

April 25, 1933.

C. DAVIDSON

1,905,159

CARBURETING DEVICE

Filed Jan. 11, 1930

2 Sheets-Sheet 1

FIG. 1

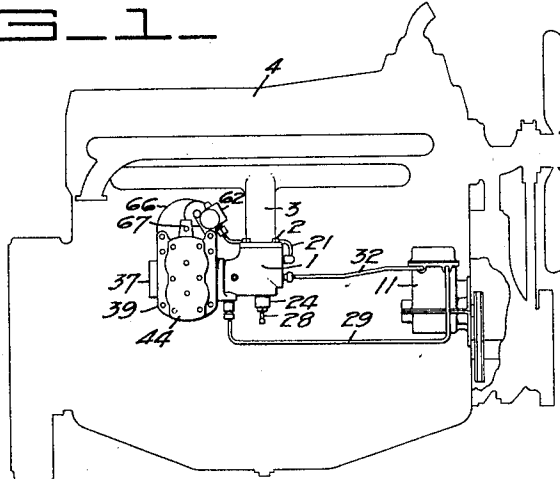
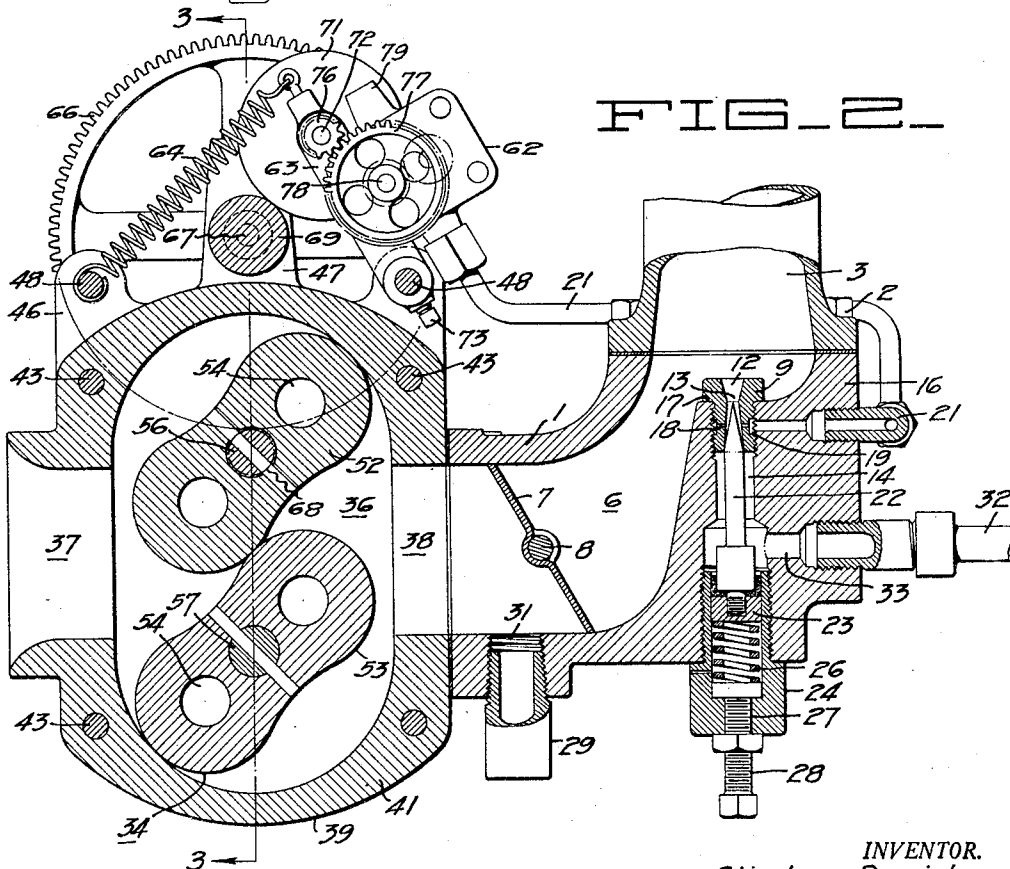


FIG. 2



INVENTOR.

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2 Sheets-Sheet 2

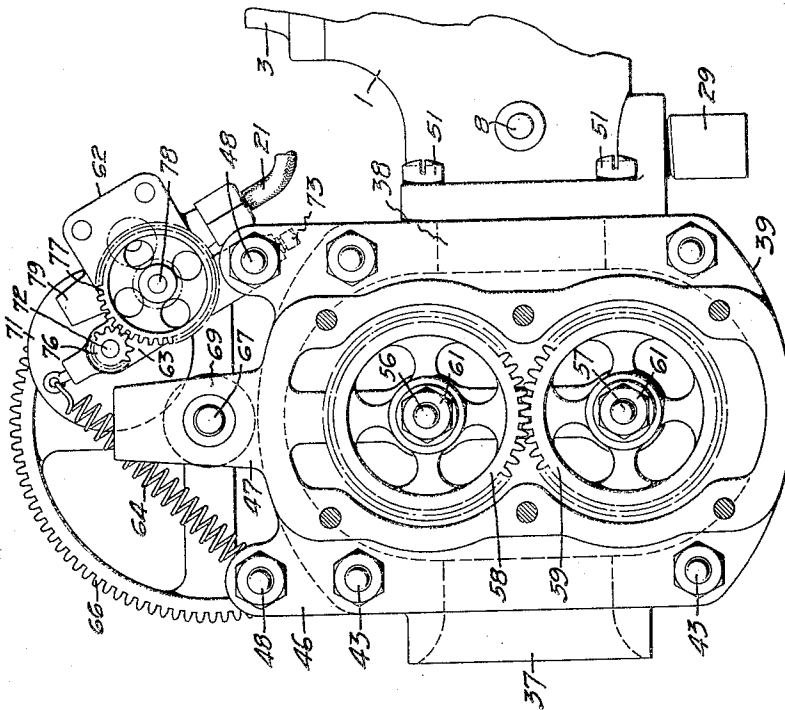


FIG. 4

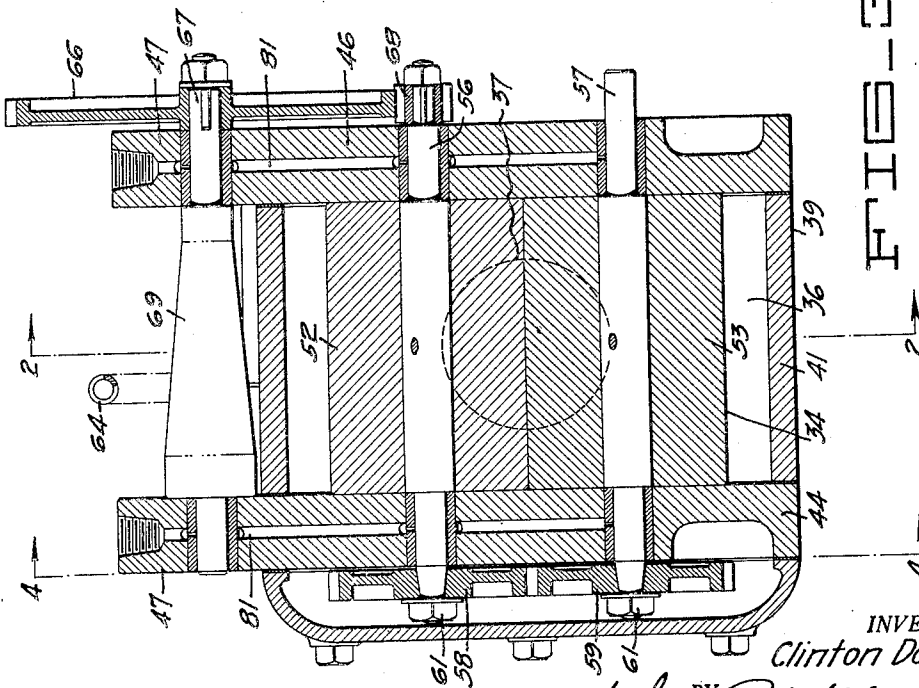


FIG. 3

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UNITED STATES PATENT OFFICE

CLINTON DAVIDSON, OF SAN FRANCISCO, CALIFORNIA

CARBURETING DEVICE

Application filed January 11, 1930. Serial No. 420,084.

My invention relates to devices for supplying fuel to internal combustion engines which operate on the Otto cycle and particularly relates to devices for supplying non-volatile as well as volatile fuels to such engines.

Devices of this general character have been described in my several co-pending applications; namely, Serial No. 316,209, filed October 31, 1928 and entitled Internal combustion engine; Serial No. 330,819, filed January 7, 1929 and entitled Internal combustion engine which matured to Patent No. 1,759,187 granted May 20, 1930; Serial No. 347,974, filed March 18, 1929 and entitled Internal combustion engine; and Serial No. 364,731, filed May 21, 1929 and entitled Hydrocarbon motor which matured to Patent No. 1,815,097 granted July 21, 1931.

The efficiency of internal combustion engines which operate on the Otto cycle is impaired because of various difficulties encountered. Some of these difficulties include the incomplete vaporization of the fuel which results in partial condensation thereof in the manifold and the admission of unequal quantities of the combustible mixture to the several cylinders under varying operating conditions.

The cost of operation of these engines is relatively high because most of such engines now in use are operated entirely on volatile fuel. The provision of means which will enable the operation of such an internal combustion engine upon non-volatile fuels will greatly reduce the running cost because of the comparative selling prices of the two types of fuel.

It is therefore an object of my invention to provide a carbureting device for supplying non-volatile as well as volatile fuels to an internal combustion engine which operates on the Otto cycle.

It is another object of my invention to provide a carbureting device which is adapted substantially completely to atomize non-volatile and volatile fuels.

It is a further object of my invention to provide a device which is adapted to furnish substantially even distribution of fuel and

air to such an engine at all engine speeds and loads.

Other objects of my invention together with some of its advantageous features will be set forth in the following description wherein I shall outline the preferred embodiment of my device. My device is not to be limited to the form shown, as my invention, as defined in the appended claims, may be embodied in a plurality of forms.

Figure 1 is a side elevation of an internal combustion engine with an embodiment of my device secured to the intake manifold thereof.

Figure 2 is an enlarged cross sectional detail taken on the line 2—2 of Figure 3, showing the construction of the air meter of my device together with the fuel pump and fuel nozzle, all disposed in operative positions.

Figure 3 is a cross section, taken on the line 3—3 of Figure 2.

Figure 4 is a cross section, taken on the line 4—4 of Figure 3.

My device is designed for use with an internal combustion engine which operates on the well known Otto cycle and in its preferred form, comprises means for atomizing fuel to be supplied to the intake manifold of the engine together with means for measuring the air which is introduced into the intake manifold and means, regulated by the air measuring means, for supplying fuel to the atomizing means.

The carbureting device of my invention preferably includes a hollow casing 1 which is secured by suitable bolts 2 to the intake manifold 3 of an internal combustion engine 4, designed to operate according to the four stroke Otto cycle. A central passageway 6 is provided in the casing which communicates with the intake manifold and in which is mounted a throttle valve 7 of conventional type on a shaft 8 journaled in the casing. Suitable linkage, not shown, is connected to the shaft 8 for manually operating the throttle valve from a position in the driver's compartment.

Means for atomizing the fuel to be supplied to the engine are provided and preferably include a fuel nozzle 9 and an air pump 11

for supplying air under pressure to the nozzle. The fuel nozzle preferably is manufactured with a relatively small orifice 12 and with a Venturi chamber 13. The nozzle expediently is threaded in order that it can be screwed into a threaded aperture 14 which conveniently is provided in an enlarged portion 16 of the casing adjacent the intake manifold. Shoulders 17 are provided on the nozzle in order that it can project into the central passageway 6 after it has been screwed into position. Fuel is admitted to the nozzle chamber through a plurality of apertures 18 which are provided in the nozzle and which are adapted to register with a groove 19 provided in the portion 16 of the casing which in turn communicates with a conduit 21 connected to a source of fuel.

In order to maintain the air pressure in the nozzle approximately constant, I preferably provide a needle valve 22, which projects into the Venturi chamber 13 of the nozzle, and which is seated by threaded engagement in a piston 23 which is slidably mounted in a thimble 24 closing the threaded aperture 14. A spring 26 conveniently is inserted between the piston and the bottom of the thimble and the tension of the spring must be overcome by air supplied under pressure to the aperture 14, in order to actuate the needle valve 22. The thimble conveniently is provided with a threaded aperture 27 for the reception of a set screw 28. Manual operation of this set screw adjusts the tension of the spring 26 to any value desired.

The air pump 11 of my carbureting device conveniently is geared to the main shaft of the engine and thereby runs in direct proportion to the engine speed. Air to be pumped is obtained from the central passageway 6 of the casing 1 by means of a suitable conduit 29 which is screwed into a threaded aperture 31 piercing the casing adjacent the throttle valve 7. It is to be noted that I preferably dispose the throttle valve between the aperture 31 and the intake manifold of the engine. The pumped air passes from the pump 11 through a suitable conduit 32 to a groove 33 which is provided in the portion 16 of the casing 1 and which is in communication with the aperture 14. The needle valve 22 is held closed by the piston 23 and the spring 26 until the air pressure is great enough to depress the piston whereupon the valve opens to permit the air to escape through the nozzle. Fuel admitted through the fuel apertures 18 is blown in the form of a fine mist toward the nozzle orifice 12 from which it is aspirated into the intake manifold of the engine by the rapidly moving current of air in the central passageway 6.

Means for metering the air which is introduced into the intake manifold of the engine and for regulating the means which sup-

ply fuel to the fuel nozzle is provided and preferably includes a positive displacement air meter 34 which conveniently comprises a chamber 36 having an inlet 37 and an outlet 38, all enclosed in a casing 39. The casing 39 preferably is manufactured of a central shell 41 pierced by suitable bolts 43 for retaining a pair of similarly formed end plates 44 and 46 having extensions 47 which are secured to each other by bolts 48. The air meter casing 39 is secured to the casing 1 by bolts 51 in such a manner that the inlet 37 communicates with the atmosphere and the outlet 38 registers with the central passageway 6.

The air meter of my carbureting device preferably comprises a pair of similarly formed rotors 52 and 53 which conveniently are apertured, as at 54, to permit of light construction. These rotors are mounted on shafts 56 and 57 respectively, journaled in the end plates 44 and 46 and are of such dimensions and are so spaced that they nearly mesh with one another and closely approach the inner periphery of the shell 41. Such mounting prevents any wear upon the rotors which would result from frictional contact with each other or with the shell. In order to aid the rotation of the air meter rotors, I preferably mount a pair of meshing multi-tooth gears 58 and 59 on the shafts 56 and 57 respectively. Suitable nuts 61 are provided for securing these gears upon the shafts. Upon operation of the engine, air is admitted through the inlet 37 and, due to the resulting pressure differential between the inlet side and the outlet side of the chamber 36, the rotors are rotated in opposite directions and the admitted air passes around the inner peripheries of the shell 41 into the central passageway 6. Due to the relatively minute clearance between each rotor and the shell and end plates, there is but a small leakage of air and the speed of the rotors is thus almost exactly proportionate to the quantity of air passing through the air meter.

Means regulated by the air meter, for supplying fuel to the fuel nozzle is provided and preferably comprises a fuel pump 62 which is adapted to be driven by the air meter through suitable reduction gears. The fuel pump conveniently is mounted on a lever 63 which, at one of its ends, is pivotally connected to one of the bolts 48 and at its other end, is urged toward another of the bolts 48 by a tension spring 64. The means for driving the fuel pump preferably includes a multi-tooth gear 66 which conveniently is mounted on a shaft 67 journaled in the extensions 47 of the end plates and which meshes with a pinion 68 carried on the shaft 56. Preferably the drive is transmitted to the fuel pump through a friction cone 69 in order that the proportions of the air-fuel

- mixture can be changed for changing conditions. The friction cone is mounted on the shaft 67 between the end plates 44 and 46 of the casing 39 and is adapted to drive a friction wheel 71 which is mounted on a shaft 72 journaled in the lever 63. The wheel 71 is held in engagement with the friction cone by the spring 64, and, in addition a set screw 73 can be screwed into a threaded aperture in one end of the lever 63 so that the lever may be secured in any adjusted position. A gear 76 conveniently is fixed on the shaft 72 and imparts rotation to a gear 77 mounted on a shaft 78 journaled in the pump casing so that fuel which is admitted to the fuel pump through an inlet 79 is pumped to the fuel nozzle 9 through the conduit 21 at a rate which is directly proportional to the speed of the air meter 34.
- Means for lubricating the moving parts of the air meter are provided and preferably include channels 81 which extend substantially through the end plates 44 and 46 and communicate with a supply of lubricant and also with the shafts 56, 57 and 67.
- It is to be noted that the carbureting device of my invention is adapted to supply either non-volatile or volatile fuels to an internal combustion engine which operates on the Otto cycle. The provision of a positive displacement air meter together with a fuel pump driven by the meter, accomplishes one of the objects of my invention; namely, the proper proportioning of the fuel and air and consequent even distribution thereof to the several cylinders of the engine.
- The provision of an air pump, which is adapted to pump air under sufficient pressure to substantially completely atomize either volatile or non-volatile fuel which is supplied to a fuel nozzle from a fuel pump regulated by an air meter, in combination with a valve in the fuel nozzle which is adapted to maintain the air pressure approximately constant in the nozzle accomplishes one of the other objects of my invention; namely, of atomizing either a volatile or non-volatile fuel supplied to an engine of the stated type.
- I claim:
1. A carbureting device for use with an internal combustion engine including an intake manifold comprising a fuel nozzle in communication with said manifold, pressure responsive means in said nozzle, means in communication with said manifold for supplying air under pressure to said pressure responsive means, an air meter for air introduced into said manifold, and means regulated by said air meter for supplying fuel to said nozzle.
 2. A carbureting device for use in connection with an internal combustion engine including an intake manifold comprising an air meter for measuring air introduced into said manifold, a pump for supplying fuel to said manifold, a train of gears for rotating said meter and said pump together, and a friction cone interposed in said train of gears for varying the speed ratio between said meter and said pump.
- In testimony whereof, I have hereunto set my hand.
- CLINTON DAVIDSON.