

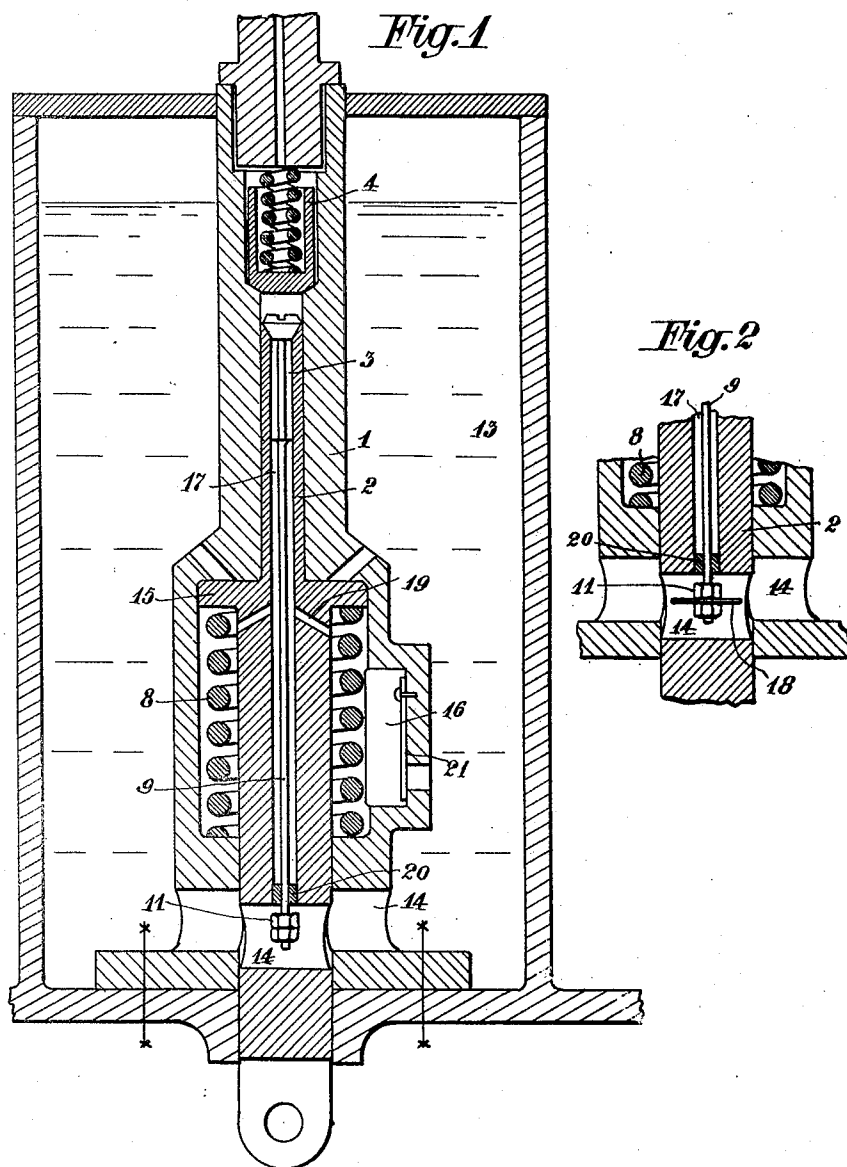
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FUEL FEED PUMP FOR INTERNAL COMBUSTION ENGINES

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UNITED STATES PATENT OFFICE.

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FUEL-FEED PUMP FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, RUDOLF WALKER, a subject of the Kingdom of Great Britain, residing at XI Simmeringer Hauptstrasse 38-40, Vienna, Austria, have invented Improvements in Fuel-Feed Pumps for Internal-Combustion Engines, of which the following is a specification.

In a modification of the improved fuel pump according to the present invention the springless suction valve mounted on the piston of the fuel pump is opened and closed quickly by its inertia which acts at every reversal of the stroke of the fast-moving piston, and is carried along by the pump piston in its open and closed conditions respectively. These movements of the valve may be accelerated by the use of hydraulic resistance. Further, the suction valve is rendered accessible from a point outside the pump cylinder.

A constructional example of the improved fuel pump is illustrated in the accompanying drawings in which—

Figure 1 is a longitudinal section, and

Figure 2 is a sectional view of a detail of the improved pump.

1 is the pump cylinder; 2 is the pump piston; and 3 is the suction valve mounted on the piston 2. The suction valve rod 9 extends throughout the length of the suction duct 17 in the piston 2 down to a laterally accessible opening 14 formed in the piston, where the rod 9 carries a preferably adjustable stop 11 for limiting the lift of the suction valve 3.

The suction valve 3 has complete freedom of movement within its stroke which is limited by the stop 11, and it is opened and closed quickly and independently of the flow of the liquid through it, by the arrangement that on the reversal of the fast-moving piston 2, the suction valve 3, owing to its own inertia, does not reverse its movement immediately but continues to move in the same direction as hitherto, so far as this is allowed by the stop 11. From that moment onwards the suction valve is carried along by the piston in its respective condition of being open or closed.

The inertia of the suction valve and consequently the rapidity with which it opens and closes increases with the speed of the pump and the weight of the suction valve. Although the suction valve is necessarily of

small size, its weight is brought up to the required amount by the provision of a long valve rod 9.

This valve rod also serves to afford access to the valve from outside the pump cylinder.

In the illustrated example, the suction valve rod 9 extends through the pump piston longitudinally of the latter down to an opening 14 formed in the piston and in the pump cylinder, where the valve rod 9 carries the, preferably adjustable, stop 11. If the opening 14 in the piston is situated entirely outside the pump cylinder 1 no opening in the latter is necessary.

Further, in the illustrated example the opening in the piston and in the cylinder is situated within the fuel tank 13.

Through these openings it is possible to inspect, operate and test the suction valve 3 by means of the valve rod 9 and observe and regulate the lift of the suction valve. Moreover the stop 11 works in liquid fuel, so that it provides the suction valve with a hydraulic resistance, which acts upon the suction valve in the movement of the piston, whereby the suction valve is caused to open and close more quickly than would be the case without this hydraulic resistance.

By mounting a plate 18 or the like device on the suction valve rod 9 (Fig. 2), this hydraulic resistance can be increased with the result that the suction valve will open and close still more quickly.

15 is a larger stage of the piston 2, which operates as a preliminary stage in an auxiliary pumping cylinder 16 and is acted upon by a spring 8, that produces a quick upstroke of the piston 2, whilst the downstroke of the latter is effected by a cam (not shown).

The suction duct 17 is closed at its lower end at 20; it communicates only by way of the ducts 19 with the auxiliary pumping space 16 which communicates in its turn with the tank 13 through a separate suction valve 21 (shown as a flap valve).

The operation of the large piston stage 15 (Fig. 1) is as follows:—During the upstroke of the piston, this stage 15 draws liquid fuel through 21 from the tank 13, and forces it, during the downstroke of the piston, through the ducts 19 into the suction duct 17 of the piston 2, and thence into the pumping space above the suction valve 3.

Owing to the closures at 20 and 21 the described construction assures a suction and compression of the auxiliary pump 15, 16 without loss, and consequently a complete
 5 filling of the suction space of the improved fuel pump even at very high speeds.

The auxiliary pump may also deliver an excess of liquid fuel to the suction valve 3 and in such a case the delivery valve 4 can
 10 be prevented from opening by various means.

What I claim is:

1. In a liquid fuel pump for internal combustion engines, a pump piston, a suction
 15 valve on said piston having complete freedom of movement within its limited stroke, said valve being of such weight as to be caused to open and close quickly by the action of its large inertia at each reversal of
 20 the stroke of the fast moving piston and being carried along in its open and closed positions respectively.

2. In a liquid fuel pump for internal combustion engines, a pump piston, a suction
 25 valve on said piston, a seat and a stop for said valve, said valve being of such weight as to be caused to open and close quickly by the action of its inertia at each reversal of the stroke of the fast moving
 30 piston and being carried along in its open and closed positions respectively, and a rod carried by the valve increasing its weight and inertia.

3. In a liquid fuel pump for internal
 35 combustion engines, a pump piston, a suction valve on said piston, a seat for said valve, said valve being of such weight as to be caused to open and close quickly by the action of its inertia at each reversal of the
 40 stroke of the fast moving piston and being carried along in its open and closed positions respectively, a rod carried by and increasing the weight of the valve and extending through the piston, an adjustable stop
 45 on said rod, and means rendering the adjustable stop accessible from the exterior of the piston.

4. In a liquid fuel pump for internal combustion engines, a pump piston, a suction
 50 valve on said piston, a seat for said valve, said valve being caused to open and close quickly by the action of its inertia at each reversal of the stroke of the fast moving piston and being carried along in its open
 55 and closed positions respectively, a rod carried by and increasing the weight of the valve and extending through the piston, an adjustable stop on said rod, means rendering the adjustable stop accessible from the exterior of the piston, and a cylinder for
 60 said piston having an opening permitting access to the adjustable stop from the exterior of the cylinder.

5. A fuel pump as claimed in claim 3
 65 characterized by the provision of a container

adapted, when containing liquid fuel, to submerge the stop therein whereby to produce a hydraulic resistance to the movement of the rod and valve and thereby cause rapid
 70 opening and closing movements of the latter at the reversals of the strokes of said piston.

6. A fuel pump as claimed in claim 4 characterized by the provision of a container
 75 adapted, when containing liquid fuel, to submerge the stop therein whereby to produce a hydraulic resistance to the movement of the rod and valve and thereby cause rapid opening and closing movements of
 80 the latter at the reversals of the strokes of said piston.

7. A fuel pump as claimed in claim 3 characterized by the provision of a container
 85 adapted, when containing liquid fuel, to submerge the stop therein whereby to produce a hydraulic resistance to the movement of the rod and valve and thereby cause rapid opening and closing movements of the latter at the reversals of the strokes of said
 90 piston, and means to increase the hydraulic resistance above that afforded by the stop.

8. A fuel pump as claimed in claim 4 characterized by the provision of a container
 95 adapted, when containing liquid fuel, to submerge the stop therein whereby to produce a hydraulic resistance to the movement of the rod and valve and thereby cause rapid opening and closing movements of the latter at the reversals of the strokes of
 100 said piston, and means to increase the hydraulic resistance above that afforded by the stop.

9. A fuel pump as claimed in claim 1 characterized by the provision of an enlargement
 105 at one end of the piston, a cylinder receiving the piston and having an enlarged portion receiving the enlarged portion of the piston, said piston having a longitudinal bore to conduct fuel to the suction valve and communicating with the enlarged portion
 110 of the cylinder, the enlarged portion of said piston being adapted to force liquid fuel into the bore of the piston, and valve controlled means admitting liquid fuel to the enlarged
 115 portion of the cylinder.

10. A fuel pump as claimed in claim 2 characterized by the provision of an enlargement
 120 at one end of the piston, a cylinder receiving the piston and having an enlarged portion receiving the enlarged portion of the piston, said piston having a longitudinal bore to conduct fuel to the suction valve and communicating with the enlarged
 125 portion of the cylinder, the enlarged portion of said piston being adapted to force liquid fuel into the bore of the piston, and valve controlled means admitting liquid fuel to the enlarged portion of the cylinder.

11. A fuel pump as claimed in claim 3
 130 characterized by the provision of an enlarge-

ment at one end of the piston, a cylinder receiving the piston and having an enlarged portion receiving the enlarged portion of the piston, said piston having a longitudinal bore to conduct fuel to the suction valve and communicating with the enlarged portion of the cylinder, the enlarged portion of said piston being adapted to force liquid fuel into the bore of the piston, and valve controlled means admitting liquid fuel to the enlarged portion of the cylinder. 10

In witness whereof I have hereunto signed my name.

RUDOLF WALKER.