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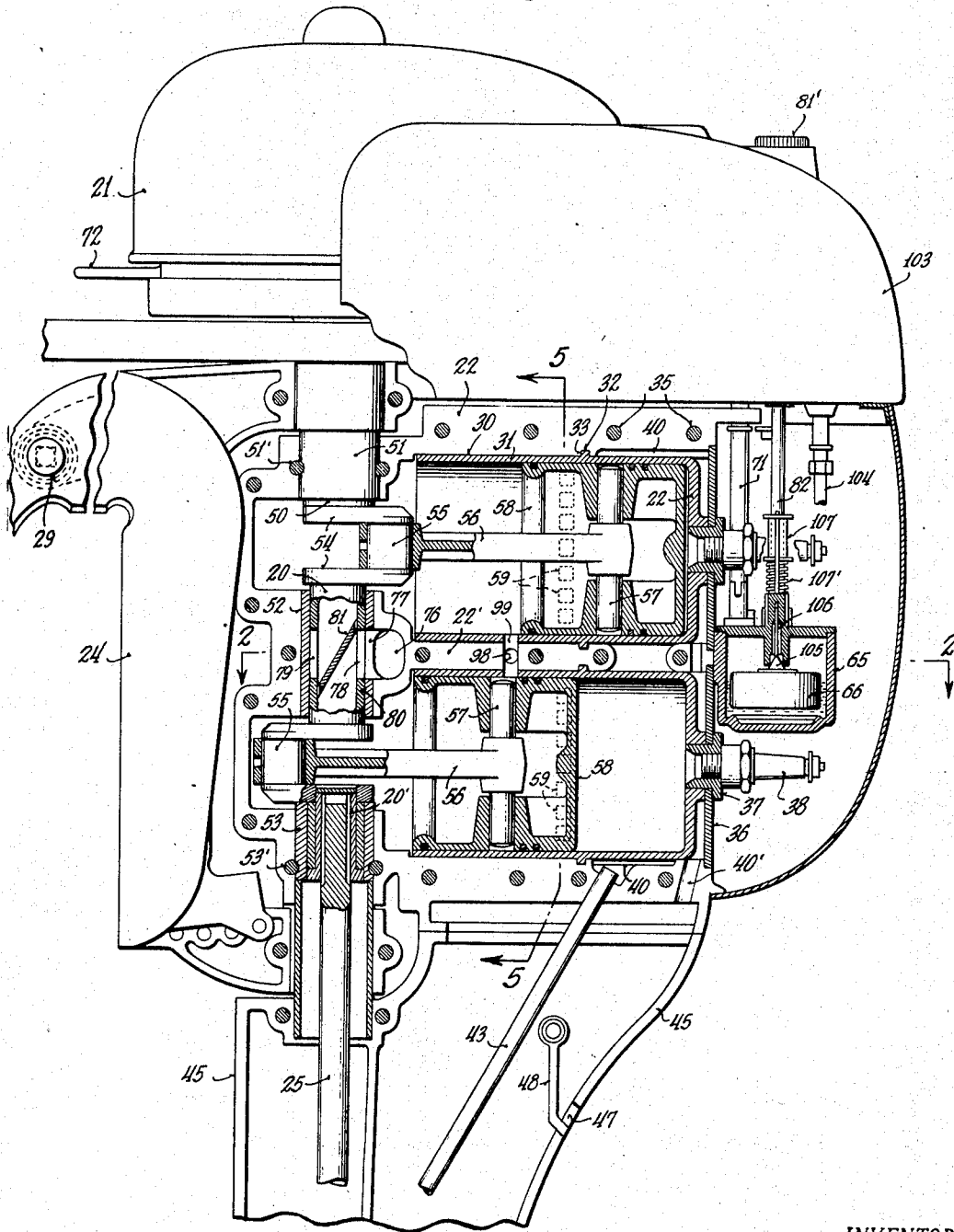
L. T. KINCANNON

2,388,331

FUEL SUPPLY FOR TWO CYCLE, CRANKCASE COMPRESSION ENGINES

Original Filed April 14, 1943 3 Sheets-Sheet 1

Fig. 1



INVENTOR.

Leo T. Kincannon

BY

Charles French

ATTORNEYS

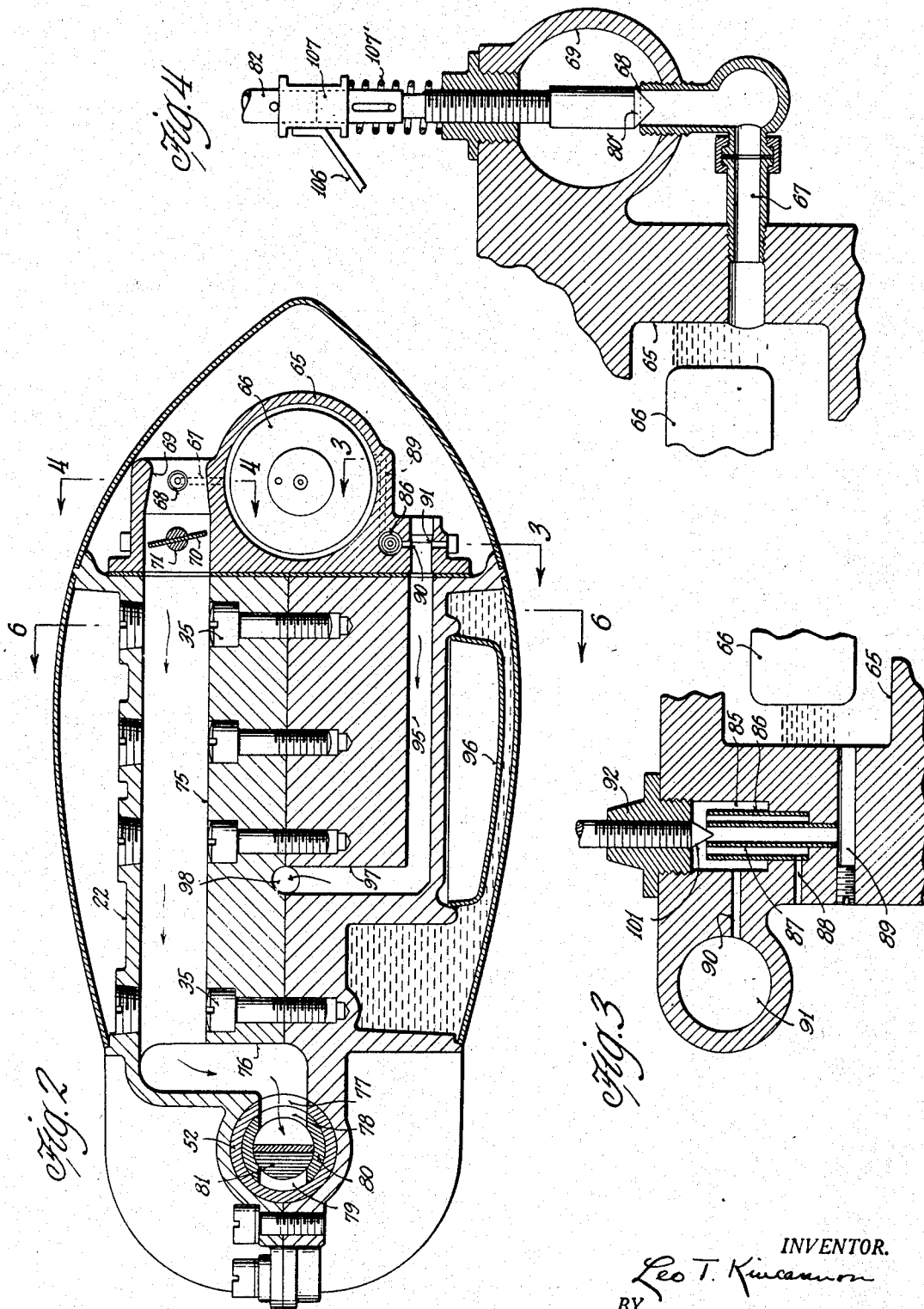
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INVENTOR.
Leo T. Kincannon
BY
Charles French
ATTORNEYS

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FUEL SUPPLY FOR TWO CYCLE, CRANKCASE COMPRESSION ENGINES

Original Filed April 14, 1943 3 Sheets-Sheet 3

Fig. 5

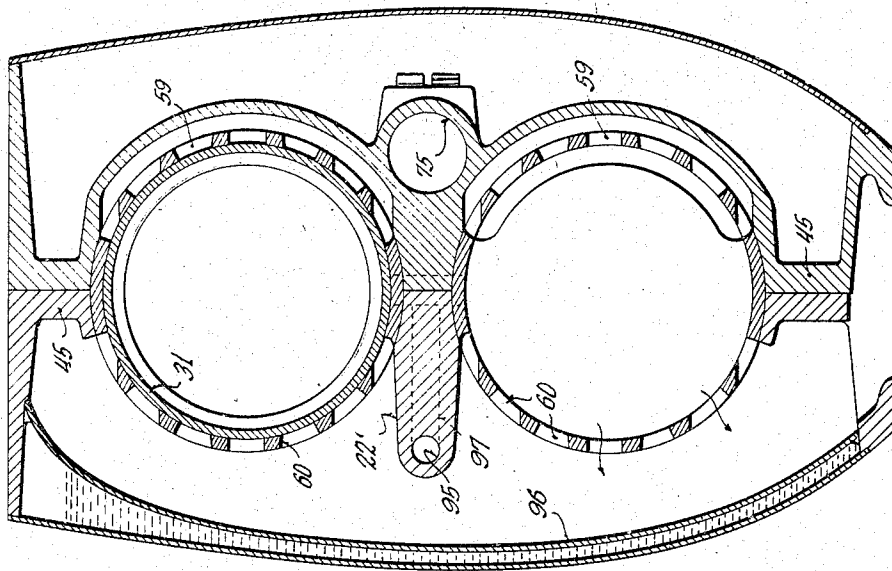


Fig. 6

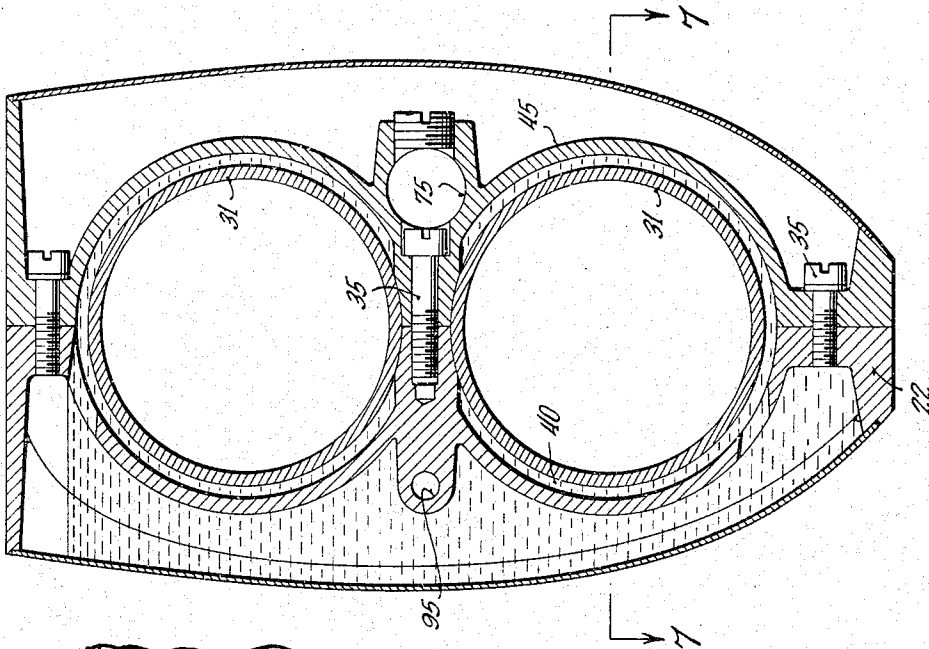
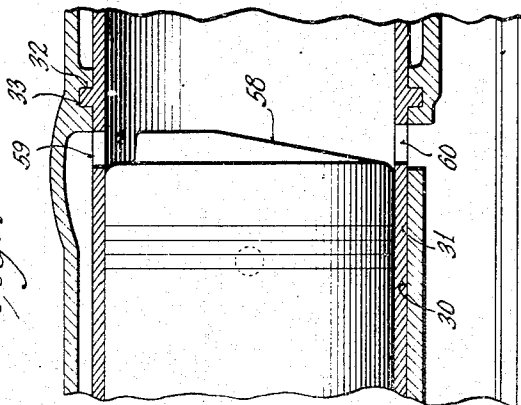


Fig. 7



INVENTOR.
Leo T. Kincannon
 BY *Charles French*
 ATTORNEYS

UNITED STATES PATENT OFFICE

2,388,331

FUEL SUPPLY FOR TWO-CYCLE, CRANK-CASE COMPRESSION ENGINES

Leo T. Kincannon, Milwaukee, Wis., assignor to
Metal Products Corporation, Milwaukee, Wis., a
corporation of Wisconsin

Original application April 14, 1943, Serial No.
482,967. Divided and this application August 4,
1944, Serial No. 548,107

4 Claims. (Cl. 123-73)

This invention relates to outboard motors.

This application is a division of my copending application for outboard motors, filed April 14, 1943, Serial No. 482,967, and has for its object the provision of an improved dual system of fuel supply. More particularly according to the present invention, means are provided for supplying the engine with two sources of fuel mixture supply, one of which is heated by the exhaust, in which one system is used for supplying the engine with pre-heated fuel mixture for low speed operation, and both systems are used for supplying the engine with fuel for normal and high speed operation.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a vertical cross-sectional view through the motor and a side elevation view of the fuel tank and the magneto and starter;

Fig. 2 is a horizontal sectional view taken on the line 2-2 of Fig. 1;

Fig. 3 is a vertical cross-sectional view taken on the broken line 3-3 of Fig. 2;

Fig. 4 is a vertical cross-sectional view taken on the line 4-4 of Fig. 2;

Fig. 5 is a vertical transverse sectional view taken on the line 5-5 of Fig. 1;

Fig. 6 is a vertical transverse sectional view taken on the line 6-6 of Fig. 2;

Fig. 7 is a detailed horizontal cross-sectional view taken on the line 7-7 of Fig. 6.

According to the drawings, the outboard motor, in general, comprises a shaft 20 on which is mounted a magneto 21 (not shown in detail herein) and a cylinder block construction 22. The entire motor is held upon the rear end of a boat by a bracket generally designated 24. The shaft 20 has splined thereto at 20' a drive shaft 25 which as shown in the aforementioned application is connected through suitable gearing with a propeller drive shaft. The entire engine assembly is suitably pivotally mounted about an axis 29 on the bracket 24, so that the engine can be tipped relative thereto to raise the propeller and the lower part of the motor structure out of the water.

The cylinder block 22 is composed of two parts split on a vertical plane and provided with longitudinal apertures 30 therethrough which receive cylinder liners 31. Circumferential apertures 32 are provided in the apertures 30 to receive annular rings 33-33 formed on the exterior of the cylinder liners 31 to properly position the cylin-

der liners within the cylinder block 22. The halves of the cylinder block 22 are bolted together with bolts fitting through transverse apertures 35 which bind the two halves of the block together and maintain the cylinder liners 31 in position.

The cylinder head end of the cylinder block is covered by a plate 36, held in position by the head of an exterior-interior threaded bushing 37 which engages an aperture in the liner and clamps the plate in fluid tight engagement with the end of the cylinder block 22.

The bushings 37 receive spark plugs 38 in their interior threads, the spark plugs having suitable connections with the magneto 21.

The cylinder block is also provided with apertures 40 which surround the combustion chambers of the cylinder liners 31 and provide a space for the circulation of water from a suitable pump, not shown. The water flows from the water pump upwardly through the water pipe 43, upwardly through the aperture 40 to the top of the upper cylinder, thence downwardly through an aperture 40' (Fig. 1) and enters a casing 45 surrounding the drive shaft 25, and leaves it through an opening 41. A partition 46 prevents the cooling water from flowing past the aperture 41 and entering the engine exhaust, not shown.

A horizontal partition 22' divides the engine into two separate and distinct parts, comprising an upper cylinder in the upper part and a lower cylinder in the lower part. The partition 22' prevents the free passage of gas between the cylinders while insuring proper suction of gas from the carburetor (to be described below) into the combustion chamber.

The cylinder block 22 is provided with an upper bearing 50, set in a sleeve 51, held in a vertical aperture in the cylinder block, a central bearing 52 held in a vertical aperture in the partition 22', and a lower bearing 53. The sleeve 51 is held in place by bolts 51' while the bearing 53 is held in place by bolts 53'.

Power is transmitted from the cylinders by a crank shaft portion of the shaft 20 having crank arms 54 joined by crank pins 55 which retain connecting rods 56. The connecting rods are joined by piston pins 57 to the piston 58 operating in the cylinders 31.

The present engine, being of the two cycle type, utilizes the pistons as valves for the control of both the burnt gas and the explosive mixture. A plurality of ports 59 through one side of the cylinder walls permits the entrance of the explosive mixture, while a plurality of ports 60 on the

opposite side of the cylinders permits the exhaust of burnt gases into an exhaust manifold 96 (Figs. 5 and 7).

The exhaust ports 60 extend further toward the cylinder head than do the intake ports 59 to allow a large portion of the burned gases under pressure to escape from the cylinder before the entrance of the fresh explosive mixture. Explosive mixture is supplied to the cylinders from a dual fuel supply system as best shown in Figs. 2, 5, and 6.

The carburetor 65 is located to the rear of the engine. The location of the carburetor in the rear of the engine permits the engine to be built lower with the main portion of the engine, including the cylinders, below the pivot 29.

For high speed operation, gasoline is supplied from the carburetor bowl 65 in which the height of the liquid is regulated by a float 66 (Fig. 1) through an aperture 67 (Fig. 4) to a jet 68 located in a venturi 69. The control of gas is effected by a butterfly valve 70 on a rotatable throttle rod 71. The butterfly valve is normally held open and is only closed when the spark control lever 72 is moved to slow speed, thus cutting off gas through the high speed passage and facilitating the flow of gas through the slow speed portion of the dual fuel supply system, to be described below.

Air from the exterior enters the mouth of the venturi 69 where it becomes charged with gas from the jet 68. The mixture of air and gas flows past the butterfly valve 70 and down a passageway 75 formed in the cylinder block on the cool side of the motor, or the side remote from the exhaust manifold. The mixture is then led through a passage 76, through a port 97 in the central bearing 52, and through one of the two ports 78-79 in a tubular central section 80 of the crank shaft 20. A deflector plate 81 interposed diagonally across the interior of the tubular shaft 80 directs the gaseous mixture either to the upper or the lower portion of the cylinder block into the crankcase from whence it enters the combustion chamber through the ports 59 heretofore described.

The flow of gasoline for high speed operation is regulated by a conical valve 80' (Fig. 4) from a knob 81 through a tubular shaft 82, the valve being adjustable up and down to vary the size of the jet 68, the speed of the engine being controlled primarily through the timing of the ignition and the position of the butterfly valve 70.

In order to operate effectively at low speeds it is necessary to maintain the velocity of gas as high as possible. For this purpose there has been provided a second or dual gas supply, best seen in Figs. 2 and 3. As shown, a well 85 is provided in the carburetor body adjacent the carburetor bowl 65. The well houses a first tubing 86, somewhat smaller in diameter than the well 85 and a second tubing 87 of considerably smaller outside diameter than the inside of the tube 86. A port hole 88 communicates with the atmosphere and with the interior of the tube 86, while a second port 89 in the carburetor body joins the interior of the tube 87 with the liquid gasoline in the float chamber 65. A third opening 90 is formed in the carburetor body between the interior of the well 85 and a venturi passage 91. The top of the well is plugged by a plug 92. Air passing through the venturi 91 has an aspirator effect, creating a vacuum in the opening 90 and in the well 85. Such a vacuum raises the level of the gasoline in the tube 85 and simultaneously draws air through the

aperture 88 and upwardly around the tube 87 and over the top thereof, creating a further vacuum in the tube 87 and vaporizing and drawing gasoline from that tube.

Gasoline vapors are carried through the opening 90 into the venturi 91 and thence through a passage 95 in the cylinder block 22. The passage 95 passes through the exhaust manifold 96 which provides heat to the gas passing there-through and aids in maintaining the mixture in gaseous form.

From the passage 95 the gas enters passages 97, 98, and 99 (Figs. 1 and 2) and enters the interior of the cylinder below the skirt of the piston 58 when the piston is adjacent the upper dead center. On the suction stroke of the piston the gas from the passages 95, 97, 98, and 99 is forced around the end of the cylinder 31 through the bypass by the descending piston and enters the intake ports 59, through which the high speed mixture is likewise adapted to pass.

Fuel from the low speed side of the engine may be regulated manually by adjusting the height of the conical valve or needle 101 passing through the plug 92 and best seen in Fig. 3.

It will be noted that during normal operation gas is supplied to the engine through both the high speed and the low speed passage and that as the speed is reduced, the butterfly valve, 70 closes the passage 75, so that for slow speed operation the passage 75 is entirely closed and gas is supplied solely through the passage 95.

It will also be noted that the high speed operation of the engine is effected through the passage 75, which is on the cool side of the motor remote from the exhaust manifold, giving a maximum volumetric efficiency, while the slow speed operation is effected through the hot part of the engine, thus pre-heating the mixture and aiding in the maintenance of vaporization.

Gasoline is supplied from a gas tank 103 through a pipe 104 connected to the float chamber 65, the height of gasoline in this chamber being controlled by a float valve 105, actuated by the float 66. The normal level of the fuel in the chamber 65, as controlled by the float 66 may be increased to flood the aspirating jets 68 and 87 by depressing the high speed control knob 81' which depresses the control tube 82, as best seen in Figs. 1 and 4. Lowering the tube 82 lowers the flooding rod 106 through a collar 107 best shown in Fig. 4. Lowering the flooding rod lowers the float 66, opening the valve 105, permitting more gasoline to pass from the tank 14 through the pipe 104 into the bowl or tank 65. The flooding rod 106 is raised to normal position by a spring 107' upon release of pressure on the knob 81'.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What I claim as my invention is:

1. In an outboard motor of the character described, the combination of a cylinder, a piston operable in said cylinder, said piston controlling openings in said cylinder for the admission of an explosive mixture and the expulsion of burnt gases, means including an exhaust passage to transmit burnt gases from the motor to the atmosphere, a high speed fuel mixture feeding system adapted to operate at high speeds, a slow speed fuel mixture feeding system passing adjacent the exhaust passage, and means to cut off the supply of fuel mixture to the high speed passage for slow speed operation.

2. In an outboard motor having a swingable frame pivoted to a fixed frame, said swingable frame carrying a motor having an engine cylinder below said pivot, a piston working in said cylinder, a crankcase, a crank shaft vertically journaled in said swingable frame and operatively connected to said piston, a fuel feed chamber mounted on the rear of said frame adjacent the head end of said cylinder, a high speed operation fuel mixture passage connecting said feed chamber with the crankcase, and a low speed operation fuel mixture passage connecting said feed chamber with said crankcase, said cylinder having a mixture inlet port connected with said crankcase and controlled by said piston.

3. A cylinder block having a cylinder and crank case, a pair of spaced lengthwise extending fuel mixture passages formed therein, one a large passage for high speed operation, the other a smaller passage for low speed operation and hav-

ing an exhaust heated wall, a fuel feed chamber connected by aspirating jets with both of said passages, both of said passages conducting fuel mixture to the crank case of said engine block, and means for cutting off the supply of fuel mixture to said large passage during low speed operation.

4. In an outboard engine, the combination of a pair of pistons, a cylinder block having a pair of crankcases and a pair of spaced cylinders in which said pistons operate and provided with fuel mixture supply passages formed in spaced relation between said cylinders, one of said passages being a slow speed passage heated by the engine exhaust gases and communicating with both of said cylinders behind the pistons when in their outer positions, and the other of said passages communicating separately with the crankcases for said cylinders.

LEO T. KINCANNON.