A. SCHMID.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED DEC. 19, 1914.

1,213,911.

Patented Jan. 30, 1917.

Fig. 1.

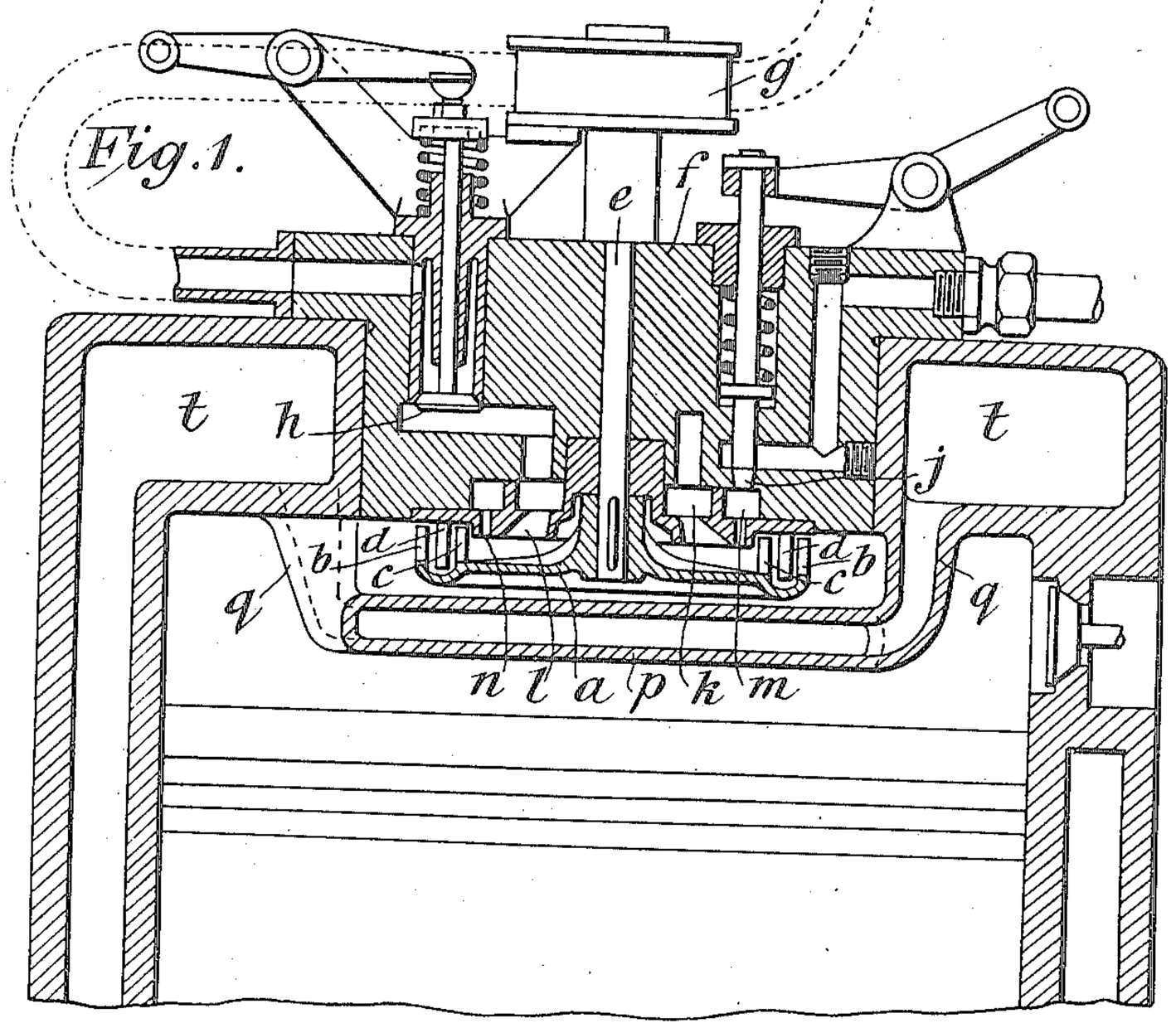
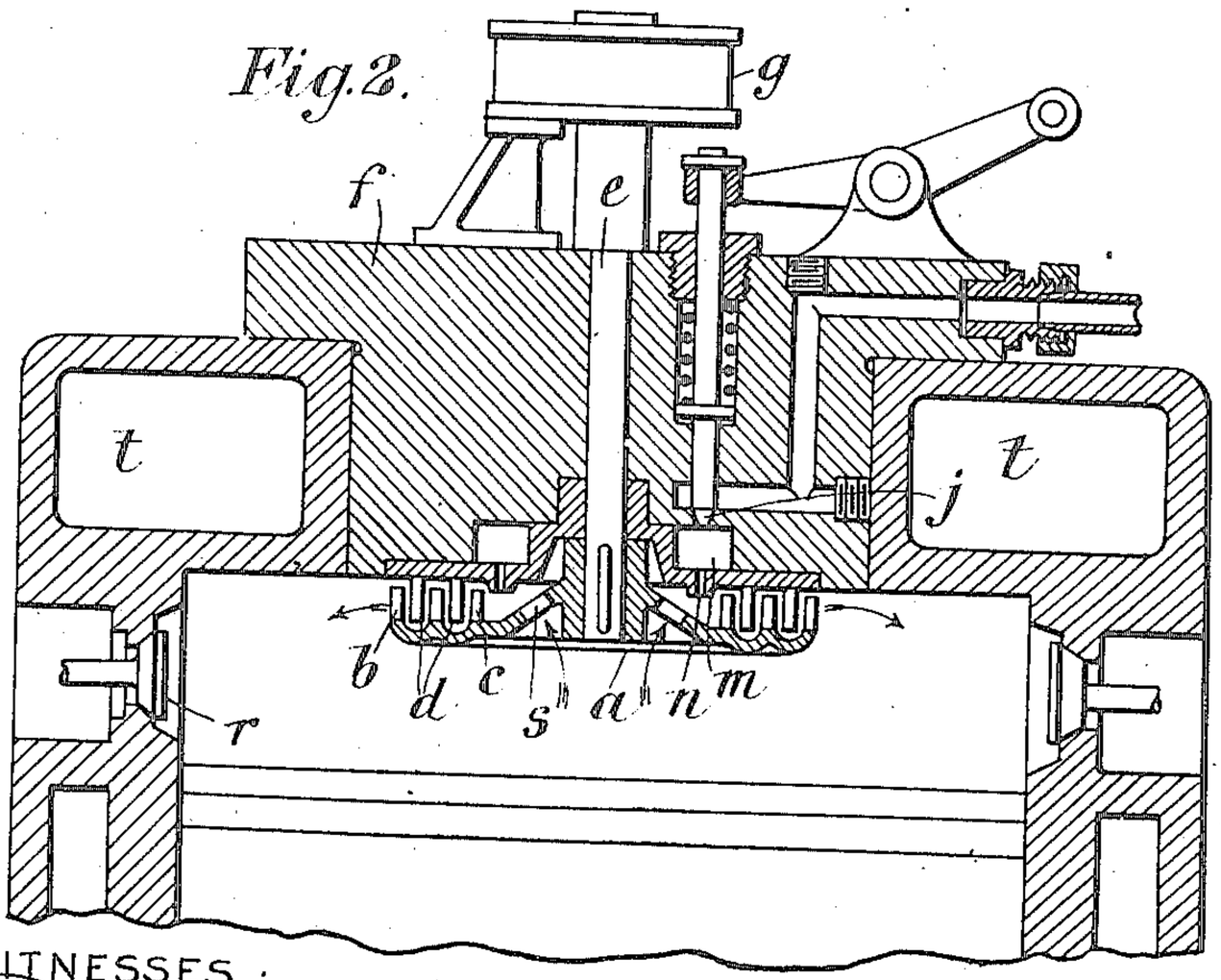


Fig. 2.



WITNESSES:

D. M. Fero.

E. M. McAllister

INVENTOR:

BY Albert Schmid

Dyer & Brown

HIS ATTORNEY IN FACT

UNITED STATES PATENT OFFICE.

ALBERT SCHMID, OF STE. ADRESSE, FRANCE.

INTERNAL-COMBUSTION ENGINE.

1,213,911. Specification of Letters Patent. Patented Jan. 30, 1917.

Application filed December 19, 1914. Serial No. 878,147.

To all whom it may concern:

Be it known that I, ALBERT SCHMID, a citizen of the United States, and a resident of Ste. Adresse, France, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines of the kind in which liquid fuel (crude petroleum for example) is introduced direct into the cylinder or combustion chamber. Two types of engines are now on the market using heavy, difficultly inflammable oil; firstly the Diesel type in which the oil is injected or sprayed by the aid of air under pressure into the highly compressed and heated air in the working cylinder, and secondly the Hornsby type in which the oil is pumped or injected into the combustion chamber which is kept at a high temperature. In either type one or more pumps are necessary to give the required pressure to the oil or air, which complicate the engine and increase its weight and cost. The use of such pumps is especially disadvantageous when the engine is to be used for high speed (tractive) purposes.

The object of the present invention is to provide an improved device by means of which liquid fuel at a low pressure may be introduced into the cylinder without the use of compressed air and then mechanically broken up or pulverized through the agency of a rotary device and intimately mixed with air to form a combustible charge. Rotary devices for introducing fuel are known, but these rotary devices do not operate in the same manner as the device of this invention.

The rotary device can be arranged at various places within the engine cylinder, but preferably it is located in the head of the engine cylinder and is driven at a high speed by a rotary motor such as an exhaust gas turbine or an electric or other rotary motor located outside of the engine cylinder, or by a rotary device driven by the air flowing into the cylinder.

In the two constructional forms of the invention shown by way of example in the accompanying drawings, Figures 1 and 2 are each a sectional elevation of the upper portion of the cylinder of an internal combustion engine embodying this invention.

In Fig. 1 the rotary device is indicated at *a* and comprises two rows *b* and *c* of moving vanes or blades and an intermediate row of fixed blades *d*. The rotary device is herein shown mounted on a spindle *e* which rotates in a casting *f* secured in the cylinder head. The motor for driving the rotary device is indicated at *g* and may be of any suitable type such as an electric motor or a small turbine driven by the exhaust gases from the engine or the like. The air inlet valve is indicated at *h* and the oil inlet valve at *j*. Air after being admitted by the valve *h* flows into a circular channel *k* in the casting *f* from which it passes through a series of orifices *l* and the blades of the rotary device *a* into the cylinder. The orifices *l* are preferably in the form of nozzles adapted to increase the velocity of the air passing through them. Liquid fuel, after passing the valve *j*, flows into a second circular channel *m* surrounding the first named channel *k* from which channel it passes through a series of small orifices *n* and is entrained by the air flowing through the nozzles *l* past the fixed and movable blades *c*, *d* and *b* into the cylinder. The oil, in passing through the fixed and moving blades, is mechanically broken up or pulverized and, when the engine is running, vaporized also due to the rotary device becoming hot. In order to protect the rotary device from the effects of the flame due to the combustion of the charge in the cylinder, a shield or screen *p* is provided supported from the cylinder head by connecting pieces *q*. The latter as well as the shield or screen *p* are preferably made hollow and communicate with the water cooling jacket *t* of the engine.

In the constructional form shown in Fig. 2, the air for the cylinder is admitted through an inlet valve *r* in the ordinary way and then passes through openings *s* in the rotary device *a* toward the innermost ring of moving blades through which and the remaining rows of fixed and moving blades it flows, carrying with it the liquid fuel which enters the cylinder from a circular channel *m* through orifices *n* as described with reference to Fig. 1.

In the form shown in Fig. 1, the motor *g* for driving the rotary device can be operated as an air turbine which is actuated by the air flowing into the cylinder during the suction stroke. In this case the pipe for this air is arranged as shown in dotted lines in Fig. 1. The motor can, however, be omitted if desired provided that the

fixed and moving blades *b*, *c*, *d* are constructed like the fixed and moving blades of an impulse turbine so that the air flowing through during the suction stroke will cause the moving element of the rotary device *a* to rotate.

The advantages of the improved device reside in the fact that no pumps are required for spraying or pulverizing the oil admitted to the cylinder. Oil may be fed by gravity past the inlet valve or by a slight pressure in the oil tank in a manner well understood. A further advantage resides in the fact that the pulverization and vaporization of the liquid fuel is brought about entirely by mechanical means having no reciprocating parts, which is of especial value for engines when used for high speed (tractive) purposes.

The engine may be started and operated in the manner described in Patent No. 1,121,135 issued to me on December 15, 1914 in which case the air supplied to the cylinder may be mixed with a suitable proportion of light oil such as petrol or gasolene by passing it for example through a carbureter, but in many cases it will be found that the engine may be started directly with heavy, difficultly inflammable fuel by actuating the rotary device with compressed air from a storage tank or by an electric motor supplied from a storage battery, or in some other convenient way, thus permitting the pulverization of the heavy fuel at starting.

I claim as my invention:

1. The combination in an internal combustion engine of means for introducing fuel into the cylinder, a rotary device positioned within the engine cylinder so as to receive said fuel and provided with alternate moving and stationary blades or fingers for mechanically breaking up or pulverizing and intimately mixing the same with air, and means for rotating said rotary device.

2. The combination in an internal combustion engine of means for introducing fuel into the cylinder, a rotary device positioned within the engine cylinder so as to receive said fuel and provided with alternate moving and stationary blades or fingers for mechanically breaking up or pulverizing the fuel and intimately mixing the same with air, and means outside of said engine cylinder for rotating said rotary device.

3. The combination in an internal combustion engine of means for introducing liquid fuel into the cylinder, a rotary device positioned within the engine cylinder so as to receive said liquid fuel and provided with alternate moving and stationary blades or fingers for mechanically breaking up or pulverizing the liquid fuel and intimately mixing the same with air, and means outside of said engine cylinder and operatively connected with said rotary device for driving the same.

4. The combination in an internal combustion engine of means for introducing liquid fuel into the cylinder, a rotary device positioned within the engine cylinder so as to receive said liquid fuel and provided with alternate moving and stationary blades or fingers for mechanically breaking up or pulverizing the liquid fuel and intimately mixing the same with air, and means outside of said engine cylinder and axially alined with said rotary device for operating the same.

5. The combination in an internal combustion engine of means for introducing liquid fuel into the cylinder, a rotary device positioned within the engine cylinder so as to receive said liquid fuel and provided with alternate moving and stationary blades or fingers for mechanically breaking up or pulverizing the liquid fuel and intimately mixing the same with air, means for rotating said rotary device, and a water cooled shield within the engine cylinder for protecting said rotary device.

6. In combination in an internal combustion engine, means for introducing fuel into the engine cylinder during the suction strokes of the engine, and a rotary device provided with alternate moving and stationary blades and positioned within the engine cylinder so as to receive, mechanically break up, or pulverize, and intimately mix said fuel with air during said suction strokes.

In testimony whereof I have hereunto subscribed my name this second day of December 1914.

ALBERT SCHMID.

Witnesses:
A. S. CACHEWAILLE,
F. W. WALL.