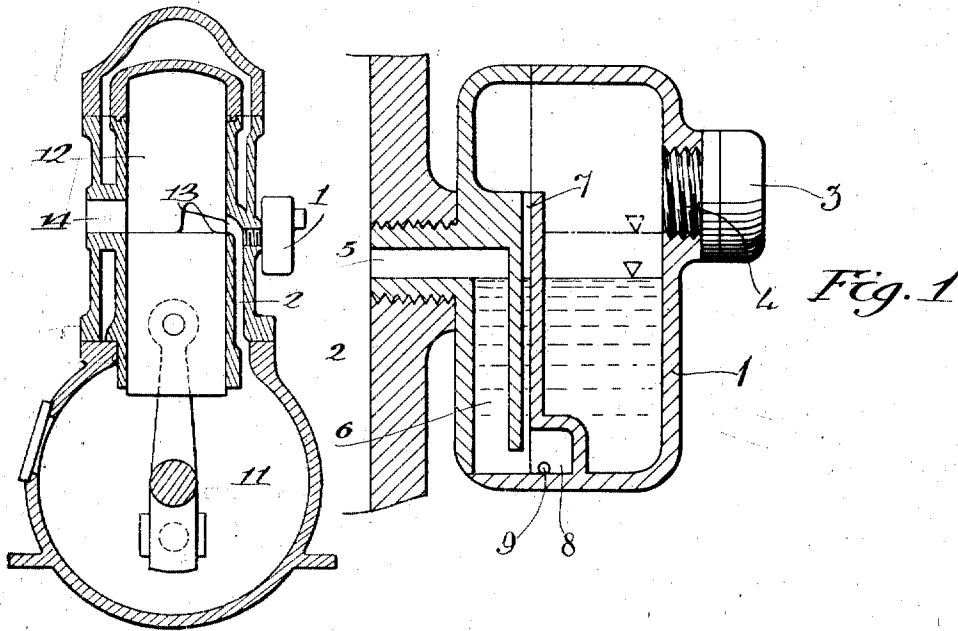


H. F. LEISSNER.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED APR. 19, 1916.

1,230,729.

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Fig. 2.



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INTERNAL-COMBUSTION ENGINE.

1,230,729.

Specification of Letters Patent.

Patented June 19, 1917.

Application filed April 19, 1916. Serial No. 92,273.

To all whom it may concern:

Be it known that I, HARRY FERDINAND LEISSNER, a citizen of the Kingdom of Sweden, residing at Ljusne, Sweden, have invented new and useful Improvements in Internal-Combustion Engines; of which the following is a specification.

This invention relates to improvements in starting devices for internal combustion engines of the type which are operated by an electrically ignited mixture of fuel and air, but which, after the start, operate by spontaneous ignition or other non-electric ignition.

In engines of this type it is of great importance, that immediately after the starting movement of the piston or the crank shaft, fuel and air be admitted to the combustion chamber of the cylinder, and at the same time that the mixture of fuel and air be prevented from entering any other place than said chamber. For this purpose the mixing of the fuel and air should be effected immediately before or simultaneously with the entrance of the air into the combustion chamber, whereby such mixture may be introduced into the said chamber even at the first revolution of the crank shaft.

The object of this invention is the provision of a fuel receptacle adapted to be placed close to the aperture through which the scavenging air enters the combustion chamber of the cylinder or in close proximity to said chamber; the said fuel receptacle delivering without the aid of any pump or other driving contrivance an approximately constant quantity of liquid fuel, each time the scavenging air enters the cylinder during the starting period.

The air mixed with liquid fuel is then ignited electrically at the suitable moment.

This fuel receptacle is especially distinguished by being provided with a U-shaped channel adapted to contain liquid fuel and thus forming a sort of liquid seal, one branch of which is connected with an air space in the receptacle, while the other branch is connected with a channel or the like leading to the air inlet of the engine or to the combustion chamber.

An embodiment of the invention is illustrated in the accompanying drawing in which Figure 1 is a sectional view of a fuel receptacle embodying my invention, and Fig. 2 is a sectional view of an internal

combustion engine provided with such a fuel receptacle.

Referring to Fig. 1, of the drawing, 1 is a fuel receptacle having a filling opening 4 for liquid fuel normally closed by a threaded cover 3, and an outlet 5 formed by the bore of an outwardly threaded connecting pipe. The outlet 5 is connected with the interior of the receptacle 1 by the branches 6 and 7 of a U-shaped channel, each of which branches has an area of passage equal or approximately equal to that of the outlet 5, the branch 7 having larger width than the outlet 5 and the branch 6, counted in the direction at right angle to a plane through the branches. The lowermost portion of the U-shaped channel forms an enlarged chamber 8 connected with the part of the receptacle 1 located outside the U-shaped channel through an aperture 9 whose area of passage is very small in relation to the areas of the branches 6 and 7.

Preferably, the filling opening 4 is placed somewhat higher than the outlet 5, and the upper edge of the branch 7 somewhat higher than the lower edge of the filling opening 4. As a result liquid fuel may, when introduced, be caused to enter the outlet 5, and the branch 7 always opens above the liquid level in the receptacle 1, the U-shaped channel thus forming a sort of liquid seal.

The fuel receptacle 1 is adapted to be screwed either into the wall of a channel 2 connecting the scavenging pump of an internal combustion engine with its cylinder in front of the inlet opening of said channel, or directly into the wall of the cylinder in such manner, that the outlet 5 opens into said connecting channel 2 or directly into the cylinder. In Fig. 2 the fuel receptacle 1 is arranged in the first named manner and connected with a vertical two stroke cycle engine, the crank casing of which acts as scavenging pump chamber. Consequently, the receptacle is connected with the channel 2 connecting the crank case 11 with the cylinder 12, directly in front of the inlet opening 13.

When the engine is to be started, such a quantity of a suitable liquid fuel, as for instance benzine, is introduced into the receptacle 1 that a part of the fuel flows through the outlet 5 into the connecting channel 2, whereupon the cover 3 is screwed on. The level of the liquid remaining in receptacle 1

is determined by the lower edge of the channel 5, as is shown on the drawing. If then the piston is caused to move from its uppermost position, the air in the crank casing 11 as well as in the connecting channel 2 is compressed. It is to be supposed that the pressure amounts, on an average, to a pressure above atmospheric of 0.2 to 0.3 kilogram per square centimeter. On account thereof air will be forced from the channel 2 through the inlet 5 and U-shaped channel into the air space above the fluid level at the same time carrying with it the liquid contained in the U-shaped channel 6, 7, except a certain quantity which remains in the chamber 8, and compressing the air in said air space. It is further supposed that during the further downward motion the piston first uncovers the exhaust port 14 and then the inlet opening 13. When the piston uncovers the latter opening, the air compressed in the crank casing enters rapidly the cylinder through the channel 2, and, on account thereof, the pressure in the crank casing and the channel 2 decreases suddenly. The compressed air contained in the space above the liquid level in the receptacle 1 now expands and is partly exhausted through the U-shaped channel and the outlet 5 at the same time carrying with it the quantity of liquid remaining in the chamber 8 or just flowing out of the opening 9. When in this manner a certain quantity of fuel has entered the channel 2, this fuel will be carried along by the air flowing upward in said channel and will enter the cylinder, and owing thereto, an explosive mixture of liquid fuel and air is obtained therein, said mixture being ignited at a suitable moment by means of an electric ignition device (not shown).

As stated above, the area of passage of the aperture 9 is very small in relation to the areas of the branches 6 and 7, and, therefore, the aperture 9 can not disturb the operation described of the outlet 5 and the branches 6 and 7 to any appreciable extent.

It will be gathered from the foregoing that the fuel receptacle is adapted for use only in connection with the starting of the engine.

Further it is to be observed that, if the total quantity of fuel exhausted from the fuel receptacle 1 during a cycle of action should not enter the cylinder instantly, the remaining quantity of fuel is located so near to the inlet opening, that said quantity will necessarily be caused to partake in the next combustion.

By reason of the arrangement of the chamber 8 the quantity of liquid fuel taken up each time on flow of air from the receptacle 1 will be approximately constant and independent of the speed of the engine.

The size of the aperture 9 is, preferably,

so chosen that the interval of time between a flow of air from the receptacle 1 and the following flow of air to said receptacle will suffice for filling the chamber 8 with liquid even at a great speed of the engine. The said interval is determined by the suction period of the air pump. The injection period of said pump determining the time between the flow of air to the receptacle 1 and the flow back from the same, is always very short, and owing thereto any considerable quantity of liquid cannot flow during said period into the chamber 8. Therefore, the chamber 8 contains always on the flow of air from the receptacle 1 to the channel 2 a certain quantity of liquid.

The size of the receptacle 1 is so chosen, that it contains a quantity of liquid fuel sufficient for starting the engine in question. When the engine commences to run, said quantity of liquid has been consumed, and then the receptacle need not be shut off from the channel 2.

If the fuel receptacle is so arranged, that it opens directly into combustion chamber of the engine, the ignition must not take place before the pressure in the combustion chamber has commenced to decrease, and liquid fuel has entered said chamber.

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

1. In an internal combustion engine, a combustion chamber, a fuel receptacle adapted to be connected with the combustion chamber and having a closed air space, a U-shaped channel positioned in said receptacle and connecting said closed air space with the combustion chamber, and a connection between said fuel receptacle and the lowermost part of said U-shaped channel.

2. In an internal combustion engine, a combustion chamber, a fuel receptacle adapted to be connected with the combustion chamber and having a closed air space, a U-shaped channel positioned in said receptacle and connecting said closed air space with the combustion chamber, and a connection between said fuel receptacle and the lowermost part of the U-shaped channel, the area of passage of this connection being much smaller than that of the U-shaped channel.

3. In an internal combustion engine, a combustion chamber, a fuel receptacle adapted to be connected with the combustion chamber and having a closed air space, a U-shaped channel partly submerged into the fuel in said receptacle, one branch of said U-shaped channel opening into said closed air space and the other branch being connected with said combustion chamber, and a connection between said fuel receptacle and the lowermost part of said U-shaped channel.

4. In an internal combustion engine, a

combustion chamber, and closed fuel receptacle connected with the combustion chamber, an air space in said receptacle, a liquid seal in the receptacle containing a carbureting liquid and opening into said air space
5 above the liquid level, said liquid seal connecting said air space with the combustion chamber, a connection between said receptacle and the lowermost part of the liquid
10 seal, and a filling opening in the wall of the receptacle.

5. In an internal combustion engine, a combustion chamber and closed fuel recep-

tacle connected with the combustion chamber, an air space in said receptacle, a liquid
15 seal in the receptacle containing a carbureting liquid and opening into said air space above the liquid level, said liquid seal connecting said air space with said combustion chamber, an enlargement of the lowermost
20 part of said liquid seal, a connection between said receptacle and said enlargement, and a filling opening in the wall of the receptacle.

In testimony whereof I have signed my name.

HARRY FERDINAND LEISSNER.