O. OHLSSON.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED SEPT. 24, 1908.

980,552. Patented Jan. 3, 1911.

Fig. 1.

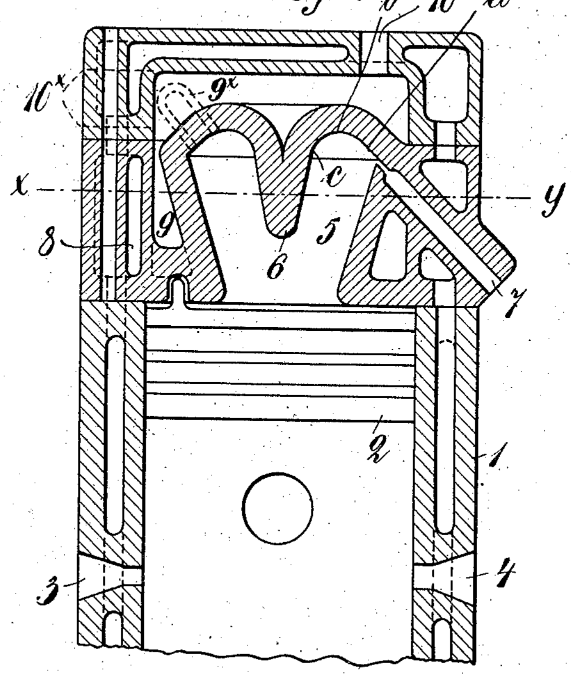


Fig. 2.

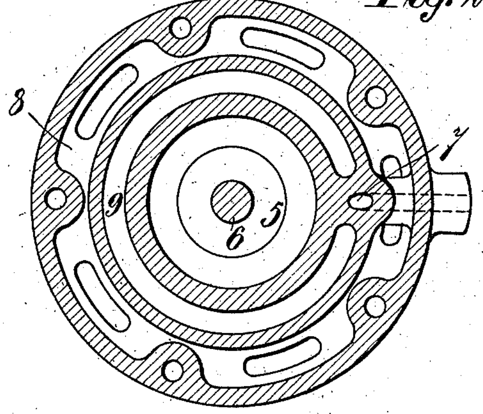
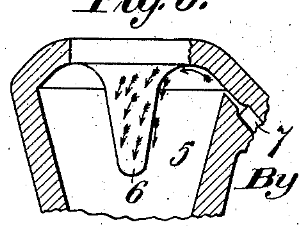


Fig. 3.



Witnesses

G. F. Cornell

John A. Rennie

Inventor

Olof Ohlsson

By J. Kaplinger

Attorney.

UNITED STATES PATENT OFFICE.

OLOF OHLSSON, OF SÖDERTELJE, SWEDEN.

INTERNAL-COMBUSTION ENGINE.

980,552. Specification of Letters Patent. Patented Jan. 3, 1911.

Application filed September 24, 1908. Serial No. 454,628.

To all whom it may concern:

Be it known that I, Olof Ohlsson, a subject of the King of Sweden, and resident of Skogsgatan 3, Södertelje, in the Kingdom of Sweden, 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.

In petroleum engines hitherto used and provided with a fuel pump, the petroleum generally is introduced into a special part of the working chamber, generally called explosion chamber, igniting chamber, igniting ball or the like in order to be vaporized and ignited in the same. Experience has shown, that the whole quantity of petroleum introduced is not burned satisfactorily, but a greater or less part of the same escapes into the atmosphere with the combustion gases. This is due partly to an incomplete vaporization of the petroleum in the explosion chamber, partly to the fact that the petroleum is not vaporized quickly enough during the period, is shortly measured, or is not mixed with or does not come in contact with the quantity of pure air necessary for the complete combustion of the gas. It has been proposed to remove the said disadvantage by feeding the petroleum directly into the air in the cylinder chamber or the explosion chamber, but this operation is possible only if a very high compression of the air is effected, causing a temperature which is considerably higher than the igniting temperature, as the petroleum fed into the air refrigerates in a rather considerable manner the air, with which it is first brought in contact; the evaporating process being thereby delayed. A very high compression of the air involves, however, as is easily understood, a considerable risk and affects the durability of the motor, to which must be added the fact that the igniting chamber, which is strongly heated, causes a considerable radiation of heat, which results in the loss of fuel and a disagreeable heating of the atmosphere in the immediate vicinity of the motor.

This invention relates to an arrangement, which removes the disadvantages, mentioned above, in a simple and practical manner. This is effected by feeding the petroleum into the explosion chamber in such a manner, that the particles are not left to themselves but are compelled to follow a metallic guiding surface, on which the evaporating operation is effected. For this purpose the channel, through which the petroleum is forced into the motor, is adapted to direct the said particles of petroleum upon the said surface around a central projection to be hereinafter more fully referred to, said channel having a straight or oblique direction toward the center of the chamber. Owing to the said arrangement the petroleum particles will follow the guiding surface, as long as they have not been vaporized, and during their passage they arrive at parts of the surface that are of higher and still higher temperature. Owing to the said fact the evaporating process is effected successively, because the particles will pass farther on the surface, the more difficult they are to evaporate, and also the mixing of the gas with the compressed air in contact with the surface is facilitated, because the mixing operation is distributed on the surrounding air cover, as the evaporating process proceeds along the distributing surface. In order to increase the said effect the surface is enlarged by being curve shaped and, as for the hottest part, it is located in the center, by there consisting of a central projection, which points toward the piston and is provided in the working or explosion chamber, facing the piston. The arrangement is adapted preferably to two stroke motors but may be applied also in motors operating in another manner.

In the accompanying drawing Figure 1 is a longitudinal section of the device. Fig. 2 is a section on the line x—y of Fig. 1. Fig. 3 shows by means of arrows the way of the petroleum particles.

The piston 2 reciprocates in the cylinder 1 and is connected with the shaft in the usual or some new manner, not illustrated in the drawing. Compressed air passes into the cylinder through the channel 3, when the piston is in its lower position, and the combustion gases are expelled through the channel 4. In the end wall of the explosion chamber 5, facing the piston, a central projection 6 is provided having the shape of a cone, the tip of which, more or less rounded, is directed toward the piston. The transition from the wider part of the end wall to the projection 6 consists of a surface curve shaped in axial section, the outermost part of which is directed downward. The channel 7 through which the liquid fuel is forced into the motor, connects with the said chamber 5. The said channel is located at the periphery of the chamber and has in the section just mentioned, a tangential or substantially tangential direction to the spreading surface. The projection 6, which preferably extends for some distance below the center of the chamber 5, may be made integral with the walls of the chamber, as shown in the drawing, or may be made of any suitable material and fixed to the said walls of the chamber. The chamber 5 is contracted conically toward the piston, substantially in the same degree as the projection 6, so that the air, contained in the chamber, is also of a conical form, forming around the projection a case, the capacity of which per unit of length increases toward the bottom of the chamber.

In order that the temperature of the walls of the explosion chamber may be kept as uniform as possible an outer jacket 8 is provided in the same, extending around the chamber and filled with water, and a similar inner jacket 9, filled with air. Owing to the said arrangement an insulating water jacket is provided nearest to the outer side and an air jacket, which is inclosed by the water jacket and also has an insulating effect. Owing to this arrangement radiation of heat from the chamber is largely prevented.

The quantity of petroleum, controlled by the regulator for each stroke of the piston with regard to the necessary amount of power, is forced through the channel 7 by a suitable pump. The part of the said channel 7 situated nearest to the inner part of the explosion chamber, is contracted to a very narrow mouth piece. The petroleum is forced into the chamber very rapidly and immediately before the end of the compression. Owing to the fact that the mouth piece has an oblique position upward, the petroleum jet will pass along the inner side of the cup-shaped end wall of the chamber but changes its course, owing to the curve shape of the end wall, shown in Fig. 1, first slowly along the straight or slightly concave part *a—b* of the surface and then rapidly against the ring shaped part *b—c* of the surface, which part has a shorter radius and is curved outward in its horizontal section, the jet then continuing along the side of the projection 6 to a point situated at a shorter or greater distance from the tip of the same. Owing to the fact that the projection 6 is situated in the center of the explosion chamber and there effects a forcible combustion of the fuel, the temperature of the said fuel will be higher than that of the outer wall of the chamber. The object of the projection is to concentrate the petroleum particles that are hardest to evaporate toward the center of the chamber and there to cause the same to evaporate after having been heated, and to cause the gas to ignite instantaneously after the whole quantity of petroleum, which has been forced into the chamber and situated in the center of the cone of compressed air has evaporated. Owing to the said facts the air is saturated with gas almost instantaneously, which results in a very rapid and complete combustion.

According to experiments made, the petroleum particles may advantageously pass first along a guiding surface, which is concave or curved inward, which surface keeps the particles somewhat gathered during the first heating operation, and then along a surface, which is curved outward and spreads the particles. The surface last mentioned, which may be called fire-surface, causes the particles to evaporate. As stated above, the particles that are hardest to evaporate continue moving on the said surface, the temperature of which increases in the direction of movement of the particles, which pass downward toward the tip of the projection, which has the highest temperature. The ignition is effected first in the said hardest evaporated particles and then spreads outward toward the periphery, where the gas already has mixed with the air case. Only one inlet channel 7 is shown in the drawing but two or more channels may be used, distributed along the periphery of the chamber and located in or substantially in the same horizontal plane. The mouth of the channel may be situated nearer to the projection 6, at the point *b* for instance, but the channel may more advantageously end at the extension *a—b* of the spreading surface, formed by the projection 6, as shown in Fig. 1. In order that no evaporation may be effected in the channel, it is surrounded by the water jacket 8.

The capacity of the explosion chamber, characterized by its contracted shape, is so adapted, that the piston can pass right to or substantially right to the same, *i. e.* so that the chamber can contain the whole or substantially the whole quantity of compressed air necessary for the charge. Owing to the previous combustion the wall of the chamber is heated to a very high degree, which still more is the case with the projection 6, especially the tip of the same. Owing to the said fact also the temperature of the compressed air case inclosed in the chamber is higher at its inner side than at its outer side. The said fact is utilized for the evaporating process by the fuel being introduced between the said inner side and the metallic guiding surface and is so spread, that the evaporating process is distributed around the said surface, as described above. The ignition and a complete combustion are effected at the very instant when the evaporation has taken place, a sufficient quantity of pure air being present in the immediate vicinity of the gas. The described shape of the guiding surface formed by the projection 6 has been found to be especially effective, but may evidently be modified, the tangential or oblique direction of the inlet channel with relation to the said surface being however maintained for the purpose set forth. An igniting pipe $9^{\times}$ is provided for the starting of the motor. The openings 10 and $10^{\times}$ are open during the heating operation and are then closed by means of valves or the like, not shown in the drawing.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In internal combustion engines, the combination of a cylinder, a piston reciprocating therein, an explosive chamber at one end of the cylinder having an inlet opening terminating at the end wall thereof, a central projection on the end wall of said chamber and directed toward the piston, said inlet opening leading the fuel to the base of the projection in a manner adapted to spread it on the same for the evaporation and ignition thereof.

2. In internal combustion engines, the combination of a cylinder, a piston reciprocating therein, an explosive chamber at one end of the cylinder having an inlet opening terminating at the end wall thereof, a central projection on the end wall of said chamber and directed toward the piston, a curve shaped transitional surface between the base of such projection and the wider part of the end wall surrounding the same, said inlet opening leading the fuel to the base of the projection in a manner adapted to spread it on the same for the evaporation and ignition thereof.

3. In internal combustion engines, the combination of a cylinder, a piston reciprocating therein, an explosive chamber at one end of the cylinder having an inlet opening terminating at the end wall thereof, a central projection on the end wall of said chamber and directed toward the piston, and also tapering toward the same, said inlet opening leading the fuel to the base of the projection in a manner adapted to spread it on the same for the evaporation and ignition thereof.

4. In internal combustion engines, the combination of a cylinder, a piston reciprocating in the same and an explosive chamber at one end of the cylinder, a central projection on the end of said chamber directed toward the piston, said chamber having an inlet opening for liquid fuel adapted for directing the same to the said projection, a water jacket and an air jacket around the said chamber, the water jacket being located outside the air jacket.

5. In internal combustion engines, the combination of a cylinder, a piston reciprocating in the same, an explosion chamber at one end of said cylinder and directed toward the piston, a central projection on the end of said chamber directed toward the piston and a water jacket surrounding the explosion chamber having a channel passing through the said jacket and leading the liquid fuel to the base of the projection in a manner adapted to spread it on the same.

6. In internal combustion engines, the combination of a cylinder, a piston reciprocating in the same, an explosion chamber at one end of said cylinder, a central projection on the end wall of said chamber directed toward the piston and tapering toward its free end, a transitional surface provided around the projection between the same and the inner side of the chamber, the said surface being concave in axial section, said chamber having an inlet channel for the liquid fuel meeting the said surface tangentially.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

OLOF OHLSSON.

Witnesses:
HJALMAR ZETTERSTRÖM,
ROBERT APELGREN.