June 27, 1933. J. W. ENRIGHT 1,916,043

INTERNAL COMBUSTION ENGINE

Original Filed April 9, 1930

Fig. 1.

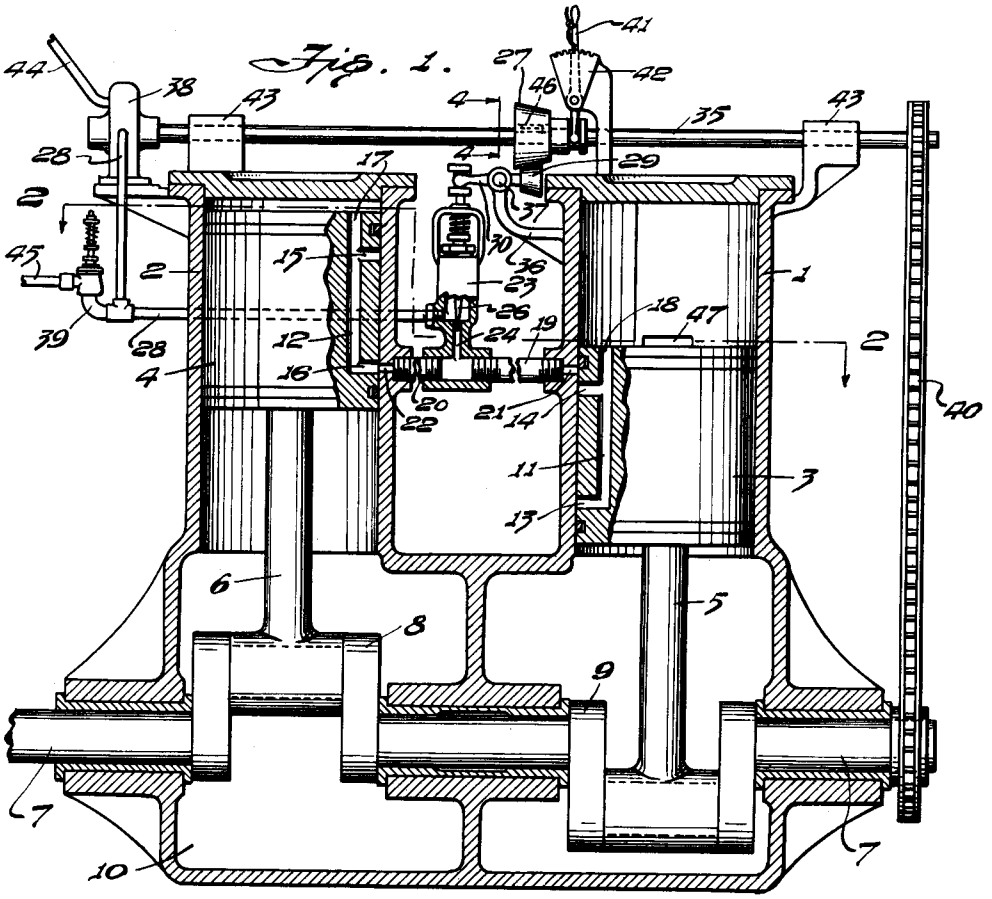


Fig. 2.

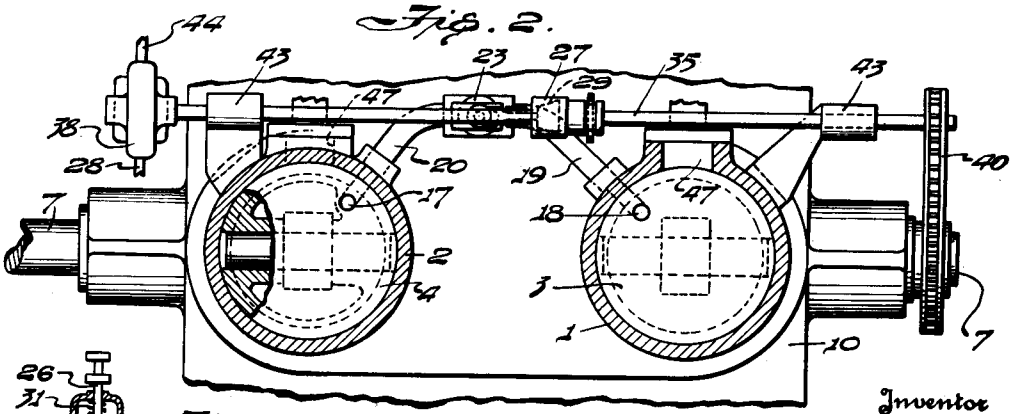


Fig. 3.

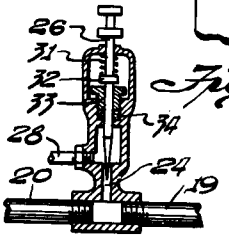


Fig. 4.



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INTERNAL COMBUSTION ENGINE

Application filed April 9, 1930, Serial No. 442,893. Renewed January 11, 1933.

This invention relates to improvements in internal combustion engines, such as ordinary two cycle gasoline engines, designed to burn a low grade fuel oil. The invention, however, is not limited to any particular cycle or type of engine.

An object of this invention is to provide an engine structure in which the explosive pressure from a preceding cylinder will force the charge of heavy fuel oil into the succeeding cylinder just when the piston in the succeeding cylinder starts its compression stroke and just after the piston closes the exhaust port, and before any compression takes place therein.

A further object is to provide a means in an engine structure for making use of the explosive pressures in one cylinder to force a charge of fuel oil into another cylinder. While one cylinder is igniting its charge of fuel the piston in the other cylinder is positioned to uncover a fuel inlet port for allowing the charge of fuel to enter thereinto. The operation is repeated when the other cylinder ignites its charge. In forcing the heavy oils into the succeeding cylinder in this manner it will be found that they are very thoroughly broken up.

Other objects will appear from the following description of the device, as disclosed in the single sheet of drawing herewith forming a part hereof.

In the drawing

Fig. 1 is a vertical sectional view of an internal combustion engine embodying the invention.

Fig. 2 is a sectional view of Fig. 1, taken along line 2—2 of the latter.

Fig. 3 is a vertical sectional view of the fuel chamber and needle valve.

Fig. 4 is a sectional view taken along line 4—4 of Fig. 1.

In the embodiment of the invention illustrated the numerals 1 and 2 designate the cylinders of a two cycle gasoline engine adapted to use a low grade fuel oil, provided with pistons 3 and 4 operably connected by connecting rods 5 and 6, respectively, with cranks 8 and 9 disposed at substantially 180° to one another on the crank shaft 7 in the usual manner; and contained in the general housing 10.

As illustrated in Fig. 1, the piston 4 is at the end of the ignition stroke and piston 3 is at the end of its exhaust stroke. The side wall of the piston 3 is provided with a longitudinal passage 11 extending through the head end of the piston as at 18, and with radial by-passes 13 and 14 leading from the passage 11 through the periphery of the side wall of the piston 3. Likewise the piston 4 is provided with a longitudinal passage 12 extending through the head end of the piston 4 as at 17, and with radial by-passes 15 and 16 leading from the passage 12 through the side wall of the piston 4. Ports 21 and 22 are formed in the cylinders 1 and 2 between the ends of said cylinders, with which the by-passes 13 and 16 register when the pistons 1 and 2 are, respectively, at the limits of their inward strokes. The by-passes 14 and 15 register, respectively, with the ports 21 and 22, respectively, shortly after the pistons 1 and 2 have commenced their inward or compression strokes. Conduits 19 and 20 lead, respectively, from the ports 21 and 22 in the cylinders to a fuel distributing member comprising a main body portion including a coupling element connected to the conduits 19 and 20, a chamber 24 in which the fuel needle valve 26 is adapted to be positioned, and a chamber 23 for receiving fuel oil from the fuel line 28.

The needle valve 26 is operably mounted in the chambers 23 and 24, and actuated by a tapered cam 27 properly timed and slidably mounted on a key 46 positioned on a cam shaft 35. The cam 27 may be shifted longitudinally of the cam shaft 35 to regulate the amount of lift of the needle valve by means of the lever 41 pivotally mounted on the quadrant 42. A lever 30 is pivoted on the pin 37 mounted in the bracket 36. A tapered roller 29 is positioned on one end of the lever 30 and functions to lift the needle valve 26 as the tapered cam 27 contacts under pressure therewith. The fuel pump 38 having an intake 44 and driven by the cam shaft 35 delivers fuel to the chamber 23 through the fuel pipe 28, a pressure regulating relief valve 39

allowing excess pressure and oil to return to a fuel tank, not shown, through a pipe 45. A packing 34 prevents the fuel oil from leaking around the needle valve while a packing nut 33 holds the packing 34 in place. A spring 31, surrounding the stem of the needle valve 26, has its lower and upper ends bearing, respectively, against a collar 32 on said stem and on the upper end of a bracket extending upwardly from the chamber 26, holds the needle valve 26 on its seat.

The cam shaft 35 is mounted in bearings 43, and is driven by the chain 40 leading from the main crank shaft.

Numeral 47 designates an exhaust port in the cylinder as clearly shown in Fig. 1, wherein the piston 3 is shown at the end of the exhaust stroke.

In Fig. 1 the piston 4 is shown at the beginning of its outstroke with its by-pass 16 registering with the port 22 so as to communicate with the conduit 20, and the piston 3 is shown at the beginning of its instroke, but the by-pass 14 of the latter piston is out of registry with the port 21 and does not come into registry with said port to communicate with the conduit 19 until after the piston 3 has covered the exhaust port 47 and the piston 4 has moved into position to cover the port 22 in the cylinder 2. Thus the explosive pressure, for instance that occurring in the cylinder 2, acting through the passage 12, by-pass 16 and port 22, will compress a charge of fuel oil trapped in the conduits 19 and 20, and such charge will be admitted through the by-pass 14 and passage 11 into the cylinder 1 when the by-pass 14 in the piston 4 registers with the port 21 after the beginning of the compression stroke of the piston 3. Immediately after a charge of fuel in the cylinder 2 has been exploded and the piston 4 has moved outwardly to cover the port 22 the by-pass 14 of the piston 3 comes into registry with the port 21 and the charge of fuel contained in the conduits 19 and 20 enters the cylinder 1. Obviously, this operation is reversed when piston 3 is at the end of its firing stroke in the cylinder 1, and piston 4 is at the end of its exhaust stroke in cylinder 2.

In the internal combustion engine according to this invention a simple and efficient means is provided for utilizing or enabling the pistons to open and close the ports, thereby eliminating the use of valves and springs to accomplish this purpose. In most devices or methods of this general type the fuel is forced into the succeeding chamber or cylinder at the completion of the compression stroke, but this invention provides a means or method for utilizing the high pressure explosive gases from the firing cylinder to force the fuel into the next cylinder at the start of the compression stroke of the succeeding cylinder and before any pressure is produced therein.

What I claim is:

1. An internal combustion engine, comprising a pair of cranks disposed at 180° to one another; a pair of cylinders; a fuel conduit communicating with both of said cylinders between the ends thereof; means for supplying fuel to said conduit; and a pair of pistons connected, respectively, to said cranks and working, respectively, in said cylinders, each of said pistons having in its side wall an inner radial passage, an outer radial passage and a longitudinal passage extending from said radial passages to its inner end, the radial passages of each piston being so positioned relatively to one another that the outer radial passage of one piston registers with said fuel conduit when such piston is at the end of its instroke and the inner radial passage of the other piston is beyond said conduit at the end of the outstroke of the latter piston.

2. An internal combustion engine, comprising a pair of cylinders; a fuel conduit connected to each of said cylinders between the ends of the latter; means for supplying fuel to said conduit; and a pair of pistons working, respectively, in said cylinders and connected together to work in opposite directions, each of said pistons having in its side wall a radial passage adjacent each of its ends and a longitudinal passage extending from said radial passages to the head of the piston, the radial passages of each of said pistons being so disposed relatively to one another and the fuel conduit being so positioned relatively to the ends of said cylinders that, when the piston in one cylinder begins its outward stroke the radial passage adjacent the outer end of such piston will register with said conduit and the radial passage adjacent the inner end of the piston in the other cylinder will be outwardly of said conduit.

In testimony whereof I have hereunto set my hand.

JOHN W. ENRIGHT.