

July 21, 1931.

C. DAVIDSON

1,815,097

HYDROCARBON MOTOR CARBURETOR

Filed May 21, 1929

3 Sheets-Sheet 1

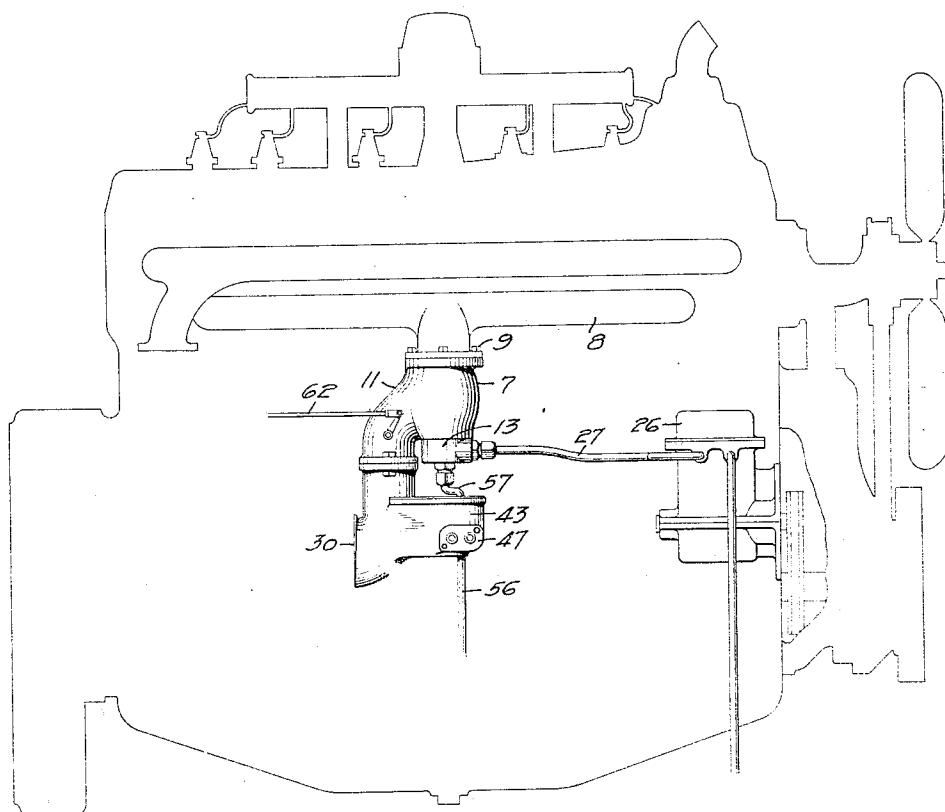


FIG. 1.

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FIG. 2.

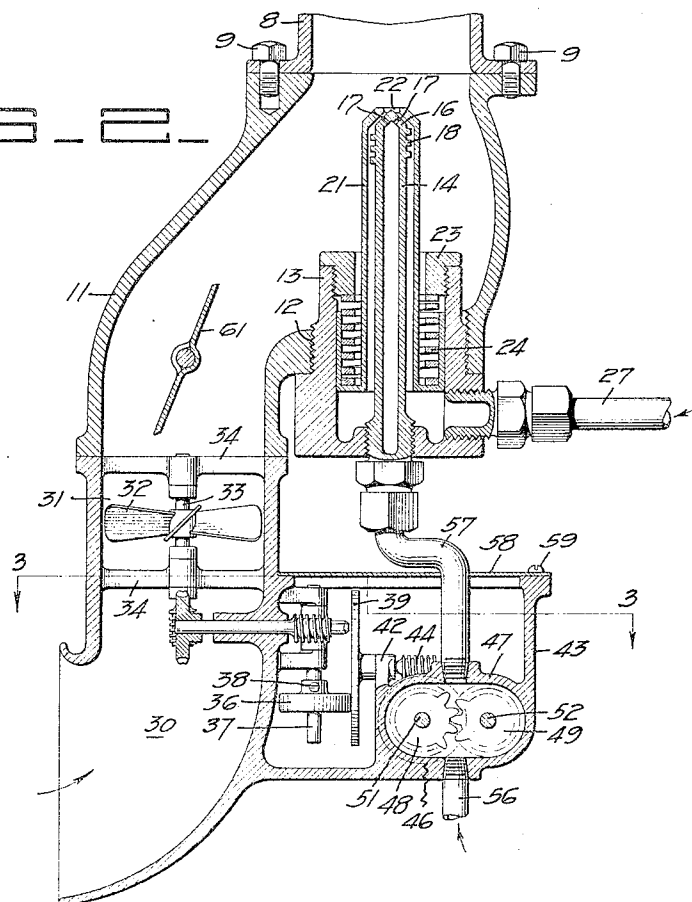
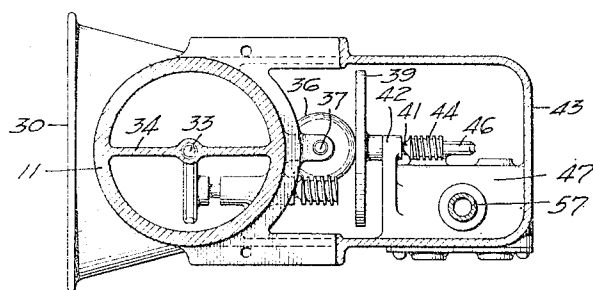


FIG. 3.



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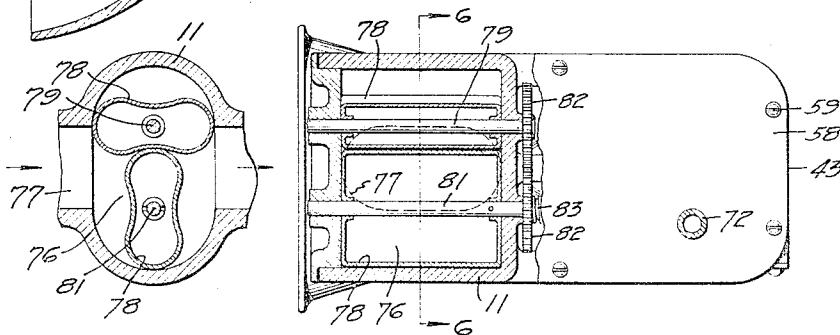
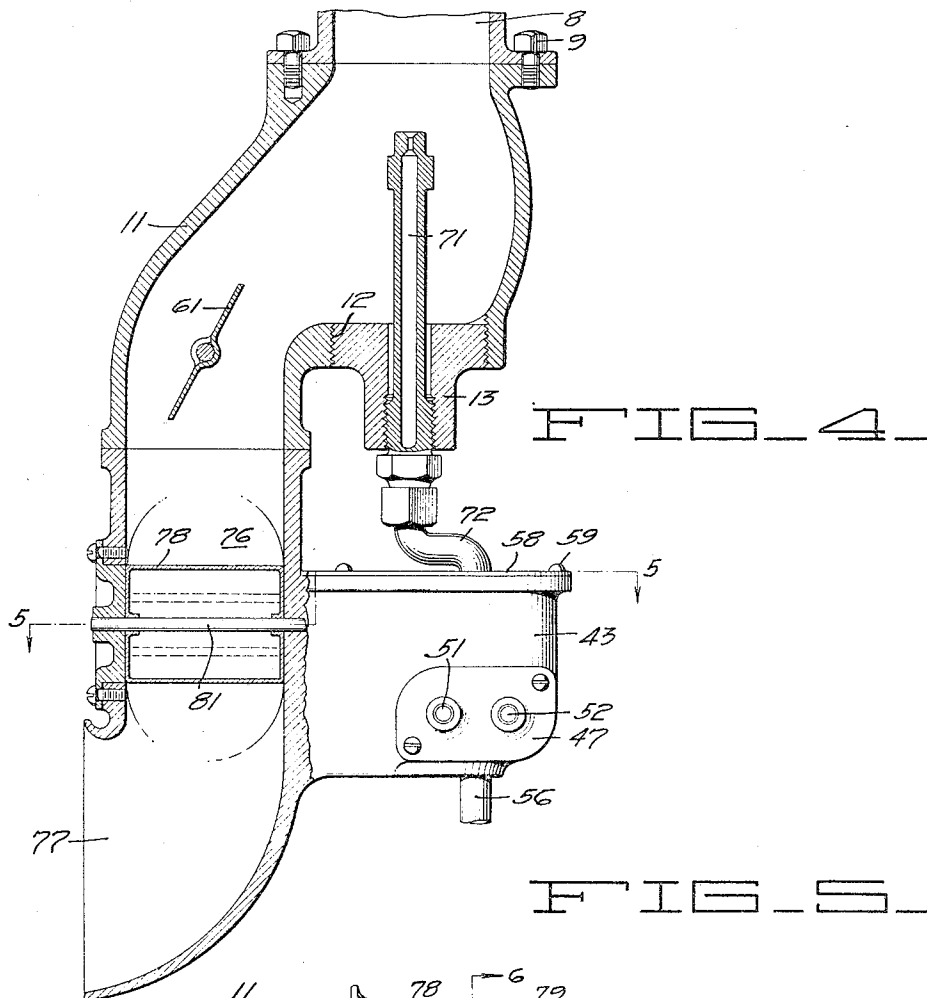


FIG. 6.

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## UNITED STATES PATENT OFFICE

CLINTON DAVIDSON, OF SAN FRANCISCO, CALIFORNIA

## HYDROCARBON MOTOR CARBURETOR

Application filed May 21, 1929. Serial No. 364,731.

My invention relates to hydrocarbon motors and particularly to the carburetor means for supplying the fuel therefor.

It is an object of my invention to provide an improved means for supplying and for atomizing the fuel utilized by a hydrocarbon motor.

Another object of my invention is to provide a device for supplying fuel to a hydrocarbon motor in proportion to the quantity of air drawn into the motor through the intake manifold.

A further object of my invention is to provide means for metering the fuel in proportion to the air admitted to a hydrocarbon motor to preserve a substantially constant fuel air ratio.

The invention possesses other advantageous features, some of which with the foregoing will be set forth at length in the following description where I shall outline in full that form of the hydrocarbon motor of my invention, which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one form of the hydrocarbon motor embodying my invention, but it is to be understood that I do not limit myself to such form since the invention, as set forth in the claims, may be embodied in a plurality of forms.

In said drawings:

Figure 1 is a side elevation of a hydrocarbon motor utilizing the device of my invention.

Fig. 2 is a portion of the intake manifold and of a device of my invention primarily intended for use upon heavy non-volatile fuel.

Fig. 3 is a cross section through the device illustrated in Fig. 2 along the line 3—3 thereof.

Fig. 4 is a view of a device constructed in accordance with my invention, the device being shown partially in cross section.

Fig. 5 is a section through the device shown in Fig. 4, the line of section being that indicated by the line 5—5 of Fig. 4.

Fig. 6 is a section along the line 6—6 of Fig. 5.

My invention is characterized by the provision of means for atomizing fuel to be supplied to an engine operating upon the well-known Otto or Beau de Rochas cycle. In combination with this atomizing means other means are provided which regulate the quantity of fuel supplied to the atomizing means in direct accordance with the quantity of air passing into the intake manifold.

While the weight of air and fuel supplied to an engine operating upon this cycle varies between the limits of 10 and 20 to 1 the ratio of the volumes is several hundred times greater being more nearly 10,000 to 1. Accordingly, while the volume of fuel is relatively small the volume of air admitted to the engine is of the order of ten thousand times as much. Many of the carburetion devices now available have undesirable characteristics with respect to the manner of supplying correctly proportioned quantities of air and fuel under all conditions of operation. In general it may be said that their tendencies are to supply an overly rich or overly lean mixture upon sudden changes in operating conditions. These variations are not conducive to the best and most efficient operation.

To supply the quantities of air and fuel in a substantially constant ratio under all operating conditions, I preferably provide the fuel supply device, indicated generally at 7 in Fig. 1. This is attached to the intake manifold 8 of a hydrocarbon motor, as by means of bolts 9. For convenience in manufacture, the hollow shell 11, which forms the body of the device of my invention, is apertured and is provided with screw threads 12 into which a thimble 13 is screwed. Extending through the thimble and preferably projecting into the intake manifold is a fuel atomizing nozzle 14. The nozzle is manufactured with a conical end 16 in which apertures 17 are provided for the ejection of fuel. For reasons which will presently appear the end 16 of the nozzle is preferably formed with an extending portion forming a square thread 18. Telescoping the nozzle 14 and slidably engaging the thimble 13 is a cap 21 having an aperture 22

adjacent to the end 16 and to the apertures 17 of the fuel atomizing nozzle 14. Positioned between the cap 21 and a screw plug 23, which closes the end of the thimble, is a spring 24 adapted to retain the aperture 22 in the cap in close engagement with the end 16 of the fuel atomizing nozzle.

To assist in the atomization of the fuel ejected through apertures 17 a supply of high pressure air is expediently provided from an air pump 26 through a conduit 27. The conduit 27 is in communication with the the body of the thimble 13. As is particularly shown in Fig. 2 air admitted from the conduit 27 raises the cap 21 from engagement with the end 16 of fuel nozzle 14 and flows about the fuel apertures 17 with a rapid helical motion imparted by the thread 18.

To assist in accomplishing the objects of my invention I preferably position within intake passage 30 of the shell 11, an air motor 31. Thus, as is particularly shown in Fig. 2, I preferably utilize a multi-bladed fan 32 fixably mounted upon shaft 33 journaled in bars 34 which are joined to shell 11. Connected to the shaft 33 thru suitable reduction gearing is a disc 36 movably positioned upon a shaft 37 as by set screw 38. Operatively disposed with respect to the disc 36 and adapted to contact with disc 36 for providing a ready variation in the gearing, and for other reasons which will be later set forth, is another disc 39 supported upon a shaft 41 which is journaled in a bearing 42 provided in body 43. A worm 44 is preferably attached to the shaft 41 which carries the disc 39. This worm usually engages irreversibly a worm gear 46 which is adapted to drive a fuel supply pump 47 positioned in the body 43. In this instance I have chosen to depict the fuel supply pump 47 as comprising two gears 48 and 49 carried respectively by shafts 51 and 52 which are journaled in the body 43.

A fuel supply conduit 56 is in communication with the fuel pump 47 and is adapted to supply fuel thereto from a suitable source of supply which is not shown. The fuel supply may be under a pressure either greater, equal to or less than that occasioned by the operation of the fuel pump. Since the pump is irreversibly driven by the worm gearing it serves as a metering device under all conditions of fuel supply. Fuel conduit 57 leads from the pump 47 to the atomizing nozzle 14. To enclose the several mechanisms and to protect them from dust a cover plate 58 is attached to the body 43 by screws 59.

In operation it is to be noted that the air drawn into the intake manifold by the suction occasioned by the turning over of the motor operates the air motor and this in turn, through the agency of the reduction gear, op-

erates the fuel pump 47 to supply fuel to the atomizing nozzle 14.

Upon a variation in the position of butterfly valve 61 by means of linkage 62 during operation of the engine, an increase or a decrease in the pressure differential existing between the intake manifold and the atmosphere is occasioned together with an increase or decrease in the quantity of air admitted. Accordingly, thru the agency of the air motor 31 and its connection to the fuel pump 47 an increase or decrease in the quantity of fuel supplied to the atomizing means is effected. The quantity of air and the quantity of fuel supplied to the motor are thus maintained in substantially the correct ratio once the relative setting of the discs 36 and 39 have been determined for the character of the fuel ordinarily supplied.

In the modification illustrated in Figs. 4, 5 and 6, atomizing nozzle 71 is primarily intended for use with fuel of a relatively volatile character. Thus, while the fuel nozzle 14 is primarily intended for heavy fuels of the character upon which hydrocarbon motors such as I have described in my several copending applications, namely, Ser. No. 316,209, filed Oct. 31, 1928, Ser. No. 330,819, Jan. 7, 1929, which has matured into Patent 1,759,187 May 20, 1930, Ser. No. 347,974, filed March 18, 1929, are adapted to operate nozzle 71, as is illustrated in Fig. 4, is intended for use with such volatile fuels as gasoline and engine distillate. The fuel nozzle is preferably in communication with a suitable fuel regulating and metering pump through the conduit 72.

To actuate the fluid regulating means air motor 76 is provided within the intake manifold 77. In this modification the air motor preferably comprises a pair of similar concavo-convex bodies 78 journaled upon shafts 79 and 81 respectively and so positioned that they are adapted to rotate within the intake manifold 77 and relative to each other with a slight clearance between adjoining surfaces. To maintain the bodies 78 in their correct relative positions gears 82 are provided upon shafts 79 and 81. Shaft 81 continues thru the intake manifold 77 a sufficient distance to carry a worm gear 83 which actively engages and operates the fluid supply means. By utilizing an air motor of this type it is possible to secure a very efficient utilization of the air passing through the intake manifold to operate the fluid regulating means.

I claim:

1. In a carburetor for a hydrocarbon motor including a mixing chamber and an air intake, an air motor positioned in the air intake so that air passing to the mixing chamber acts upon the motor, an atomizing nozzle for supplying atomized fuel to the mixing chamber, a pump for supplying fuel to the atomizing nozzle, and means connecting the

air motor variably to the pump whereby the ratio of fuel supplied to the nozzle by the pump to air passing thru the air intake can be varied.

5 2. In a carburetor for a hydrocarbon motor including a mixing chamber and an air intake, an air motor positioned in the air intake so that air passing to the mixing chamber acts upon the motor, an atomizing nozzle for  
10 supplying atomized fuel to the mixing chamber, a pump for supplying fuel to the atomizing nozzle, and means connecting the air motor to the pump whereby rotation of the motor is effective to drive the pump so that fuel  
15 for atomization is supplied to the nozzle, said connecting means including means whereby the ratio of air and fuel supplied in atomized form can be varied.

In testimony whereof, I have hereunto set  
20 my hand.

CLINTON DAVIDSON.

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