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INJECTION MEANS FOR INTERNAL
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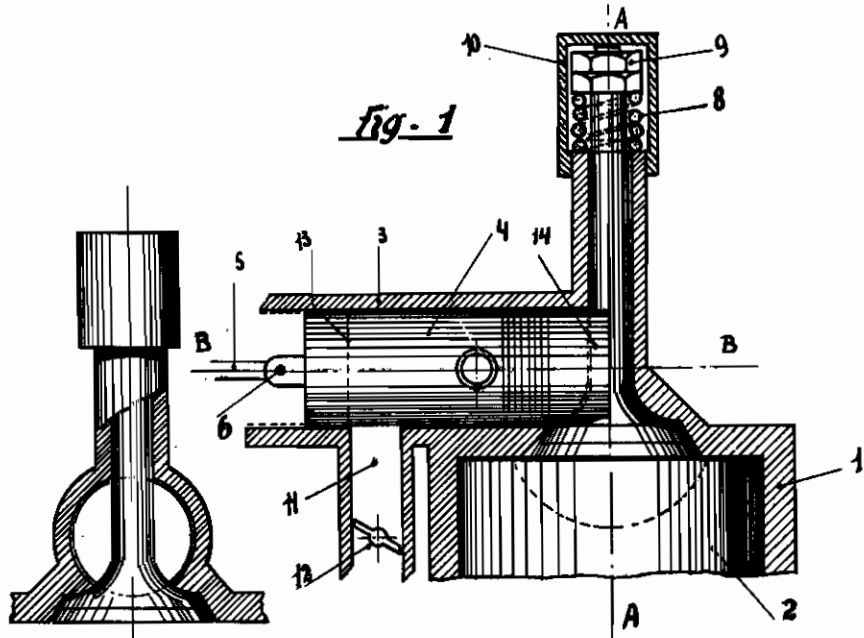


Fig- 1

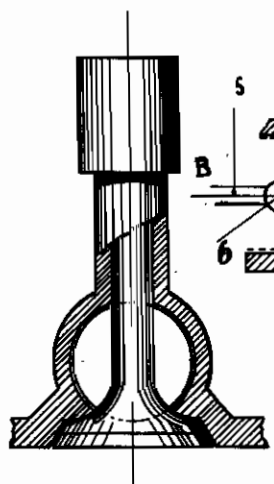


Fig- 2

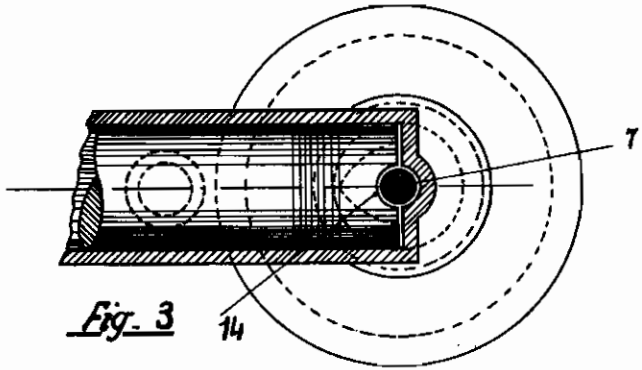


Fig- 3

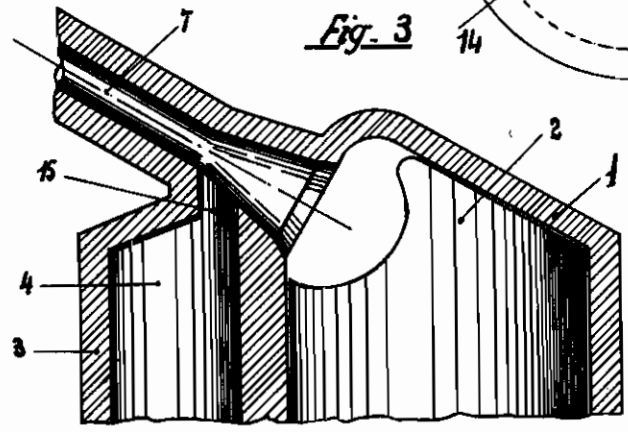


Fig 4

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ALIEN PROPERTY CUSTODIAN

INJECTION MEANS FOR INTERNAL COMBUSTION ENGINES

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The present invention relates to an improved type of two- or four-stroke internal combustion engine, operable with any sort of fuel in the form of either gas, or mist or solid suspension in the air or gas, either separately or in combination.

More particularly the present invention relates to a device for injecting air or fuel or both into the driving cylinder.

Said device comprises, in combination with the driving cylinder, a smaller cylinder, hereinafter called the injecting cylinder, which is integral with the driving cylinder and in which an injecting piston is reciprocated.

The injecting cylinder is provided with a suction or inlet aperture and an injection aperture, the latter being provided with a valve closed by a spring or other adjustable resilient means and capable of opening when the pressure of the piston in the injecting cylinder exceeds a determined limit, so that the fluid of any kind desired is injected under the wanted pressure in the combustion chamber of the driving cylinder. Said fluid may consist either of air, or gas fuel or a mixture thereof; or else it may consist of a finely subdivided suspension of a liquid or solid fuel in a gas.

Injection may take place either in the combustion chamber of the driving cylinder or in a pre-combustion chamber, either directly or indirectly; means to improve evenness of the mixture may be provided, if desired, for instance by giving a suitable shape to the valve head or the valve seat or adding downstream of the same other distributing or mixing or whirling organs; moreover, if desired, means for heating the fluid or mixture fed from the valve, such as electric heaters, may be added. The inlet aperture may be provided of a regulating valve, e. g. a butterfly throttle. Injection may be regulated by adjusting or varying the stroke of the injecting piston or anyhow varying the volume of fluid urged at every stroke by the same and adjusting the phase of the injecting piston stroke in relation to the driving piston stroke, that is the advanced ignition.

The injection pressure is determined by registering the resilient means which counteracts the opening of the ignition valve.

The injection valve may be assisted or controlled in its operation by mechanic or elastic or magnetic or other means.

It is a characteristic of the present invention the fact that the injection piston is always so shaped as to reduce the clearance, for instance

by exactly fitting against the stem or the head of the valve matching its shape.

In order to give a more complete illustration of the invention, two particular embodiments of the same are described hereunder, being it understood that they are given as examples only, and not as limitations of the invention, many other embodiments being possible with different mutual arrangements of the driving cylinder, injecting cylinder and valve.

Said two embodiments are diagrammatically represented in the attached drawing, wherein:

Fig. 1 is a sectional view of a device according to the invention;

Fig. 2 is a section through line A—A of Fig. 1;

Fig. 3 is a section through line B—B of Fig. 2;

Fig. 4 is a sectional view of a different embodiment of the device according to the invention with reference to Fig. 1.

The driving cylinder 1 containing the driving piston 2 is integral, in correspondence to its head, with a smaller cylinder 3, which will be called hereinafter the injecting cylinder; in this cylinder a piston 4 is directly actuated by a cam or other means, for instance from the driving shaft or other shaft connected with the driving shaft by means of a connecting rod 5 pivoted in 6 on the piston. A passage is provided between the driving cylinder and the injecting cylinder, in which passage is placed a preferably conical wall 7, urged in the closed position by a spring 8 held by nuts 9 and protected by a cap 10.

The injecting cylinder 3 is provided also with an inlet conduit 11 with a throttle 12. This conduit is uncovered by piston 4 at the end of its intake stroke which extends to the dotted line 13, this conduit leading the fluid or the fluid mixture to be injected.

The head of the injecting piston is shaped with a cavity 14, so as to match with an extremely small gap the shape of the wall 7 and to reduce the volume of the noxious space. This detail can be seen more clearly in Figures 2 and 3.

In the modification of Fig. 4 the cylinder 3 is parallel to driving cylinder 1 and the injecting piston 4 bears an extension 15 penetrating into the passage between the injecting cylinder and the seat of wall 7, which in this case is arranged with a direction inclined to the center lines of the two cylinders.

The above embodiments are given for example purposes only and many modifications can be introduced in the device according to invention as to the type of the engine which can be a 2-

or 4-stroke engine, with either electric or spontaneous ignition, and can operate with either gaseous or liquid or solid fuels of any kind, or as to the shape and dimensions of the injecting cylinder and piston, the number of cylinders and relative drive and regulation mechanism, and the shape and dimensions of the injection wall,

or as to the coupling of the injection unit with the driving cylinder and the relative arrangement of the various parts, or else as to all the other modifications and improvements which may be introduced or added in the single cases according to circumstances.

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