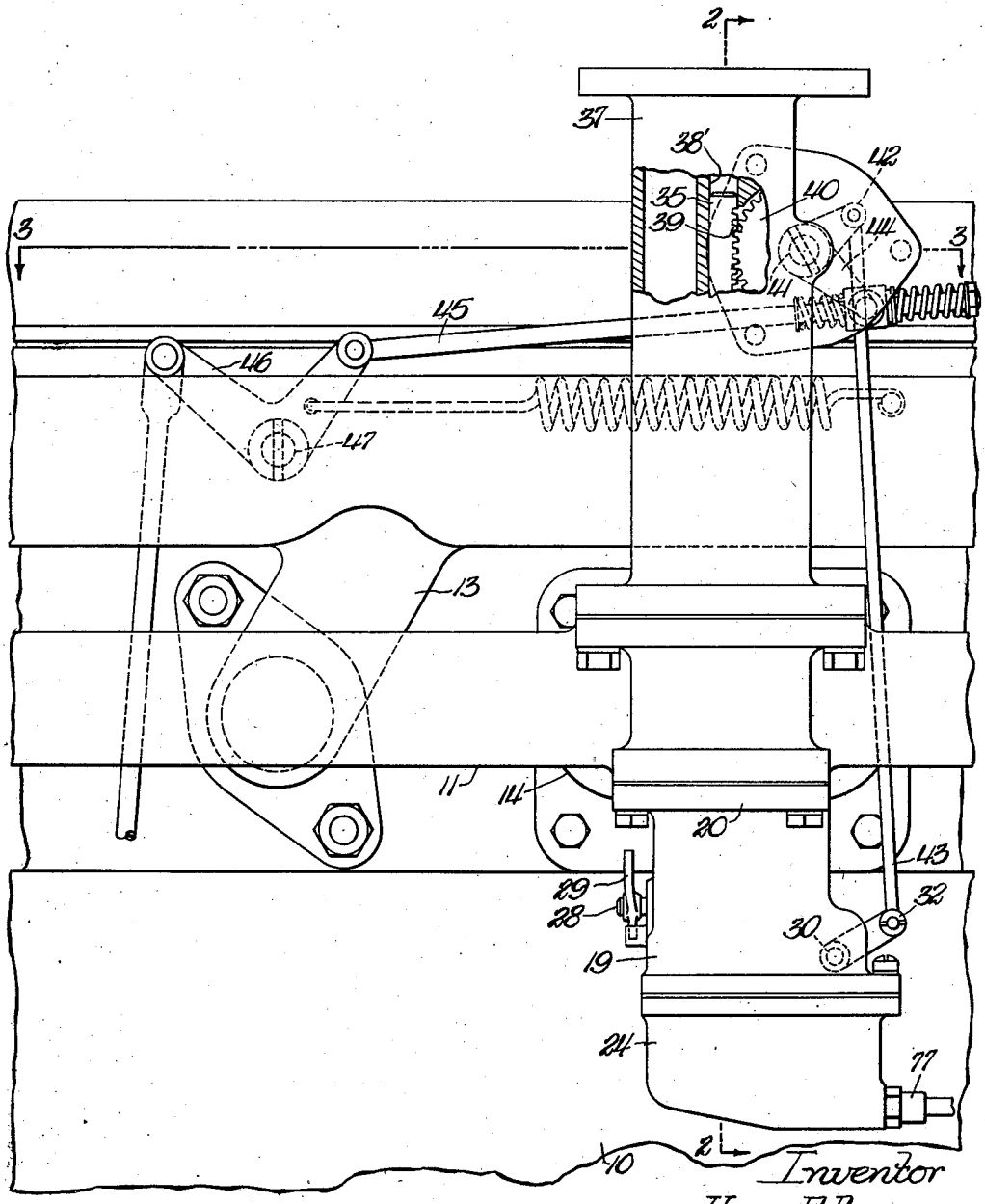
July 12, 1938. H. F. BRYAN 2,123,522

CARBURETION SYSTEM FOR ENGINES

Filed April 18, 1936 4 Sheets-Sheet 1

Fig. 1



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CARBURETION SYSTEM FOR ENGINES

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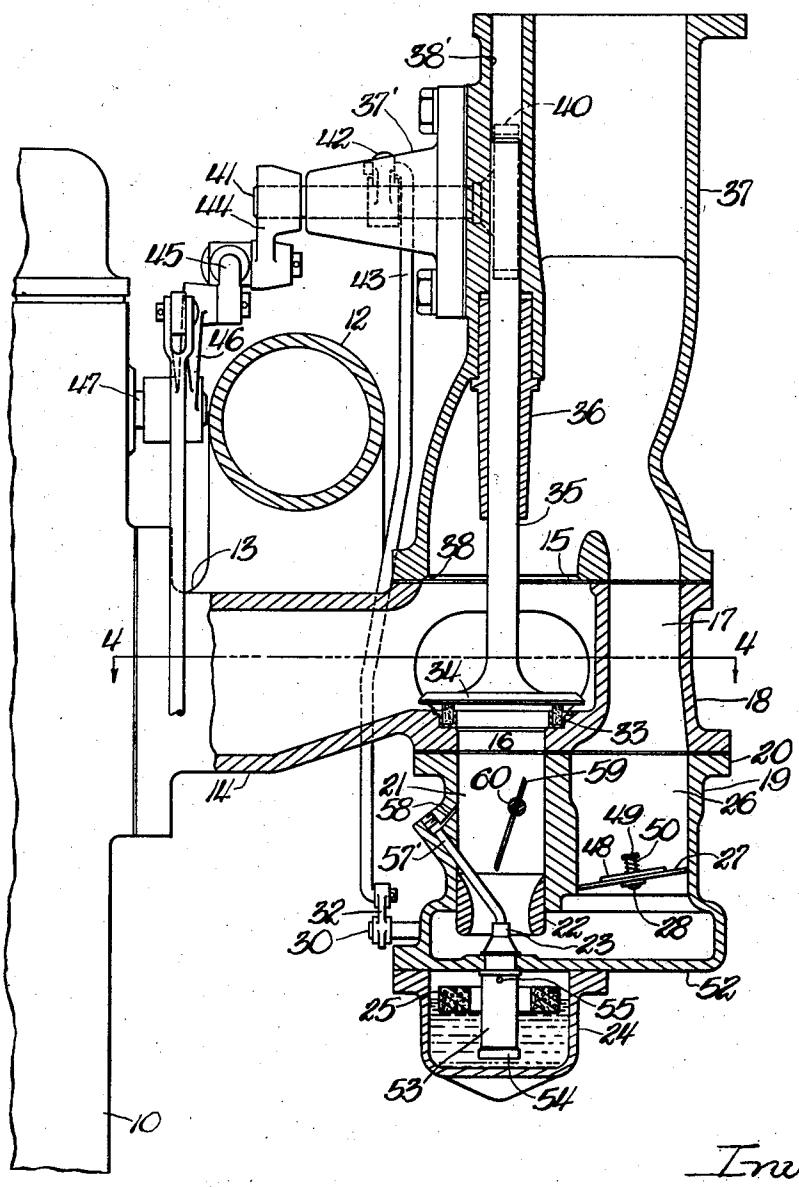
Fig. 2



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CARBURETION SYSTEM FOR ENGINES

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Fig. 3

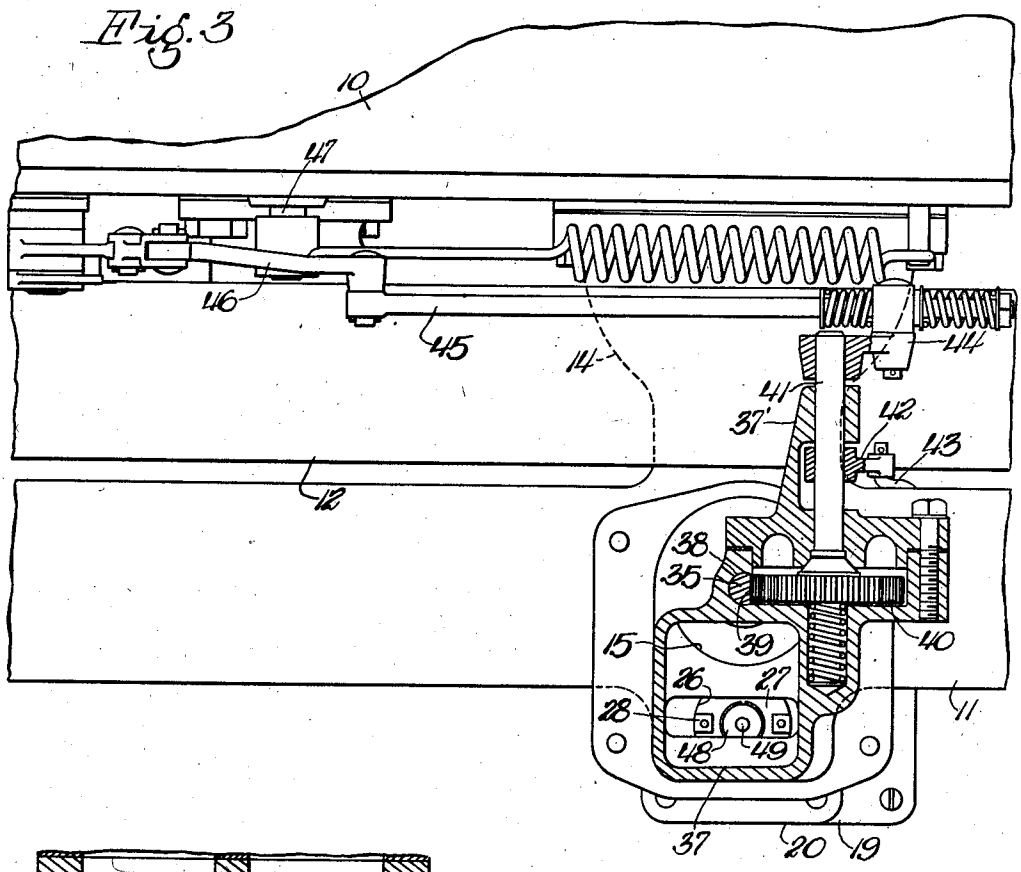
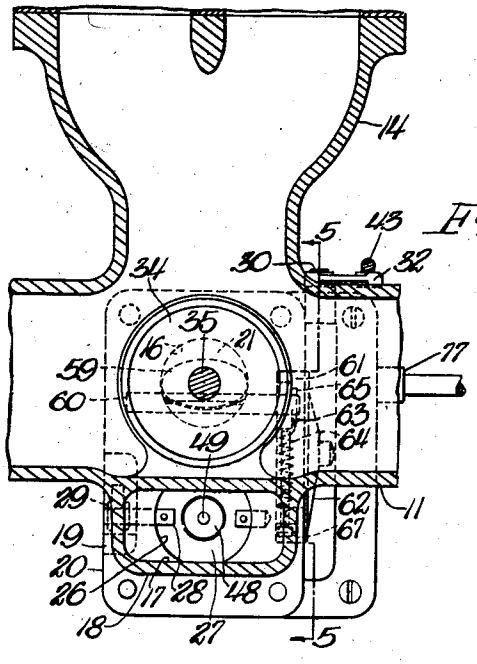


Fig. 4



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CARBURETION SYSTEM FOR ENGINES

Filed April 18, 1936 4 Sheets-Sheet 4

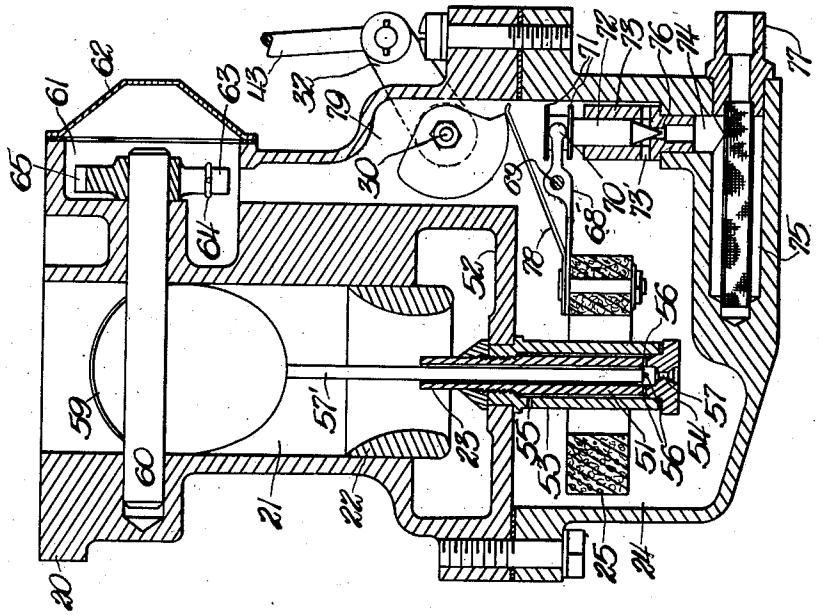

Fig. 6

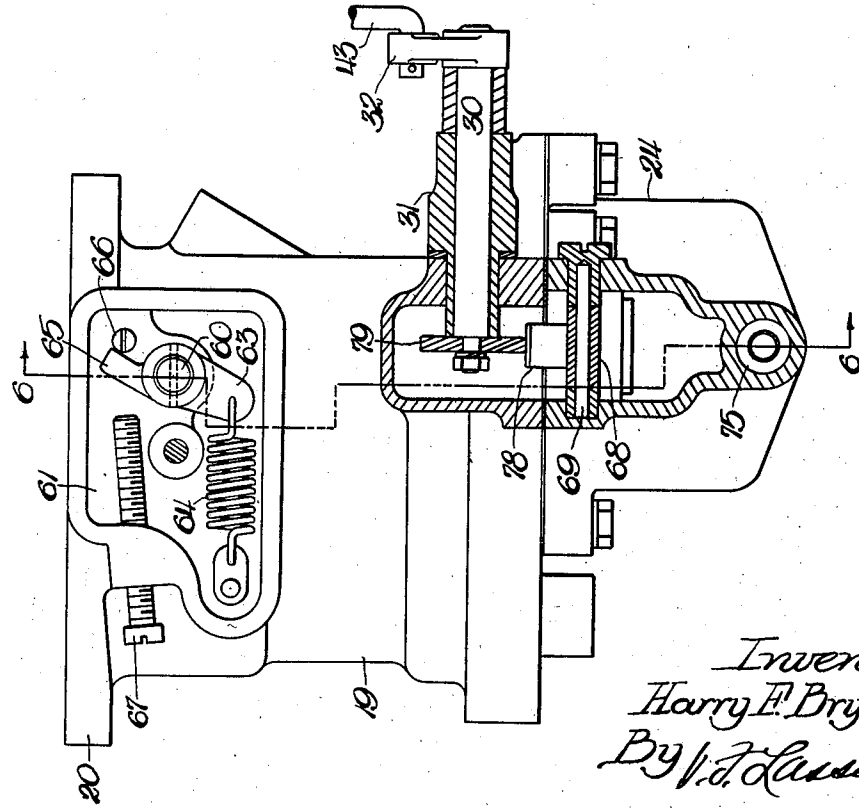

Fig. 5

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UNITED STATES PATENT OFFICE

2,123,522

CARBURETION SYSTEM FOR ENGINES

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Application April 18, 1936, Serial No. 75,067

11 Claims. (Cl. 123—27)

This invention relates to a carburetion system utilized for starting Diesel engines. More specifically, it relates to a carbureting device which is an auxiliary unit to be used on an air supply system for solid injection engines when said engines are started by using a volatile mixture with spark ignition.

In the use of Diesel engines for automotive vehicles and the like, one of the principal problems in operation has been to start the engines satisfactorily by manual means. Various mechanisms and systems have been resorted to for turning the engines over against high compression. Another method by which the engine is initially operated on a volatile mixture with spark plug ignition has been successfully used. Such a method is disclosed in the Wentworth Patent 1,225,295, May 8, 1917. A more recent development along this line is shown in the patent to Johnston 2,032,755, issued March 3, 1936. In the use of Diesel engines for tractors it is imperative that an air cleaner be used on the air inlet means leading to the intake manifold. The application of a carburetion system must also be worked out to prevent the intake of unfiltered air to the engine. Another problem encountered in the use of carburetion systems is providing for a complete shut-off of the volatile mixture supply when operation is shifted to the Diesel cycle. This is necessary as any gasoline fed into the engine during operation on high compression detonates and causes rough running of the engine as well as possible injury due to the rapid pressure rise during combustion.

A principal object of the present invention is to incorporate a volatile mixture carbureting device into the air in-take system of a compression ignition engine.

Another object is to provide a positive and simplified valve for cutting off the supply of volatile mixture when the engine is shifted to operate on compression ignition.

These objects and others which will be apparent from the detailed description to follow are attained by a construction as shown in the drawings, in which:

Figure 1 is a side elevation of a portion of an engine showing the essential elements of applicant's fuel supplying device. A small portion of this figure is broken away to show by a vertical longitudinal section a portion of the control mechanism;

Figure 2 is a transverse vertical section taken on the line 2—2 of Figure 1;

Figure 3 is a plan view with a portion taken on the section line 3—3 of Figure 1;

Figure 4 is a section taken on the line 4—4 of Figure 2;

Figure 5 is a sectional view of the carbureter taken on the line 5—5 of Figure 4; and,

Figure 6 is a sectional view of the carbureter taken on the line 6—6 of Figure 5.

As illustrated, only a portion of the engine block 10 has been shown. The block is conventional in construction and carries an inlet conduit in the form of the usual intake manifold 11 and an exhaust manifold 12 attached to the side thereof. The inlet and exhaust ports are in horizontal alignment as is usual and the intake manifold 11 is spaced from the block a sufficient distance to provide for connecting conduits 13 forming a part of the exhaust manifold 12. Said conduits are connected by suitable flanges with the block. The intake manifold 11 is connected with the two center ports of the engine block, as shown in Figure 4 by a conduit 14.

The conduit 14 connects with the intake manifold at the center thereof which is flattened in cross section, as best shown in Figure 2. Directly in line with the conduit 14, the intake manifold is provided with an opening 15 formed in the top wall thereof and an opening 16 formed in the bottom wall in axial alignment with the opening 15. Outwardly beyond the central portion of the inlet conduit 11, a section of an auxiliary conduit 17 is formed by a wall 18 integral with the inlet conduit. The conduit 17 is open at the top and bottom, said openings being in the same planes as the openings 15 and 16 formed in the inlet manifold.

A carbureter 19 of a special construction is secured by an upper flange 20 with a flanged extension formed on the inlet manifold. Said carbureter is provided with a mixture passage 21 which is in alignment with the opening 16 in the inlet manifold and which forms a part of an auxiliary by-pass conduit. A Venturi throat 22 in the mixture passage 21 forms a suction producing means for drawing fuel through a nozzle 23 which is in communication with the float chamber 24 of the carbureter. A float 25 in the chamber 24 maintains the fuel level as is conventional in constant level float bowls. Adjacent the mixture passage 21 an air inlet passage 26 is formed in the carbureter communicating at its lower end with the inlet end of the Venturi throat 22 and with the bottom of the auxiliary conduit 17. A choke

valve 27 positioned in the inlet passage 26 is mounted on a two piece shaft 28 extending through the walls of the carbureter. A lever 29 on the shaft 28 provides for regulating the position of the valve 27.

More specifically describing the carbureter construction, the choke valve 27 is mounted on the two piece shaft 28 in order to provide a center area in which an automatic valve 48 is mounted on the intake side of the valve. Said valve is mounted on a headed pin 49 around which a spring 50 is positioned to resiliently hold the valve 48 in position against the valve 27. A plurality of openings are formed in the valve 27 around the pin 49 to provide for the flow of a limited amount of air when the valve is in closed position.

The fuel nozzle 23 which was above referred to is the upper end of a member 51 which is threaded into the upper end of a cylindrical member 53. Said member is secured to the lower wall 52 of the upper portion of the carbureter. The member 53 extends downwardly into the float chamber a substantial distance below the normal liquid level therein. The member 51 is formed with a head 54 which abuts the lower end of the member 53. An annular space is formed between the member 53 and the member 51. Said member is formed with an air bleed 55 above the normal liquid level in the float chamber forming a communication between the space above the float chamber and the annular space between the member 53 and the member 51. Below the liquid level a plurality of openings 56 form a communication between the annular space between the member 51 and the member 53 and the interior of the member 51. A restricted metering opening 57 formed centrally in the head 54 of the member 51 regulates the supply of fuel fed to the air bled nozzle 23. The member 51 forms the fuel well. A tube 57' extends centrally into the well spaced from the inner wall of the member 51. Said tube extends upwardly, as best shown in Figure 2, and communicates with a small discharge conduit 58 formed in the wall of the mixture passage 21 on the outlet side of the venturi.

An automatic throttling valve 59 somewhat oval in its general shape is mounted on one side of its center on a shaft 60. As best shown in Figures 5 and 6, said shaft extends into a housing compartment 61 at one side of the carbureter. Said compartment is covered by a plate 62. Within the compartment a small lever 63 is rigidly secured to the shaft 60. A spring 64 is secured to the lever 63 at one side of the center of the shaft and is anchored on the carbureter body. An extension 65 of the lever 63 at the opposite side of the center from the attachment of the spring 64 forms a stop which is limited in the direction of opening by a fixed stop 66. An adjustable stop 67 engageable by the extension 65 limits the closing movement of the automatic throttle valve 59. In effect, this construction acts as a governor to automatically reduce air flow through the carbureter upon any material increase in the flow of air therethrough.

The float valve 25, previously referred to, is carried on a bracket 68 pivotally mounted on a pivot pin 69, best shown in Figures 5 and 6. Said bracket extends beyond the pivot pin and is provided with spaced arms 70 which operate between the flanges 71 of a head formed on a needle valve 72. Said needle valve is mounted for reciprocation in a bore formed in a valve member 73. Said member is fitted into a bore 74 communicating with a horizontal bore 75 formed in the base of the float chamber. A central orifice 76 which is engaged and controlled by the needle valve 72 forms the fuel inlet communicating between a central bore in the lower end of the valve member 73 and lateral outlet passages 73'. The bore 75 contains a filtering screen positioned to filter fuel entering the float chamber through the fitting 77 adapted to be connected to a fuel supply line.

The bracket 68 of the float chamber carries a spring 78 which extends upwardly and rearwardly over the needle valve 72. Said spring is engageable by a cam 79 fixed on the transverse shaft 30 rotatably mounted in a fitting 31 extending through the upper portion of the carbureter. A lever 32 fixed on the shaft 30 provides means for connecting the shaft to the shifting mechanism, as will be hereinafter described. The operation of the carbureter will be understood from the above description, as the metering mechanism is conventional utilizing the air bled well formed by the members 51 and 53 and the separate idling passage formed by the tube 57'. The speed control is obtained by the spring controlled automatic throttle valve 59 actuated by the air velocity through the carburetor.

The mechanism for closing the fuel float valve and holding the float mechanism from vibrating when the engine is operating on the Diesel cycle is operated by the lever 32. When said lever (referring to Figure 6) is moved in an anticlockwise direction, the cam 79 engages the spring 78 thereby holding the float 25 against vibration and holding the needle valve 72 firmly on its seat to assure a tight valve to prevent any further delivery of fuel to the float chamber. This construction greatly increases the length of life of the float and needle parts and makes it unnecessary to manually close the shut-off valve between the fuel supply tank and the carbureter when the engine is operated on the Diesel cycle.

In the lower wall of the manifold 11 a gasket 33 is seated in a recess formed around the opening 16. Said gasket is on the upper side of the wall and is engageable by the head of a valve 34. Said valve has an upwardly extending stem 35 which is slidably fitted in a guide 36 carried by an upper inlet member 37 mounted on the inlet manifold. Said member is provided with two branches one of which aligns with the opening 15 formed in the inlet manifold to form the main air inlet conduit. A valve seat 38 is formed around this branch of the inlet member to provide a seat for the cut-off valve 34 when it is in lifted position. The other branch of the inlet member 37 forms part of an auxiliary conduit and communicates with the vertical conduit 17 formed in the inlet manifold and through said passage with the air inlet passage 26 of the carbureter. The branch 37 of the inlet member, the conduit 17, the air inlet passage 26 and the mixture 21 together provide an auxiliary by-pass conduit from the main portion of the main air inlet conduit to the inlet conduit of the manifold 11.

The valve stem 35 extends beyond the guide 36 into a bore 38' formed in the inlet member 37. Said stem is provided on one side with a gear rack 39, as best shown in Figure 1. A rotatable member 40 is formed with gear teeth adapted to engage the gear teeth on the rack 39. Said member is fixed to a shaft 41 which extends into and is carried by a bearing bracket 37' secured to the engine side of the inlet member 37.

As best shown by the section in Figure 3, the

shaft 41 carries a lever arm 42 which is connected by a link 43 with the lever arm 32 on the fuel cut-off valve, previously described. The shaft 41 is also provided with a lever arm 44 which is connected by link 45 with a bell crank member 46 rigidly connected to a transverse shaft 47 mounted on the engine block 10. Said shaft is one of the control shafts for shifting from operation on a volatile mixture cycle and spark ignition to operation on high compression with solid fuel injection and spark plug ignition. In so far as this invention is concerned the shaft 47 may be referred to as an actuating shaft for cutting out or bringing into use the carburetion system for supplying volatile mixture to the inlet manifold.

The operation of the device, as above described, is apparent from the detailed description. The parts have been shown in Figure 2 in a position with the carbureter cut off from the inlet manifold. With the valve 34 in this position seating against the gasket 33 air will be drawn through main air inlet conduit formed by the inlet member 37 and through the opening 15 directly into the inlet manifold. Said air will be distributed to each end of the manifold and to the center branch formed by the conduit 14. No air will pass downwardly through the passage 17 into the carbureter or upwardly through the mixture passage 21. When the valve 34 is lifted by shifting the bell crank member 46 with the valve head in contact with the seat 38 in Figure 2, direct communication between the air inlet member 37 and the inlet manifold is cut off. Air, then, passes downwardly through the passage 17 through the air inlet passage 26 as the valve is then in the open position through the Venturi throat 22 and upwardly through the mixture passage 21 into the inlet manifold. The air is carbureted by receiving the required supply of fuel from the float bowl 24 through the nozzle 23.

By connecting the carbureter to the main air inlet system of the Diesel engine filtered air as taken into the main air inlet manifold 37 may be carried directly to the air inlet manifold for solid fuel injection or may be shunted through the carbureter by operating the control valve 34. This is a novel and useful construction which prevents any difficulty due to providing filters for two separate air inlets. It also reduces to a minimum the amount of gasoline or gasoline vapor which may be taken into the inlet manifold after cutting off the carbureter.

Although applicant has disclosed and described above only a preferred embodiment of his improved auxiliary carburetion system for solid injection engines, it is to be understood that he claims as his invention all modifications falling within the scope of the appended claims.

What is claimed is:

1. An air intake system for solid injection engines provided with an auxiliary volatile mixture supply system which comprises an inlet conduit having upper and lower walls, aligned openings formed in said walls, a by-pass conduit formed adjacent said conduit, an air inlet member having one branch communicating with said by-pass conduit and another branch communicating with the inlet conduit through the upper opening, a carbureter formed with an air inlet passage communicating with said by-pass conduit and a mixture passage communicating with the inlet conduit through the bottom opening formed therein, and valve means for selectively closing either of the openings in the conduit walls.

2. An air intake system for solid injection engines provided with an auxiliary volatile mixture supply system which comprises an inlet conduit having upper and lower walls, aligned openings formed in said walls, a by-pass conduit formed adjacent said conduit, an air inlet member having one branch communicating with said by-pass conduit and another branch communicating with the inlet conduit through the upper opening, a carbureter formed with an air inlet passage communicating with said by-pass conduit and a mixture passage communicating with the inlet conduit through the bottom opening formed therein, a vertically movable valve in alignment with the openings formed in the inlet conduit and means for moving said valve to close either the upper opening in the conduit whereby air passes through the carbureter or to close the lower opening whereby the carbureter is cut out of the circuit and whereby air flows directly from the inlet member into the conduit.

3. An air intake system for solid injection engines provided with an auxiliary volatile mixture supply system which comprises an inlet manifold having upper and lower walls, aligned openings formed in said walls, a vertical by-pass conduit open at its ends formed adjacent said manifold, an air inlet member having one branch communicating with the upper end of said conduit and another branch communicating with the opening in the upper wall of the manifold, a carbureter formed with an air inlet passage communicating with the lower end of said conduit and a mixture passage communicating with the opening in the lower wall of the manifold, a vertically movable valve in alignment with the openings formed in the inlet manifold and means for moving said valve to close either the upper opening in the manifold whereby air passes through the carbureter or to close the lower opening whereby the carbureter is cut out of the circuit and whereby air flows directly from the inlet member into the manifold.

4. An auxiliary carburetion system for attachment to the air inlet conduit of an engine normally operated with solid fuel injection comprising an auxiliary conduit adapted to be connected in parallel with the main air inlet conduit, a volatile mixture conduit formed as a portion of said auxiliary conduit, means for supplying a volatile fuel for carburetion to said mixture conduit, a float chamber for supplying fuel to said means, an inlet conduit connected with said float chamber, a float controlled needle valve for controlling flow through said fuel inlet conduit, and means for positively holding the needle valve in closed position when the engine is operated on solid fuel injection.

5. An auxiliary carburetion system for attachment to the air inlet conduit of an engine normally operated with solid fuel injection comprising an auxiliary conduit adapted to be connected in parallel with the main air inlet conduit, valve means for selectively directing air flow through either the main air conduit or through the auxiliary conduit, a volatile mixture conduit formed as a portion of said auxiliary conduit, means for supplying a volatile fuel for carburetion to said mixture conduit, a float chamber for supplying fuel to said means, an inlet conduit connected with said float chamber, a float controlled needle valve for regulating flow of fuel into the float chamber, and means for positively holding the needle valve in closed position, said means being

operatively connected to the valve means for closing the needle valve when air flow is directed through the main air inlet conduit.

6. An air intake system for solid injection engines provided with an auxiliary volatile mixture supply system which comprises an inlet conduit having spaced openings formed therein, a by-pass conduit, an air inlet member having one branch communicating with one end of said by-pass conduit and another branch communicating with one opening in the inlet conduit, a carbureter formed with an air inlet passage communicating with the other end of said by-pass conduit and a mixture passage communicating with the other opening in the inlet conduit, and valve means for selectively closing either of the openings in the conduit walls.

7. An air intake system for solid injection engines provided with an auxiliary volatile mixture supply system which comprises an inlet conduit having spaced walls, spaced openings formed in said walls, a by-pass conduit lying adjacent said conduit, an air inlet member having one branch communicating with said by-pass conduit and another branch communicating with one of the openings in the inlet conduit, a carbureter formed with an air inlet passage communicating with said by-pass conduit and a mixture passage communicating with the other opening in the inlet conduit, and valve means for selectively closing either of the openings in the conduit walls.

8. An air intake system for solid injection engines provided with an auxiliary volatile mixture supply system which comprises an inlet conduit having spaced openings formed therein, a by-pass conduit, an air inlet member having one branch communicating with one end of said by-pass conduit and another branch communicating with one opening in the inlet conduit, a carbureter formed with an air inlet passage communicating with the other end of said by-pass conduit and a mixture passage communicating with the other opening in the inlet conduit, and a single valve means operative to simultaneously open either opening and close the other.

9. An air intake system for solid injection engines provided with an auxiliary volatile mixture supply system which comprises an inlet conduit having spaced walls, spaced openings formed in said walls, a by-pass conduit lying adjacent said conduit, an air inlet member having one branch communicating with said by-pass conduit and another branch communicating with one of the openings in the inlet, a carbureter formed with an air inlet passage communicating with said by-pass conduit and a mixture passage communicating with the other opening in the inlet conduit, and a single valve means operative to simultaneously open either opening and close the other.

10. An auxiliary carburetion system for the air inlet conduit of an engine normally operated with solid fuel injection and having an inlet conduit and a main air inlet conduit communicating therewith, comprising an auxiliary conduit, said auxiliary conduit communicating at one end with the main air inlet conduit and at its other end with the inlet conduit, means supplying a volatile liquid fuel for carburetion in the auxiliary conduit, and valve means operable in one position to provide a direct air flow path between the main air inlet conduit and the inlet conduit and operable in another position to provide an air flow path from the main air inlet conduit through the auxiliary conduit and into the inlet conduit.

11. An auxiliary carburetion system for the air inlet conduit of an engine normally operated with solid fuel injection and having an inlet conduit and a main air inlet conduit communicating therewith, comprising an auxiliary conduit, said auxiliary conduit communicating at one end with the main air inlet conduit and at its other end with the inlet conduit, means for supplying a volatile liquid fuel for carburetion in the auxiliary conduit, and a single valve element operable in one position to provide a direct air flow path between the main air inlet conduit and the inlet conduit and operable in another position to provide an air flow path from the main air inlet conduit through the auxiliary conduit and into the inlet conduit.

HARRY F. BRYAN.