

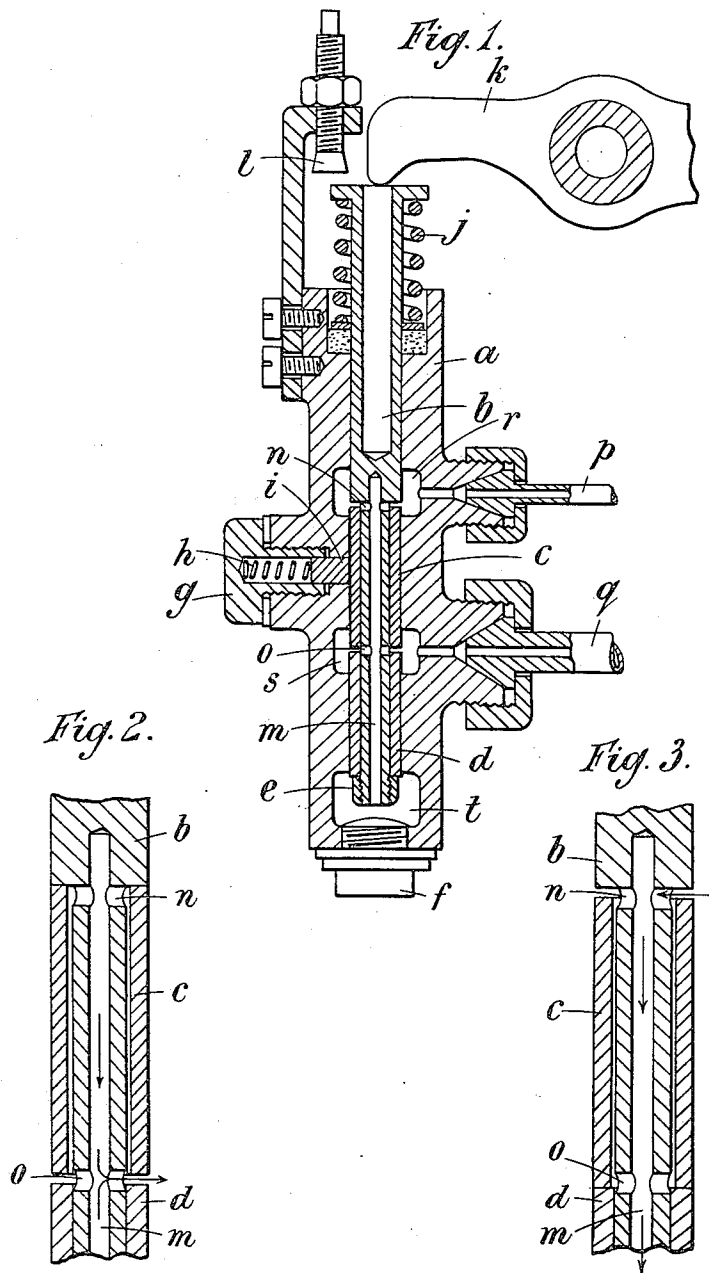
March 22, 1932.

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1,850,926

PUMP FOR INJECTING LIQUID FUEL INTO INTERNAL COMBUSTION ENGINES

Filed April 9, 1928



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UNITED STATES PATENT OFFICE

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PUMP FOR INJECTING LIQUID FUEL INTO INTERNAL COMBUSTION ENGINES

Application filed April 9, 1928, Serial No. 268,537, and in Belgium April 15, 1927.

The injection of liquid fuel in engines of the Diesel or similar type, must always be effected under very great pressure and this renders it difficult to supply the exact quantities required for the small charges necessary.

The object of the present invention is to provide a pump of simple and strong construction with a positive control for the intake and delivery or ejecting organs, and allows the pump to be operated at great speed and consequently to be actuated directly by the shaft of the engine.

The pump forming the subject matter of the invention is hereinafter described by way of example, in reference to the accompanying drawings in which:—

Figure 1 is a longitudinal section of the pump as a whole, and

Figures 2 and 3 are longitudinal sections drawn to a larger scale, in which, respectively, the intake and ejecting organs are shown in the two terminal positions.

The pump body *a* has an axial bore forming a cylinder in which a piston *b* is moved downwards by a tumbler lever or tappet *k* and upwards by a spring *j*.

The axial bore of the body *a* has three enlargements or chambers *r*, *s* and *t*. Into the chambers *r* and *s* open respectively the intake and delivery pipes *p*, *q*, for the liquid fuel; the purport of the third chamber *t* is hereinafter described.

The piston *b* comprises a main body, whose lower portion is of smaller diameter than the upper portion, and has an axial channel *m*, and two transverse apertures *n* and *o* which latter form passages respectively for the intake and the discharge of the liquid fuel. On the reduced portion of the piston there are fitted two sleeves *d* and *c*, of which, the former is fast and within the latter the said reduced portion is independently slidable, the sleeve *c* acting as a closely fitting obturator or valve. A plunger or brake block *i* bearing against the valve *c* under the pressure of a spring *h*, exerts a braking action and causes the valve *c* to lag behind when the piston *b* receives its longitudinal motion.

The pump operates as follows:—

Assuming that the piston *b* is just starting its ascent under the action of the spring *j*, from the lowermost position in which it is shown in Figure 1, the valve *c* under pressure of the brake block *i*, remains stationary during this ascent and the two apertures *n* and *o* are uncovered during a brief portion of the stroke. This permits equilibrium to be established between the delivery and intake columns and consequently prevents any leakage. The injection period, through the lower aperture *o* is abruptly terminated through the continued upward movement of the sleeve *d* bringing the upper end of this sleeve into contact with the lower end of the valve *c* and thereby, as shown in Figure 3, closing the discharge aperture *o*. Simultaneously, the upper intake aperture *n* is uncovered and the liquid enters the central channel *m* and fills the lower enlargement or chamber *t*. The control tumbler *k* then becomes operative and begins to depress the piston *b*, while, at the same time, the valve *c*, through the action of the brake lock *i*, will be held stationary. This will cause the intake aperture *n* to be closed, as in Figure 2, and the liquid fuel, under strong pressure, will be ejected through the aperture *o* into the chamber *s* and thence into the delivery tube *q*.

The liquid fuel, by filling the lower chamber *t*, acts as an elastic cushion to the liquid passing from the central channel *m*, and renders the discharging jet more uniform. At that moment, under the action of the spring *j*, a new return or upward stroke commences, and the before described cycle is repeated. The quantity of liquid fuel ejected can be regulated by merely varying the stroke of the piston as for example by an adjustable stop or set screw *l*, or by more or less choking a by-pass in the delivery column.

The pump serves to deliver positively, an accurate charge of fuel, and the injection takes place exactly at the right moment whatever be the speed of the engine.

Having described my invention, I declare that what I claim and desire to secure by Letters Patent is:—

1. In a liquid-fuel injecting pump, the combination with a pump body having an in-

let and an outlet for the fuel, of a piston provided with a reduced portion and with enlarged end portions and longitudinally movable in the body, a central channel in the piston, two transverse apertures extending through the piston and opening into the central channel, and adapted to communicate with the inlet and outlet, and a sleeve valve mounted on the reduced portion of the piston with freedom of movement between the two enlarged portions thereof, and displaceable longitudinally in the pump body under the action of said piston, said sleeve valve being adapted to open and close the transverse apertures alternately.

2. In a liquid-fuel injecting pump, the combination with a pump body having an inlet and an outlet for the fuel, of a piston longitudinally movable in the body, a central channel in the piston, two transverse apertures extending through the piston and opening into the central channel, and adapted to communicate with the inlet and outlet, a sleeve valve on the piston adapted to open and close the transverse apertures alternately, and a retarding device engaging the sleeve to cause it to lag behind during the movement of the piston.

3. In a liquid-fuel injecting pump, the combination with a pump body having an inlet and an outlet for the fuel, of a piston provided with a reduced portion and with enlarged end portions and longitudinally movable in the body, a central channel in the piston, two transverse apertures extending through the piston and opening into the central channel, and adapted to communicate with the inlet and outlet, and a sleeve valve mounted on the reduced portion of the piston with freedom of movement between the two enlarged portions thereof, and displaceable longitudinally in the pump body under the action of said piston, said sleeve valve being adapted to open and close the transverse apertures alternately, said pump body being provided with three chambers, into one of which opens the inlet and one of the transverse apertures, into another opens the outlet and the second transverse aperture, and with the third of which the central channel is in open communication.

4. In a liquid-fuel injecting pump, the combination with a pump body having an inlet and an outlet for the fuel, of a piston longitudinally movable in the body, a central channel in the piston, two transverse apertures extending through the piston and opening into the central channel, and adapted to communicate with the inlet and outlet, a sleeve valve on the piston movable relatively thereto to open and close the transverse apertures alternately, said pump body being provided with three chambers, into the upper of which opens the inlet and one of the transverse apertures, into the second of which

opens the outlet and the second transverse aperture, and in the lowest of which nearest the outlet, plunges the lower end of the piston, said lowest chamber being in open communication with the said central channel, and a retarding device engaging the sleeve to cause it to lag behind the piston during its longitudinal movement.

In witness whereof I have affixed my signature hereto.

FRANÇOIS FEYENS.