

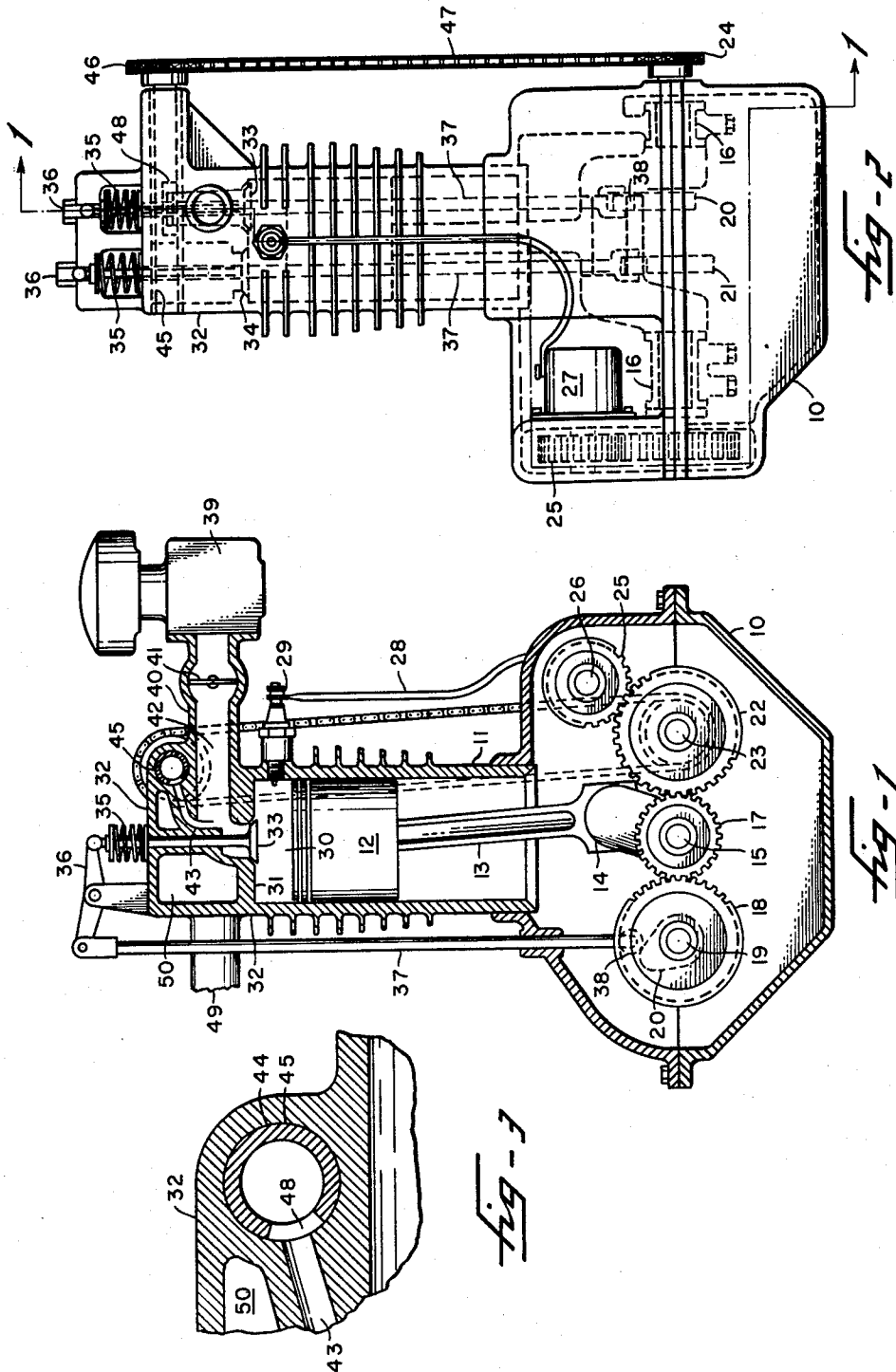
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W. A. FOLCKE

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INTERNAL COMBUSTION ENGINE

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INTERNAL COMBUSTION ENGINE

Walter A. Folcke, 4737 Resmar Road, La Mesa, Calif.

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1 Claim. (Cl. 123-75)

This invention relates to internal combustion engines and the provision of means for effecting the complete combustion of the atomized fuel supplied thereto. It is well known that the modern automobile engine, especially at closed throttle position and low engine speeds, does not completely burn the fuel supplied thereto with the result that obnoxious hydrocarbon gases appear in the exhaust and pass out into the air creating the atmospheric condition known as smog. This has an unpleasant odor, is irritating to the eyes and it is a main purpose of my invention to eliminate the formation of this smog.

Another object is to provide means for introducing a charge of auxiliary clean air into the combustion chamber of the engine just before the fuel-air mixture from the carburetor is drawn into this chamber. This clean air is drawn in by the engine piston itself during the initial portion of its suction stroke and the usual fuel-air mixture during the remaining portion of this stroke.

A further object is to provide means for introducing this auxiliary air into the inlet duct of the engine at a point between the carburetor throttle valve and the inlet valve of the cylinder.

Further objects will become apparent as the description of my novel engine structure proceeds. For a better understanding of the invention, reference is made to the accompanying drawing, in which:

FIG. 1 is a vertical section on line 1-1 of FIG. 2 through a gasoline engine embodying the invention, some parts being shown diagrammatically;

FIG. 2 is an end view of the engine of FIG. 1, the carburetor being omitted for clarity; and

FIG. 3 is an enlarged cross sectional view of the auxiliary air valve and its surrounding support.

The gasoline engine shown is of the four cycle type and comprises a hollow crank case 10 to the upper portion of which is attached a cylinder 11 within which a piston 12 slides. A connecting rod 13 connects the piston to a crank 14 on a rotary crank shaft 15 which is journaled in two bearings 16 carried by crank case 10. A spur gear 17 is attached to one end of shaft 15 and meshes with a gear 18 of twice its diameter, gear 18 being attached to the end of a cam shaft 19 to which two spaced apart cams 20, 21 are attached. The bearings that support shaft 19 are omitted for clarity, being of a known type. Also meshing with gear 17 is a gear 22 having twice the diameter of gear 17, gear 22 being attached to a shaft 23 whose outer end carries a sprocket 24. Gear 22 drives a smaller gear 25 which is attached to the end of an armature shaft 26 of an electrical generator 27 of known type. Through cable 28 the generator supplies current to a spark plug 29 that at the proper time causes a spark within combustion chamber 30 located between the top face of piston 12 and the bottom face 31 of cylinder head 32. Although cylinder head 32 is illustrated as being integral with cylinder 11, it may be a separate part and connected to the cylinder in the usual way by several bolts (not shown). Any known type of timer (not shown) is associated with generator 27 to cause the spark to pass across the spark plug gap at the proper instant.

A conical inlet valve 33 and conical outlet or exhaust valve 34 have seats in cylinder head 32, these valves being operated by the cams 20, 21. The valves are biased upwards toward their closed position by springs 35 and opened by a pair of pivoted levers 36 which are rocked

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by two push rods 37 whose lower ends carry a pair of rollers 38 that ride on the cams 20, 21.

A fuel-air mixture is formed in carburetor 39 which may be of known type having an outlet tube 40 containing throttle valve 41 of the usual disc type, this valve being rotated by a linkage of known type (not shown) connected with the accelerator pedal. An internal passageway or channel 42 of the shape shown is formed in cylinder head 32 to connect outlet 40 of the carburetor to the cylinder inlet port surrounding valve 33 and lead the fuel-air mixture to combustion chamber 30. A second passageway or channel 43 of the shape shown is also formed in cylinder head 32, the lower end of channel 43 being located close to inlet valve 33 and its inclined upper portion terminating in a long cylindrical bore 44 machined in head 32. Rotatable in bore 44 is an open ended tubular valve 45 whose end projects beyond head 32 and carries a sprocket 46 of the same size as sprocket 24, a chain 47 connecting these two sprockets. Opposite the upper end of channel 43, valve 45 has a generally rectangular shaped port opening 48 therethrough to admit fresh air into channel 43 as later described. The cylinder head has an interior channel 50 in which cooling water circulates.

The engine operates in the following manner; a portion of port opening 48 is brought opposite channel 43 just before or at the time piston 12 reaches the top of its stroke. Cam 20 has moved inlet valve 33 and this is now in slightly open position. As piston 12 moves down on its suction stroke, cam 20 moves valve 33 to full open position and port opening 48 fully uncovers the upper end of channel 43 so that an unobstructed passage is provided via these openings to admit fresh air into combustion chamber 30 so that substantially no fuel-air mixture is drawn past throttle valve 41 during the initial fifth or quarter portion of the suction stroke of the piston. During this part of the piston stroke, channel 43 and valve opening 48 offer much less resistance to the flow of fluid into the cylinder than does the path through carburetor 39 and the small annular area between the periphery of throttle valve 41 and its surrounding tube 40. A layer of fresh air is thus introduced against the top of the piston and tends to remain there as the piston moves down. The rotation of valve 45 has by now caused it to close the upper end of channel 43 so that no additional fresh air is admitted into the cylinder during the remainder of the suction stroke. During the remainder of this stroke the fuel-air mixture formed in carburetor 39 is drawn past throttle valve 41 into channel 42 and cylinder 11. During this suction stroke of the piston, exhaust valve 34 has remained closed and continues so during the following upward (compression) stroke.

Near the end of the suction stroke roller 38 moves down on cam 20 and spring 35 becomes effective to close inlet valve 33. Piston 12 moves up on its compression stroke to greatly compress the fuel-air mixture and also the fresh air in the cylinder, the piston motion also helping to mingle this fresh air with the fuel-air mixture so that oxygen is available near each particle of fuel to support its combustion. Just before or at the instant the piston reaches the top of its stroke, a spark passes across the gap of spark plug 29 to ignite the gaseous charge in the combustion chamber. The high pressure and heat developed force the piston down on its power stroke thus applying torque to crank shaft 15 and causing it to rotate. This rotation supplies energy to the usual flywheel (not shown) attached to shaft 15.

As the piston reaches the bottom of its power stroke, cam 21 raises its push rod 37 and opens exhaust valve 34. As the piston now rises on its exhaust stroke, the burned gases in the cylinder are expelled through the

exhaust port at valve 34 into an exhaust duct 49. While the invention has been illustrated in an engine of one cylinder, it will be understood that it may be applied to one of 4, 6 or more cylinders, a body of fresh air being introduced into each cylinder during the initial portion of the suction stroke of the piston therein.

It is known that when the usual automobile engine is idling or running at low speeds, the fuel-air mixture drawn through the carburetor is especially rich in fuel content and insufficient air is drawn into the cylinders to provide complete combustion of the fuel. The result is that much unburned hydrocarbon gases appear in the exhaust and form smog in the ambient atmosphere. This invention is especially effective at these low engine speeds when the throttle valve is closed or almost closed, the additional fresh air introduced into the cylinder providing the proper amount of oxygen to secure complete combustion of the fuel charge. It is also found that the invention provides a more constant compression of the gaseous charge in the cylinder at idling speed or slightly open throttle position as well as at wide open throttle settings.

Having described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

An internal combustion engine comprising, in combination: a long cylinder; a piston slidable in said cylinder; a cylinder head secured to one end of said cylinder to provide a closed combustion chamber between said cylinder head and piston, said cylinder head being provided with an inlet valve opening facing the end of said piston; a rotary crank shaft mounted near the end of said cylinder remote from said combustion chamber; a pitman connecting said piston to said crank shaft; an inlet valve constructed to open and close said valve opening; means driven by said crank shaft to operate said inlet valve and cause it to open said valve opening when said piston is closely adjacent said cylinder head; a carburetor having a tubular outlet; a throttle valve mounted in said outlet;

said cylinder head having a short duct connecting said tubular outlet to said inlet valve opening and also a short passageway whose inner end terminates in said duct adjacent said valve opening, said cylinder head having a long cylindrical bore in which the outer end of said passageway terminates; an open ended tubular valve supported for rotation in said cylindrical bore, said tubular valve having a single opening extending through its wall positioned to register with the outer end of said passageway at each rotation of said tubular valve; means continually driven by said crank shaft to rotate said tubular valve and cause said single opening therein to register with the outer end of said passageway when said piston commences its suction stroke and remain in registry therewith during the initial portion of said suction stroke whereby air passes axially through said tubular valve, said short passageway and said inlet valve opening into said combustion chamber during the initial portion of said suction stroke; the tubular outlet of said carburetor supplying fuel-air mixture to said inlet valve opening and combustion chamber during the remaining portion of said suction stroke, said piston being constructed to compress said charge of air and fuel-air mixture in the combustion chamber as said crank shaft returns the piston to its initial position adjacent said cylinder head; and means for igniting the compressed charge.

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FRED E. ENGELTHALER, *Primary Examiner.*