nozzle *b* to which fuel is fed by a pipe *b'*. The chamber *a* is connected with the combustion chamber *c* by means of a channel *c'* traversing the wall of the cylinder head B. Mounted in the end of the cylinder head B is the main fuel nozzle *d* to which fuel is admitted by a pipe *d'*. The jets of fuel ejected by the nozzle *d* are directed into the combustion chamber *c* as shown.

Now, it is to be understood that the nozzle *b* injects into the ignition chamber *a* a fuel quantity which is always the same and which may correspond to the quantity ordinarily injected when the engine is running light. It is evident that this constant fuel quantity will produce a heat quantity which likewise remains always constant so that, if the chamber *a* is made of dimensions which by conduction and radiation ensure a constantly equal admission of heat, the most favorable temperature is always maintained.

The additional fuel charge which is necessary for operating the engine is admitted through the nozzle *d* and is variable. Due to the lateral arrangement of the ignition chamber *a* with relation to the combustion chamber *c*, as shown, the jet entering the chamber *c* from the chamber *a* through the channel *c'* will cross the fuel jets ejected by the nozzle *d* so that the latter will be effectively ignited by the first-mentioned jet.

The piston face is provided with a pris-

matical projection *e* and the cylinder head
 B has a correspondingly formed contracted
 portion *f* which constitutes a passage con-
 necting the interior of the cylinder A and
 5 the combustion chamber *c*. When the pis-
 ton is in motion the projection *e* will upset
 an air-whirl which at the end of the piston
 stroke will enter through the passage *f* into
 the combustion chamber *c* containing the air
 10 compressed by the piston. In the chamber
c the said whirl will cause an efficient atom-
 ization of the fuel and a good mixture of
 the fuel with the compressed air. A good
 ignition, atomization and mixing of fuel
 15 and air being thus secured, a shockless and
 complete combustion will take place.

The present engine on the one hand
 possesses over the self-ignition engines for
 heavy oils the advantage that it has a low
 20 compression pressure, while on the other
 hand it does not possess the well-known
 disadvantages of the low pressure engines
 with ignition chamber now in use.

Having thus described my invention, what
 25 I claim as new and desire to secure by Let-
 ters Patent, is:

1. An internal combustion engine compris-
 ing a cylinder, a piston movable in the
 cylinder, a cylinder head, a combustion
 30 chamber, an ignition chamber and cooling
 means for the cylinder and its head, a fuel
 nozzle mounted in the wall of the ignition
 chamber and adapted to inject a constantly
 equal quantity of fuel into the ignition
 35 chamber, and another fuel nozzle mounted
 in the wall of the combustion chamber and
 adapted to inject a variable quantity of fuel
 into the combustion chamber.

2. An internal combustion engine compris-
 40 ing a cylinder, a piston movable in the cylin-
 der, a cylinder head, a combustion chamber
 formed in the cylinder head, an ignition
 chamber arranged at one side of the cylin-
 der head, a nozzle mounted in the wall of
 45 the ignition chamber and adapted to inject
 fuel into the same, and another nozzle
 mounted in the wall of the combustion cham-
 ber in axial direction of the cylinder and
 adapted to inject fuel into the combustion
 50 chamber, and a passage connecting the ig-
 nition chamber and the combustion cham-
 ber, said passage traversing the wall of the
 cylinder head and lying in a direction trans-
 verse to the axis of the cylinder so as to

cause the jet entering the combustion cham- 55
 ber through said passage to cross the jets
 discharged by the secondly mentioned fuel
 nozzle.

3. An internal combustion engine com- 60
 prising a cylinder, a piston movable in the
 cylinder, a cylinder head, a combustion
 chamber in the cylinder head, an ignition
 chamber formed at one side of the cylinder
 head and connected with the combustion
 chamber, a fuel nozzle adapted to inject 65
 fuel into the ignition chamber, and another
 fuel nozzle adapted to inject fuel into the
 combustion chamber, a prismatical projec-
 tion formed on the face of the movable pis-
 ton, a contracted portion formed by the 70
 cylinder head and constituting a hollow pas-
 sage connecting the combustion chamber
 with the interior of the cylinder, said pas-
 sage having a form corresponding to the
 contour of the piston projection, said pro- 75
 jection being adapted to upset an air-whirl
 which is caused to enter the combustion
 chamber at the end of the piston-stroke.

4. An internal combustion engine compris- 80
 ing a cylinder, a cylinder head, a combustion
 chamber formed in the cylinder head, an
 ignition chamber arranged at one side of the
 cylinder head, a nozzle mounted in the wall
 of the ignition chamber and adapted to in- 85
 ject fuel into the same, and another nozzle
 mounted in the wall of the combustion
 chamber adapted to inject fuel into the com-
 bustion chamber, and a passage for connect-
 ing the ignition chamber and the combustion
 chamber, said passage being positioned so 90
 as to cause the jet entering the combustion
 chamber therethrough to cross the jets dis-
 charged by the second mentioned nozzle.

5. An internal combustion engine com- 95
 prising a cylinder, a combustion chamber
 beyond the cylinder and communicating
 therewith, an ignition chamber at the side
 of the combustion chamber having a pas-
 sage communicating with the combustion
 chamber, means for feeding fuel into both 100
 chambers, the passage between the ignition
 and combustion chamber being positioned
 to direct the jet therefrom across the jet
 discharged by said means into the combus-
 tion chamber. 105

In testimony whereof I have signed my
 name to this specification.

JOSEF LEMAIRE.