

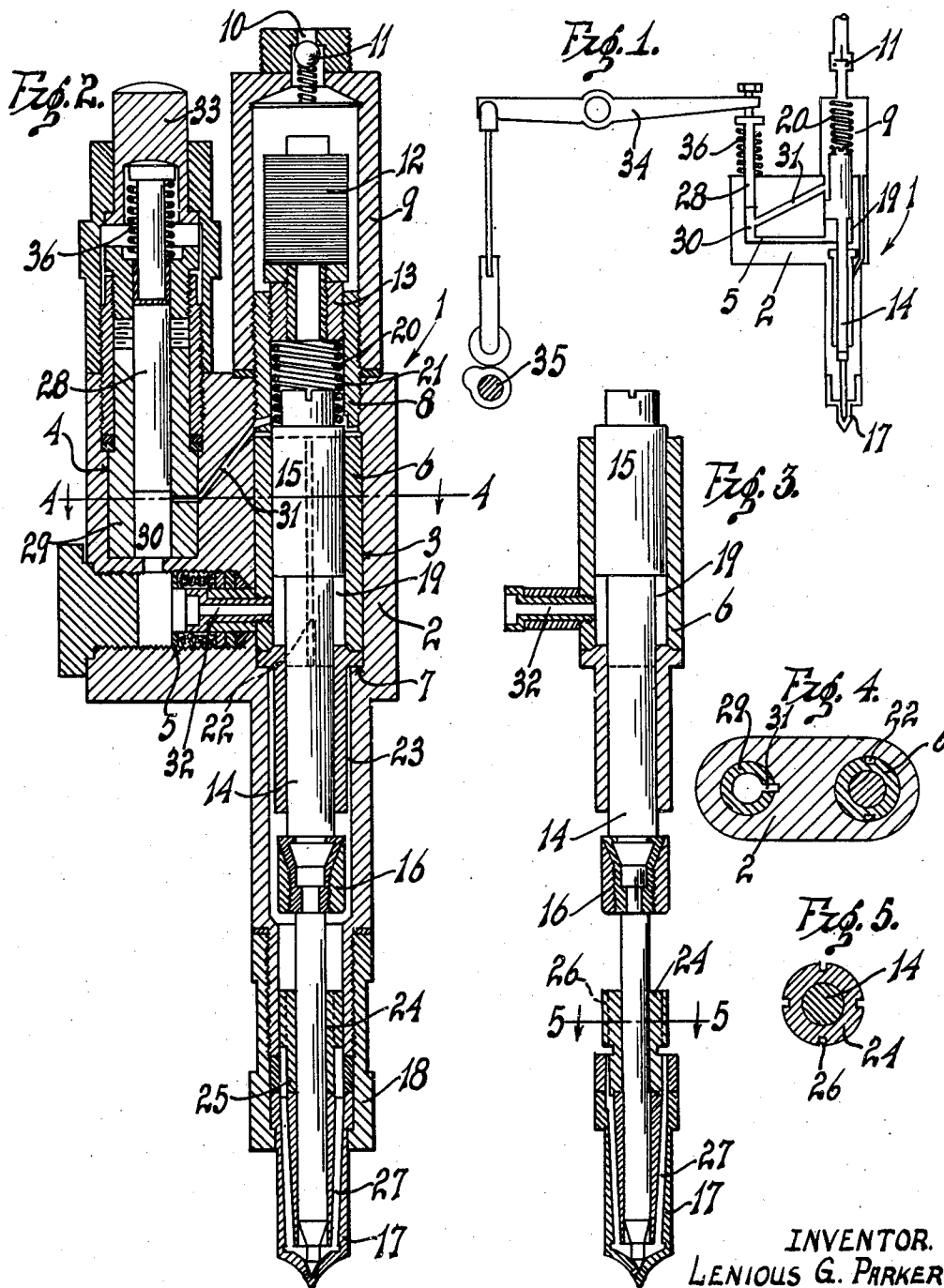
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FUEL NOZZLE

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FUEL NOZZLE

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This invention relates to a fuel nozzle particularly applicable to Diesel engines.

An object of my invention is to provide a novel fuel nozzle in which the fuel valve is raised by hydraulic pressure, the hydraulic pressure being created by an auxiliary piston actuated in timed relation to the engine.

Another object of my invention is to provide a novel fuel nozzle of the character stated, and in which the valve actuating piston also increases the pressure of the fuel prior to injection into the engine.

Still another object is to provide a novel fuel nozzle of the character stated which is effective in operation, and an arrangement of parts permitting an ease of assembly, and furthermore, a nozzle through which fuel will readily flow, and which will properly meter, the fuel into the engine.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing:

Figure 1 is a diagrammatical view of my fuel nozzle.

Figure 2 is a longitudinal sectional view of the fuel nozzle.

Figure 3 is a longitudinal sectional view of the fuel valve and the parts in which it is guided.

Figure 4 is a sectional view taken on line 4—4 of Figure 2.

Figure 5 is a sectional view taken on line 5—5 of Figure 3.

Referring more particularly to the drawing, the fuel nozzle 1 consists of a body 2 which is mounted in each of the engine cylinders in a usual and well known manner. This body is provided with a vertical bore 3 in which the valve is mounted, a second vertical bore 4, adjacent the bore 3, and in which the actuating piston is mounted. A third horizontal bore 5, connects the bores 3 and 4, and a jet is mounted in the bore 5, as will be further described. A sleeve 6 is fixedly mounted in the bore 3, and rests on a shoulder 7 in this bore, thus limiting the downward movement of the sleeve. The sleeve is also pressed tightly in the bore, thus preventing longitudinal movement thereof. A fitting 8 is threaded into the upper end of the bore 3, and a cap 9 screws onto this fitting. An inlet port 10 extends into the upper end of the cap 9, and this port is controlled by the spring pressed ball 11. A filter 12 of usual and well known design, is mounted on the fitting 8 by means of the nipple 13. A fuel valve 14 is mount-

ed within the bore 3, and is provided with a piston 15 at its upper end which piston closely fits the ball of the sleeve 6. The stem of the valve 14 may be made in two parts if desired, that is, two parts being held together and in alignment by means of the coupling 16, which is usual and well known in the art. The lower end of the valve 14 is seated in the usual tip 17, which is fixedly attached to the lower end of the body 2 by means of a threaded coupling sleeve 18.

A fluid chamber 19 is provided under the piston 15 and within the sleeve 6. The stem of the valve 14 closely fits the lower portion of the sleeve 6, and consequently, the chamber 19 is sealed against leakage of fluid. A coil spring 20 bears against the top of the valve 14 urging the valve downwardly onto its seat in the tip 17. Fuel under pressure, enters through the port 10, into the cap 9. The fuel then passes through the filter 12, and thence into the spring chamber 21 above the piston 15. The fuel then passes downwardly through vertical slots 22 which are cut in the outer surface of the sleeve 6. The lower portion of this sleeve is reduced in diameter, thus leaving an annular space 23 in the bore 3, through which, the fuel, under pressure, can pass. The fuel then moves downwardly around the stem of the valve 14, past the head 24 of the guide sleeve 25, this head being provided with vertical slots 26 to permit the passage of the oil. Ducts 27 are provided within the valve tip 17 permitting the fuel, under pressure, to pass to the usual spray jets of the tip 17. The lower end of the valve 14 is seated in the valve tip in the usual and well known manner, and fuel can pass into the engine cylinder only when the valve 14 is raised, all of which is usual and well known.

An operating piston 28 is reciprocally mounted in the sleeve 29, this sleeve being fixedly mounted in the bore 4. A chamber 30 below the piston 28, is provided with a fuel inlet duct 31 which extends through the body 2 from a point above the piston 15 to a point below the piston 28 when this last named piston is in raised position. The chamber 30 opens into the bore 5, and a jet 32 is fixedly mounted in the bore 5 and opens into the chamber 19. A follower cap 33 bears against the top of the plunger 28 and is engaged by the rocker arm 34, this rocker arm being actuated from the cam 35, in the usual and well known manner. The cam 35 is engine driven, and consequently, the plunger 28 will be reciprocated in timed relation to the engine. A coil spring 36 bears against the plunger 28, and returns this plunger to its normal raised position.

As previously described, fuel, under pressure, enters the port 10, flowing downwardly, as previously described, to the tip 17. This fuel, under pressure, also passes through the duct 31, filling the chamber 30, the bore 5, and the chamber 19. When the cam 35 depresses the plunger 28, the fuel in the chambers 30, 19, and bore 5, is placed under pressure. As the plunger 28 moves downwardly, the fuel, under high pressure, is forced backwardly through the duct 31, until this duct is closed by the movement of the plunger. The fuel oil which is in the nozzle thus has its pressure increased a certain amount, and the ball check 11 prevents the movement of this high pressure fuel back into the intake line. As the plunger 28 continues its downward movement, the fuel oil, under pressure, will be exerted against the bottom of the piston 15, thus raising the valve 14, thus permitting fuel oil, under high pressure, to spray out of the nozzle 17. When the plunger 28 returns to its raised position under the urge of the spring 36, the spring 20 will simultaneously seat the valve 14. This cycle is repeated in timed relation to the movement of the piston in the engine cylinders.

Having described my invention, I claim:

1. A fuel nozzle comprising a body, having a bore providing a fuel passage with a valve seat and a bore for a plunger, a valve in said passage and arranged to engage said seat, said body having a fluid chamber arranged to be sealed from said passage, a piston head on said valve in communication with said chamber and arranged to move said valve to uncover said seat when pressure is increased in said chamber, means providing a duct from said second bore to said chamber, means providing a communication duct between said passage and said second bore, and a plunger in said second bore, said ducts being arranged so that upon advance of said plunger the pressure in said communication duct will be increased and upon continued advance the plunger will seal said fluid chamber from said passage by closing said communication duct and thereafter increase the pressure of the fluid in said chamber.

2. A fuel nozzle comprising a body having a fuel passage with a seat at an end of said passage, a cylinder for a plunger, a high pressure fuel inlet to said passage, a check valve to close the inlet against back flow of fuel from the passage, a valve in said passage between said inlet and seat and arranged to normally engage said seat, a piston head on said valve, a fluid chamber in said body arranged to be sealed from said passage, said fluid chamber communicating with and arranged in such relation to said piston head that an increase in pressure in said chamber will displace said valve to disengage said seat, a duct connecting said chamber and cylinder, a plunger in said cylinder reciprocable therein to increase the pressure in said chamber to unseat said valve, a duct extending from said passage to said cylinder at a point such that during the end portion of the forward stroke and the beginning portion of the return stroke of the plunger the latter duct will be closed while the other duct will remain open, and a means to reciprocate said plunger.

3. A fuel nozzle comprising a body, said body having a vertical bore therein, a piston having a piston head operating in the bore, a valve depending from the piston and extending longitudinally in said bore, a nozzle tip at the lower end of the bore, said valve being seated in the

tip, spring means yieldably holding the valve seated against the tip, said bore having a chamber therein below and communicating with the piston head and arranged so that it is sealed from the remaining portion of the bore, a second bore in the body, an actuating plunger reciprocally mounted in the second bore, means to actuate said plunger, fuel intake means communicating with the first named bore whereby fuel under pressure is fed into the first named bore above the piston, said bore having bypassed grooves in the periphery thereof to by-pass the piston head and said chamber and through which fuel is adapted to pass to the tip, said body having an intake duct extending from above the piston head in said first bore to said second bore and positioned to be closed by the plunger as it moves to an advanced position by said actuating means, said body having a second duct connecting the chamber under the piston with the second bore at a point further from the plunger than the point of connection of said first duct as concerns said movement of the plunger.

4. A fuel nozzle comprising a body, said body having a bore therein, a piston having a piston head in the bore, a valve depending from the piston and extending longitudinally in said bore, a nozzle tip at the lower end of the bore, said valve being seated in the tip, spring means yieldably holding the valve seated against the tip, said bore having a chamber therein below and communicating with the piston head and arranged so that it is sealed from the remaining portion of the bore, a second bore in the body, an actuating plunger reciprocally mounted in the second bore, means to actuate said plunger, fuel intake means communicating with the first named bore whereby fuel under pressure is fed into the first named bore above the piston, said bore having bypass grooves in the periphery thereof to by-pass the piston head and said chamber and through which fuel is adapted to pass to the tip, said body having an intake duct extending from above the piston head in said first bore to said second bore and positioned to be closed by the plunger as it moves to an advanced position by said actuating means, said body having a second duct connecting the chamber under the piston with the second bore at a point further from the plunger than the point of connection of said first duct as concerns said movement of the plunger.

5. A fuel nozzle comprising a body, said body having a bore therein, a piston having a piston head operating in the bore, a valve connected to one end of the piston and extending longitudinally in said bore, a nozzle tip at one end of said bore, said valve being seated in the tip, spring means yieldably holding the valve seat against the tip, said bore having a chamber therein located between the end of the piston and the seat end of the bore, and communicating with the piston head and arranged so that it is sealed from the remaining portion of the bore, a second bore in the body, an actuating plunger reciprocally mounted in the second bore, means to actuate said plunger, fuel intake means communicating with the first named bore whereby fuel under pressure is fed into the first named bore to the opposite side of the piston from said chamber, said bore having bypass grooves in the periphery thereof to by-pass the piston head and said chamber and through which fuel is adapted to pass to the tip, said body having an intake duct extending from the said opposite side

of the piston head in said first bore to said second bore and positioned to be closed by the plunger as it moves to an advanced position by said actuating means, said body having a second duct connecting the first named chamber with the second bore at a point further from the plunger than the point of connection of said first duct as concerns said movement of the plunger.

6. A fuel nozzle comprising a body, said body having a bore therein, a piston having a piston head operating in the bore, a valve connected to one end of the piston and extending longitudinally in said bore, a nozzle tip at one end of said bore, said valve being seated in the tip, spring means yieldably holding the valve seat against the tip, said bore having a chamber therein located between the end of the piston and the seat end of the bore, and communicating with the piston head and arranged so that it is sealed from the remaining portion of

the bore, a second bore in the body, an actuating plunger reciprocally mounted in the second bore, means to actuate said plunger, fuel intake means communicating with the first named bore whereby fuel under pressure is fed into the first named bore to the opposite side of the piston from said chamber, said bore having bypassed grooves in the periphery thereof to by-pass the piston head and said chamber and through which fuel is adapted to pass to the tip, said body having an intake duct extending from the said opposite side of the piston head in said first bore to said second bore and positioned to be closed by the plunger as it moves to an advanced position by said actuating means, said body having a second duct connecting the first named chamber with the second bore at a point further from the plunger than the point of connection of said first duct as concerns said movement of the plunger, said fuel intake means including a check valve.

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