Dec. 14, 1926. 1,610,846

F. M. CAMPBELL

INTERNAL COMBUSTION ENGINE

Filed Nov. 27, 1923

FIG. 1

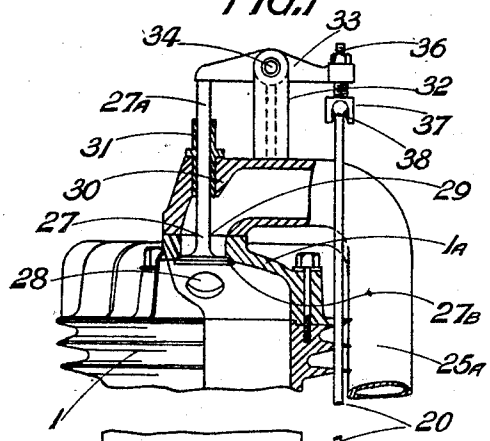
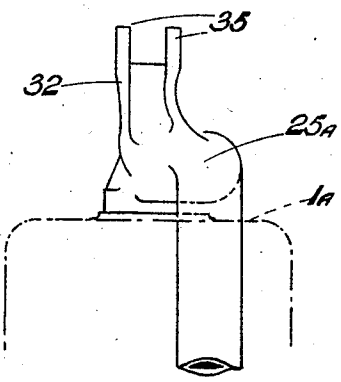


FIG. 2



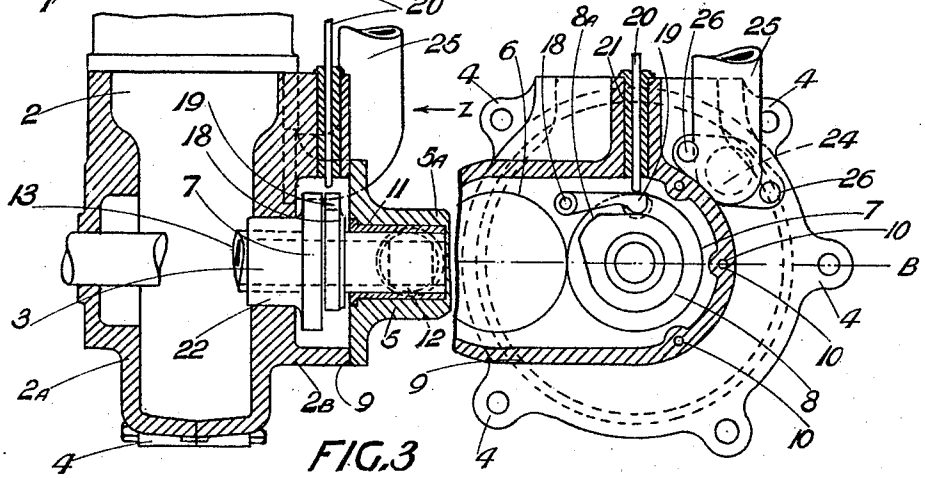
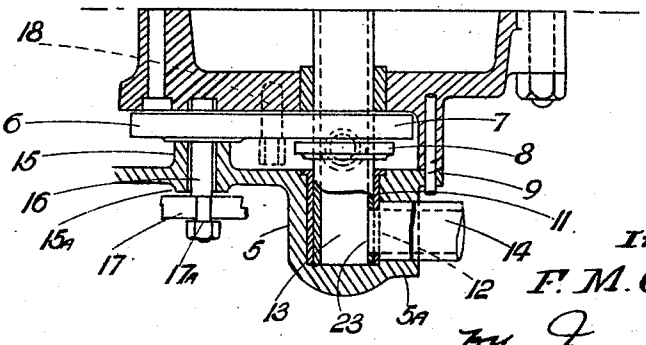


FIG. 3



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

Application filed November 27, 1923. Serial No. 677,319½.

The object of the invention is to improve the method of introducing fuel and provide apparatus therefor, whereby scavenging is rendered more efficient and a higher percentage of useful work obtained from the engine.

According to this invention the fuel mixture is admitted through an overhead port in the cylinder cover, rendering more efficient scavenging and less wastage of fuel through the exhaust port; each fresh charge of fuel is brought into contact with a sparking plug, thus reducing its liability to heat, and reducing the very high temperature to which cylinder heads of engines working on the two stroke cycle are liable; by passing the mixture into the cylinder in this manner the burnt gases do not collect in the cylinder head so readily with a tendency to retard flame propagation, causing consequent loss of power.

By admitting the gases to the crankcase through a rotary valve, the charge has a longer period in which to be drawn in, and is not subject to the restricted control by the movement of the piston as in the ordinary two cycle engine, where the inlet port to the crankcase is only open for a very short period, and is also open for a time when the piston commences to compress the gases in the crankcase.

Thus this engine, with the adaptation of a small amount of four-cycle engine practice, has combined in it the better qualities of the two types, and in so doing there will be a consequent saving of fuel over that consumed by other engines of the same bore, stroke, and piston speed.

This engine can be used in units of two, four, or more cylinders, in line with, but with a slight rearrangement of the valve gear giving the engine a similar appearance to the present four, six, and "straight eight" cylindered engines working on the four-stroke cycle. At the same time it will give a smaller and more powerful engine and a more even torque for the same number of cylinders and cylinder capacity.

In the drawings accompanying the specification,

Figure 1 is an elevation, the middle part broken away of the engine, the crank case in section, the top of the cylinder and a portion of the induction pipe being in section.

Figure 2 is an elevation, partly in section, of Figure 1, looking in the direction of the arrow Z, the cover of the cam and magneto gears is removed.

Figure 3 is a section through the crank shaft case on the centre line B, in Figure 2.

The usual parts employed in internal combustion engines are included in my apparatus; namely, a cylinder 1, crank case 2, and crank shaft 3. The crank case 2, is preferably in two parts 2^A and 2^B and adapted to be bolted together as indicated at 4. There is a cover 5, for the magneto drive gears 6 and 7, and valve operating cam 8; the said cover 5 fits upon the face of the crank case forming a joint therewith at 9, being adapted to be secured to the said face by suitable studs, some of which are indicated at 10.

There is a crank shaft apertured bush 11, adapted to be a press fit into part 5^A of the cover 5, the said bush is apertured at 12 to form communication between the carburetor and the cylinder 1, through the medium of the hollow portion 13, of the crank shaft 3; a portion of the feed pipe leading from the carburetor to form the communication above stated is indicated in Figure 3 at 14.

There is a boss piece 15 projecting to the interior from the face of the cover 5, and a portion 15^A of the said boss 15 projecting outwardly to house a spindle 16 projecting from the magneto drive spur pinion 6; the said spindle projects outwardly sufficiently to engage the gear, as indicated at 17, for a direct drive on to the magneto (not shown) and which is secured preferably in the manner indicated at 17^A.

There is a push rod lifter spindle 18 threaded to register with a threaded hole in the crank case having its end projecting sufficiently to engage with the rod lifter, which is fashioned as at 19, to engage with the cam 8, the upper face of the lifter 19 being adapted to engage with a point of the push rod 20, the said push rod projecting through a bushed boss part in the crankcase at 21.

The cam 8 is preferably integral with the magneto drive spur pinion 17 on the crank shaft 3, both parts being keyed thereto, in a position for the gear to mesh with the gear pinion 6. The crank shaft is preferably of the form indicated, having one of its journals hollow, as at 13, and adapted to project through a portion of the crank casing and journal in the bearing bush 22 and in the apertured bush 11, fitted in the cam

gear cover part 5A. There is an inlet port 23 in the crank shaft to register with the aperture 12 in the apertured bush 11, once in the course of the crank shaft's revolution, thus forming communication between the carburetor and the interior of the crank shaft case.

There is an aperture 24 in the part 2B of the crank case 2 into which fits one end of the induction pipe 25, there being tapped holes to register with screws 26 for the purpose of studding the said induction pipe to the crank case.

The cylinder is bolted to the top face of the crank case, and is fitted with the usual type piston, not shown in the drawings; the cylinder is fashioned at the top preferably in the manner indicated, having the inlet valve 27, open or set concentric with and directly over the top of the piston. Ignition is introduced through the usual medium, a sparking plug, the position of the said plug being provided for as indicated at 28, while diametrically opposite, provision is made for compression release valve, the body part being threaded to register with a standard sparking plug thread so that the said release valve body and the sparking plug may be interchangeable.

The induction pipe 25 is preferably in two parts, coupled in a convenient manner, the upper portion 25A, which projects horizontally towards the centre of the cylinder, is provided with a machined face to form a joint with a machined face on the cylinder head 1A, the inlet port 29 on the induction pipe being so arranged that, when a joint with the cylinder head 1A is formed, the pipe will be concentric with the inlet aperture in the cylinder head. Immediately above the said concentric apertures there is a boss 30, projecting partially inwardly from the surface to the interior part of the induction pipe, and partially outwards from the exterior surface of the induction pipe through which a hole is bored concentric with the before mentioned inlet port. There is a bush 31 fitted to the hole to form a guide for the stem 27A of the inlet valve 27, the said valve being spring maintained in the closed position against its seat 27B.

There is an upwardly projecting bracket member 32, formed integral with the upper part 25A of the induction pipe 25, for the purpose of supporting the rocking lever 33 which is pivotally mounted on the spindle 34 between the lugs 35 of the said upwardly projecting bracket 32. Motion to open the valve is transmitted through the medium of the cam 8 once in each revolution of the crank shaft; the said cam engages the push rod lifter 19 which is held normally in contact with the tread of the cam under spring influence. The push rod lifter 19 engages with the point of the push rod 20, and upon the cam 8 rotating, the enlarged portion 8A of the cam 8 comes in contact with the push rod lifter raising the said push rod 20, turning the member 33 upon its pivot 34, and depressing the inlet valve 27. There is an adjustment consisting of a stud 36 having enlarged portions 37 to take the top end of the push rod 20, and a ball member 38 to reduce friction; the said stud is threaded and adapted to screw into the rocking lever 33 for adjustment and be secured there by a jam nut. A spent gas outlet or exhaust port is provided for, not shown in the drawings.

On proceeding to describe the cycle of operations, I will assume that the engine is working, and that ignition has exploded a compressed charge of gas.

On the downward stroke of the piston a charge is drawn into the crank case 2, through the port 23; in the progress of the cycle, the inlet valve 27 is opened due to the influence of the cam 8, on the crank shaft rotating, and in a measure the port 23 opens simultaneously with the opening of the said inlet valve, permitting a partially compressed charge of fresh fuel to be drawn into the cylinder and approximately at the same time a fresh charge of fuel drawn from the main supply through the pipe 14, to the crank case.

On the piston descending, due to explosion of the fuel, the spent gas or exhaust port is opened and the burnt gases expelled, the return stroke of the piston compressing the charge within the cylinder, having at an early part of its return stroke partially compressed the charge in the induction pipe, and in the crank chamber, before it reaches the cylinder. Thus there is induction, compression and explosion every revolution.

What I claim as new and desire to secure by Letters Patent is:—

In a two-cycle internal combustion engine, a cylinder, a head removably secured thereon, a fuel inlet in the head, a crank shaft, a two-part crank case through which the crank shaft extends, one side wall of the crank case being formed with a flange to define a chamber in part concentric with the crank shaft and extending transversely of the crank case to receive engine operating parts actuated by the crank shaft, a cover for said chamber having a hollow extension in line with the crank shaft, and a communication leading from the interior of said extension to the fuel inlet, said crank shaft being hollow for a portion of its length including that part within the extension and being formed with an outlet from said hollow portion to communicate with said communication leading to the fuel inlet.

In witness whereof I affix my signature.

FRANK MONTGOMERY CAMPBELL.