April 12, 1932. H. M. LEONARD 1,853,825

FUEL INJECTING MEANS

Filed June 2, 1927

Fig. 1.

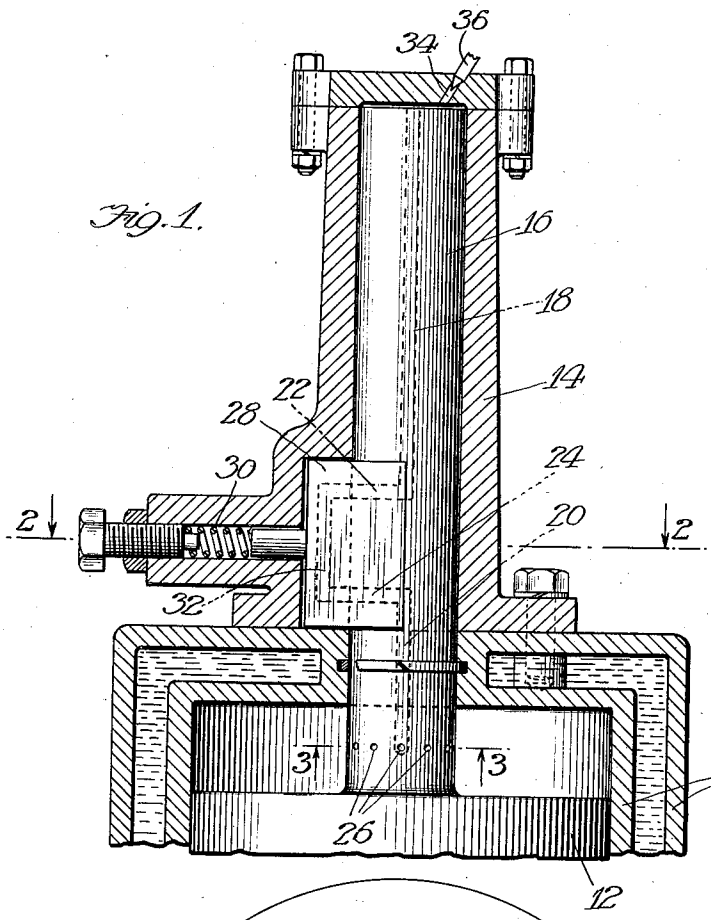


Fig. 3.

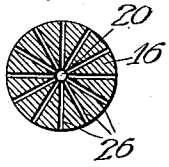
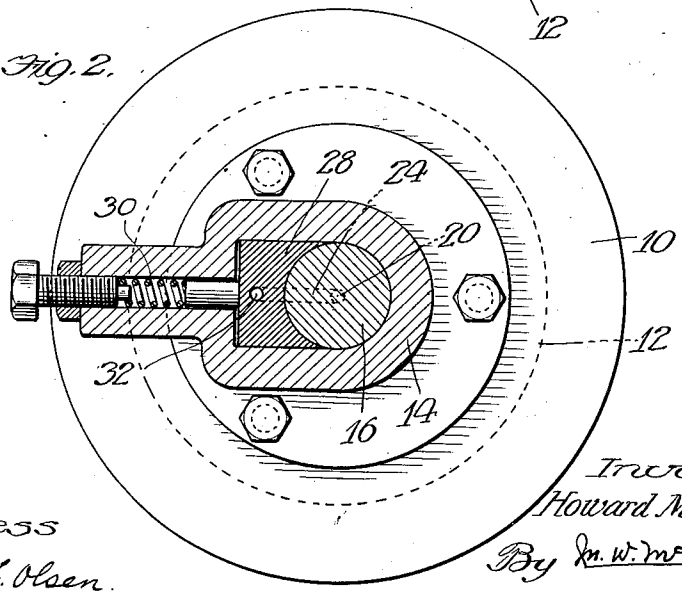


Fig. 2.



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UNITED STATES PATENT OFFICE

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FUEL-INJECTING MEANS

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This invention relates to engines, and is illustrated as embodied in a two-cycle internal combustion engine of the injection type. An object of the invention is to provide novel and very simple means for injecting the fuel, preferably after having first vaporized it in a charge of air or exhaust gas or other fluid medium. I prefer to eliminate the usual cam mechanism entirely, by mounting the fuel-feeding plunger in a novel manner on the engine piston itself, with the plunger cylinder formed as a coaxial extension of the engine cylinder. The plunger may advantageously be formed with a longitudinally-extending fuel passage communicating with a series of radial passages at its base through which the fuel is injected into the engine cylinder.

Another feature of novelty relates to forming a fuel-feeding plunger, such as the one described above, with two disconnected passages which are placed in communication with each other, in one plunger position, by means such as a novel spring-pressed shoe slidably engaging the side of the plunger.

The above and other objects and features of the invention, including various novel combinations of parts and desirable particular constructions, will be apparent from the following description of one illustrative embodiment shown in the accompanying drawings, in which:

Figure 1 is a vertical section through the upper part of the engine cylinder and through the novel fuel-feeding means;

Figure 2 is a horizontal section through the fuel-feeding means on the line 2—2 of Figure 1; and

Figure 3 is a horizontal section, on the line 3—3 of Figure 1, through the plunger.

The illustrated engine includes a water-cooled engine cylinder 10, in which is an engine piston 12, and at the upper end of which is arranged a plunger cylinder 14 which is substantially coaxial with respect to the engine cylinder. Within the plunger cylinder is a novel fuel-feeding plunger 16, shown as being an integral central extension of the piston 12. Plunger 16 preferably has two disconnected central passages 18 and 20, having at their adjacent ends parallel radial passages 22 and 24 opening on the side of the plunger. Passage 20 communicates, at its lower end, with a number of radial passages 26 at the base of the plunger, and through which the fuel charges are injected into the engine cylinder when the piston and plunger are at the upper end of their stroke.

In the side of the plunger cylinder 14, there is arranged a novel shoe 28, held yieldingly in slidable engagement with the side of the plunger by means such as a spring 30, and which is formed with a U-shaped passage 32 arranged to connect the passages 18 and 20 when the plunger 16 is at the upper end of its stroke.

When the piston and plunger are on their downward stroke, a charge of fuel is introduced into the plunger cylinder, for example through a passage 34 controlled by a needle valve 36. A charge of air or other fluid medium may also be introduced through the passage 34, but I prefer to arrange the parts so that just before the end of the piston stroke the passage 22 will enter the engine cylinder, whereupon a charge of hot exhaust gas under considerable pressure will rush through the passage 18 into the plunger cylinder space above plunger 16. On the upward stroke, the fuel is vaporized in the fluid medium, and the mixture is highly compressed, and when passage 32 connects passages 18 and 20 the compressed and vaporized mixture is injected into the engine cylinder through the passages 26.

While one illustrative embodiment has been described in detail, it is not my intention to limit the scope of the invention to that particular embodiment, or otherwise than by the terms of the appended claims.

I claim:

1. A fuel-feeding plunger having two disconnected axial passages and spaced radial passages communicating therewith, in combination with a shoe slidably engaging the side of the plunger and formed with a passage which is arranged, in one position of the plunger relatively to the shoe, to connect said radial passages.

2. An engine comprising, in combination,

an engine cylinder, a plunger cylinder opening from the engine cylinder, an engine piston in the engine cylinder having a plunger extending into the plunger cylinder and which plunger is formed with disconnected passages, and means comprising a shoe contacting with the plunger and having an opening connecting said passages in one position of the plunger, said shoe being slidably mounted in a recess formed in the plunger cylinder.

3. An engine comprising, in combination, a combustion chamber, a fuel feeding plunger driven into and out of said combustion chamber and having disconnected fuel feeding passageways communicating therewith and a spring loaded apertured shoe adapted at one position of the plunger to establish communication between said fuel feeding passageways.

4. An engine comprising, in combination, a combustion chamber, a compression chamber, a fuel-feeding plunger reciprocally mounted within the compression chamber and driven by the engine into and out of the combustion chamber and provided with disconnected fuel-feeding axial passageways having intersecting radial passageways, and means adapted to establish communication therebetween at one position of the plunger to permit fuel to flow from the compression chamber into the combustion chamber.

5. An engine comprising, in combination, a combustion chamber, a compression chamber opening therein, a fuel-feeding plunger reciprocally mounted within the compression chamber and provided with disconnected fuel-feeding passageways, an apertured shoe slidably supported within the wall of the compression chamber controlling the flow of fuel through said plunger and resilient means urging said shoe against the plunger.

6. An engine comprising a combustion chamber, a piston therein, a compression chamber, a fuel feeding plunger therein reciprocated by the engine, said plunger having disconnected axial passageways between the combustion and compression chambers, and means adapted to establish communication between the axial passageways at one position of the plunger, the plunger being provided with a plurality of discharge passages intersecting one of the axial passages at substantially the middle of the combustion chamber when the plunger is in said position to permit fuel to be forced from the compression chamber to the combustion chamber.

7. An engine comprising, in combination, a combustion chamber, a compression chamber positioned adjacent thereto, a movable fuel feeding plunger driven by the engine into and out of said combustion chamber and compression chamber and provided with disconnected fuel feeding passageways, and means establishing communication between the passageways at one position of the plunger, one passageway communicating directly with the combustion chamber to permit the discharge of fuel thereinto, and the other passageway adapted to be brought into communication with the combustion chamber by the movement of the plunger.

In testimony whereof, I have hereunto signed my name.

HOWARD M. LEONARD.