Dec. 28, 1937. A. W. NELSON 2,103,595

INTERNAL COMBUSTION ENGINE

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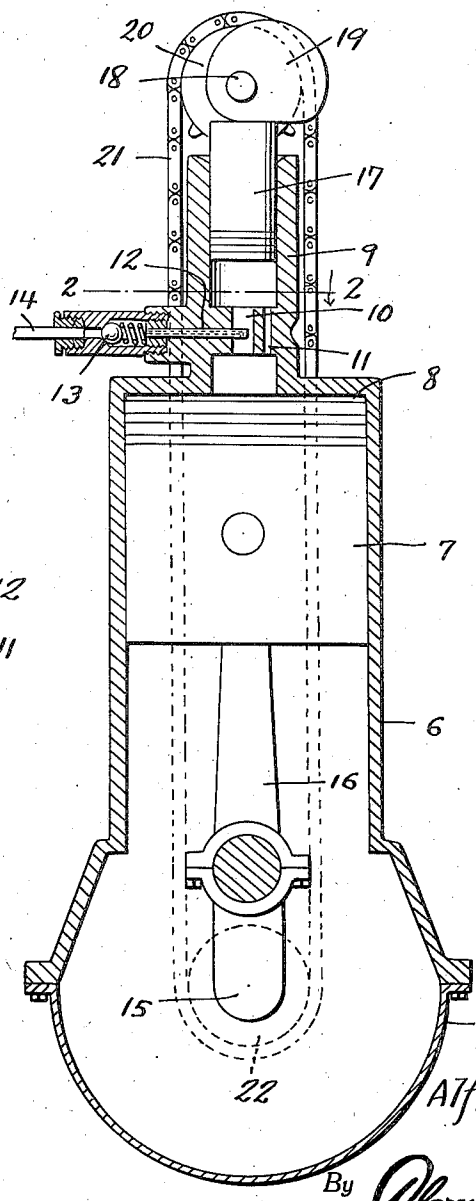


Fig. 1.

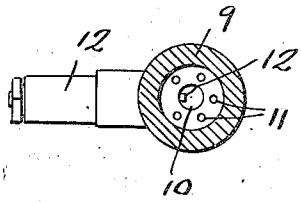


Fig. 2.

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INTERNAL COMBUSTION ENGINE

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1 Claim. (Cl. 123—33)

This invention appertains to new and useful improvements in internal combustion engines, and more particularly to an engine wherein air is automatically compressed and admitted into the firing chamber to mix with the fuel.

The principal object of the present invention is to provide means in the form of a variable auxiliary compression chamber for the internal combustion engine which affords a liquid fuel injection engine the operating characteristics of an air injection engine.

Another important object of the present invention is to provide means wherein the mixture of fuel and air is not dependent for penetration on high injection fuel pressure, therefore permitting the injection pressure fuel to be substantially low.

These and various other important objects and advantages of the invention will become apparent to the reader of the following specification.

In the drawing:

Figure 1 represents a vertical sectional view through one cylinder of the improved engine.

Figure 2 represents a cross-section on line 2—2 of Figure 1.

Referring to the drawing, wherein like numerals designate like parts, it can be seen that numeral 5 represents the usual crank case from which rises the cylinder 6 in which the piston 7 is operative. Numeral 8 represents the firing chamber of the engine and from the head of the cylinder 6 rises the compression chamber 9 communicating with the firing chamber 8 by the passageway 10 having the by-pass ducts 11.

Numeral 12 represents the usual fuel injection nozzle equipped with the check valve fitting 13 and the fuel line 14 connected thereto. The nozzle 12 projects into the passageway 10.

Numeral 15 represents the usual crank shaft with the connecting rod 16 disposed between the same and the piston 7.

A plunger 17 is operative in the compression chamber 9 and located above the plungers 17 is the shaft 18 on which is located a cam 19 for each of the plungers 17. The shaft 18 is equipped with the sprocket wheel 20 which has trained thereover the sprocket chain 21, the latter also being trained over a sprocket wheel 22 on the crank shaft 15. It can now be seen that the piston 7 compresses the air through the passageway 10 into the variable compression chamber 9. As fuel is injected through the nozzle 12, the plunger 17 operated by the cam 19 and timed with the fuel injection, forces the compressed air through the passageway 10 and duct 11 progressively with the injected fuel into the combustion chamber 7, changing the injected fuel into a fine mist.

As the piston 7 descends on its suction stroke, taking in a charge of air, the piston 17 is at its lowermost position closing the chamber 9. When the piston 7 rises on its compression stroke, the piston 17 rises allowing the piston 7 to compress the charge of air from the chamber 8 into the chamber 9. As the piston descends, the pressure in the chamber 8 will decrease rapidly due to the increased area in chamber 8, but at this time the piston 17 starts down on its stroke forcing the compressed air from the chamber 9 into the chamber 8, thus retaining the initial pressure in chamber 8 over a longer period of piston travel.

When the piston is at the top of compression stroke and piston 17 is starting down on its discharging stroke, the fuel is injected into the passageway 10, igniting and expanding as it passes into the chamber 8, as fresh compressed air is being discharged from the chamber 9 in relation to the injection of fuel. As the burning fuel charge passes from the passageway 10 to the chamber 8, there is compressed air passing from the chamber 9 through the ducts 11 into the chamber 8, atomizing and creating a greater turbulence of burning fuel.

Due to the action of the piston 7 forcing the compressed air charge from the chamber 9 into the chamber 8 less fuel injection is required to form the working pressure on the power stroke of the piston 7.

The timing operation of the piston will range from 15 degrees before top center of piston 7 to 40 degrees after top center of piston 7 and the period of injection of fuel will range from 7 degrees before top center of piston 7 to 35 degrees after top center of the piston 7. The piston 17 will be at the bottom of its stroke closing chamber 9 during the intake and scavenging cycles.

It can readily be seen that the pressure drop in chamber 8 will be greater than in chamber 9 as the piston 7 recedes, therefore, the velocity of the air contained in the chamber 9 passing through the small ducts 11 will be great enough to atomize the fuel charge and create a greater turbulence in chamber 8. The sizes of the passageway 10 and ducts 11 will vary according to the stroke of the engine, but the passageway 10 will be approximately 3/8 of an inch in diameter

and the ducts 11 only about ⅛ of an inch in diameter.

While the foregoing specification sets forth the invention in specific terms, it is to be understood that numerous changes in the shape, size, and materials may be resorted to without departing from the spirit and scope of the invention as claimed hereinafter.

Having described the invention, what is claimed as new is:

In combination, an engine consisting of a plurality of cylinders, each of these said cylinders being provided with a piston therein, a crank shaft, a pitman connection between each of the said pistons and the crank shaft, each of the said cylinders being provided with an air compression chamber, a plunger operative in the compression chamber, a cam for operating each of the said plungers, timing means between the cams and the crank shaft, a constricted passageway between the compression chamber and the cylinder, and a fuel injection nozzle projecting into the said constricted passageway, said passageway defining an annular shoulder between the cylinder and the compression chamber, said shoulder having by-pass ducts therethrough communicating the cylinder with the compression chamber, said by-pass ducts being each substantially less in diameter than the said passageway.

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