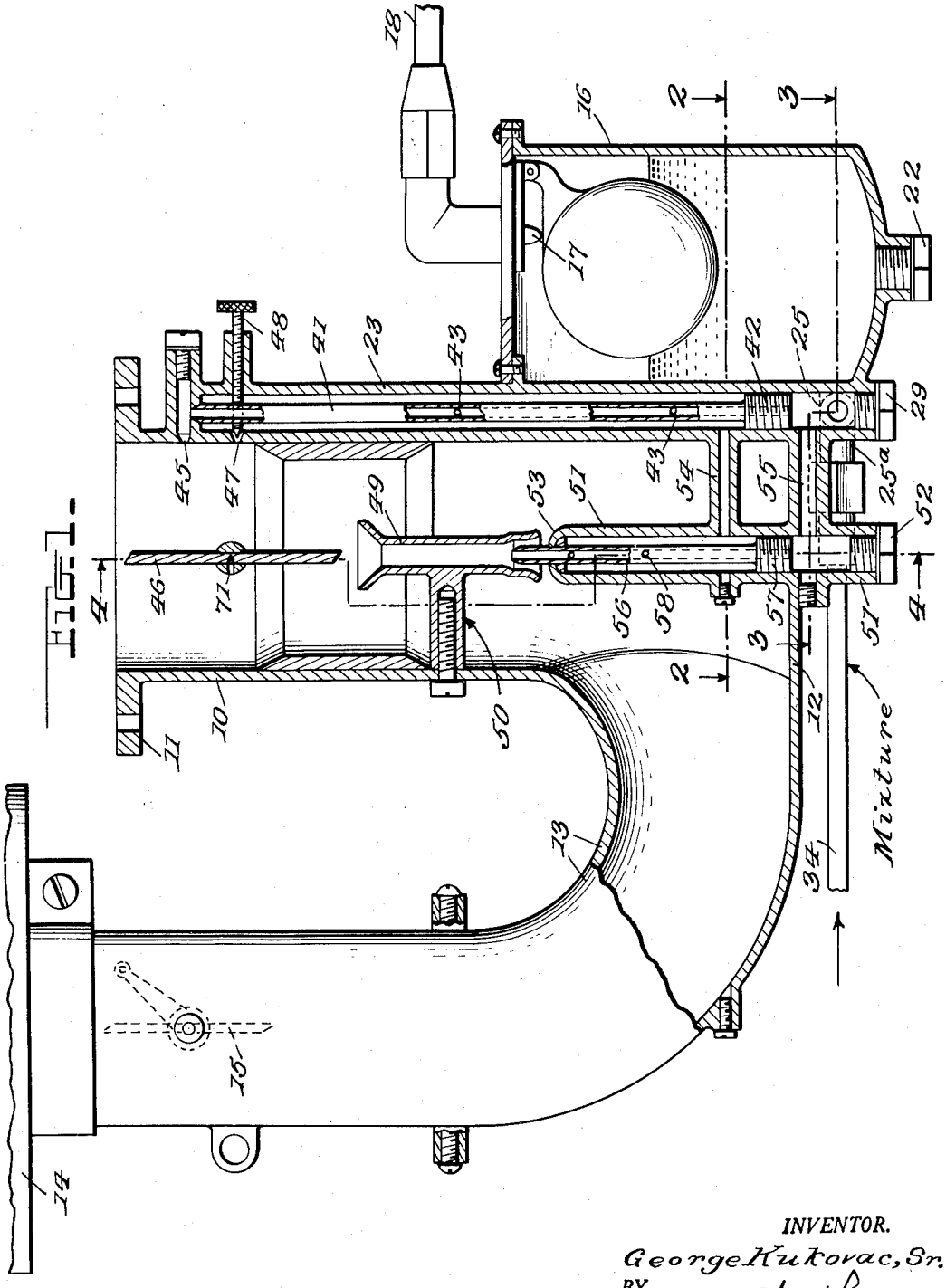
Nov. 15, 1955 G. KUKOVAC, SR 2,723,652

COMBINATION CHARGE FORMING VAPORIZER AND CARBURETOR FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 26, 1953 4 Sheets-Sheet 1



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Filed Oct. 26, 1953 4 Sheets-Sheet 2

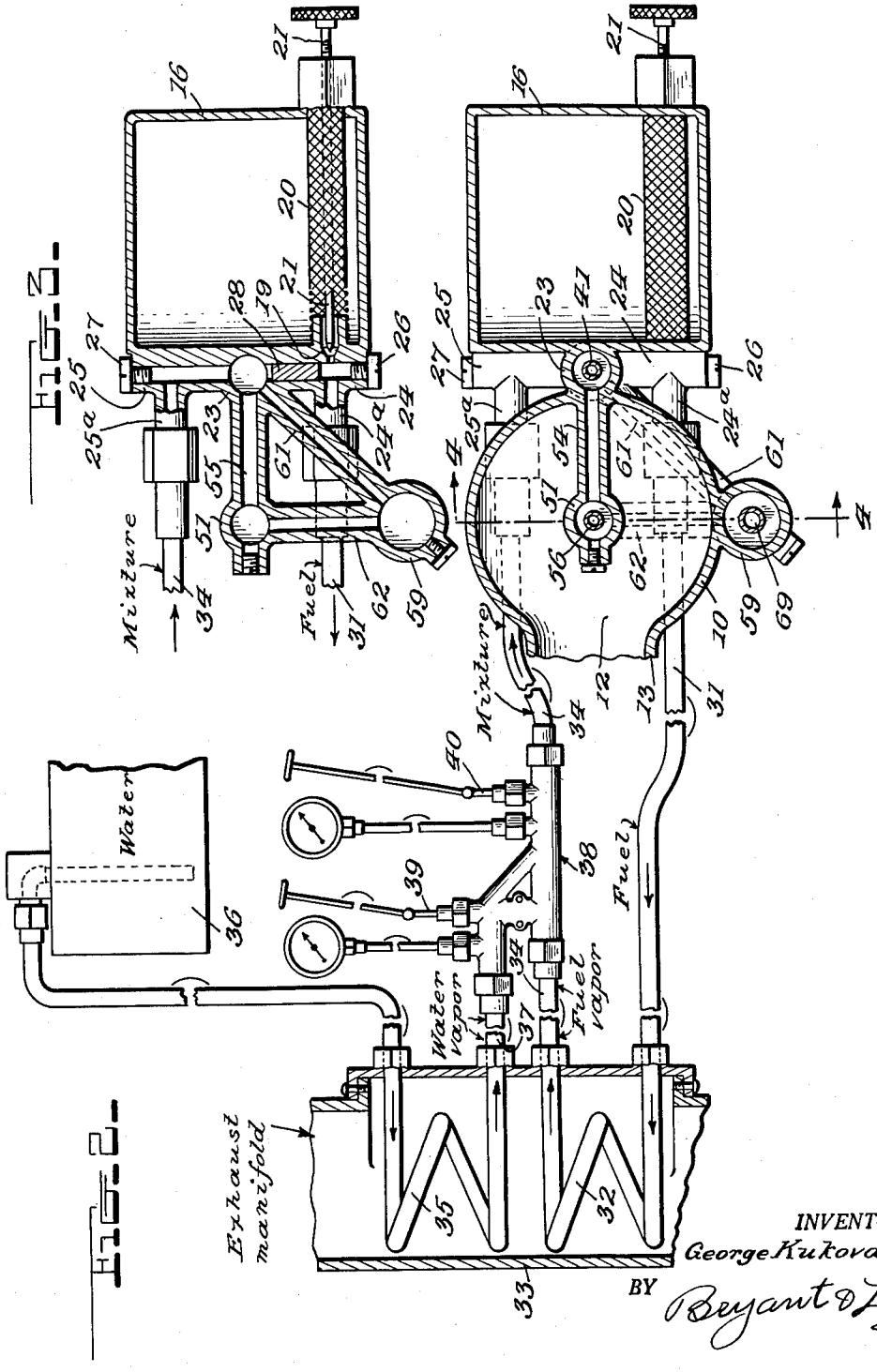


FIG. 2.

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FIG. 5

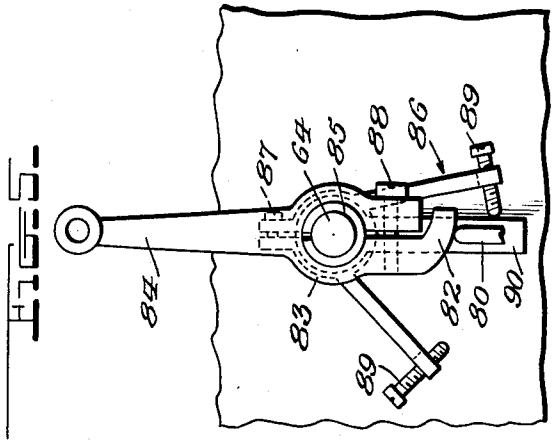


FIG. 6

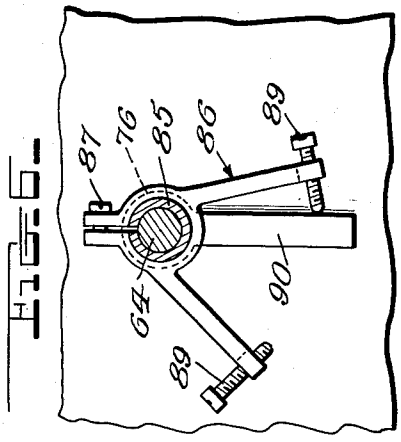
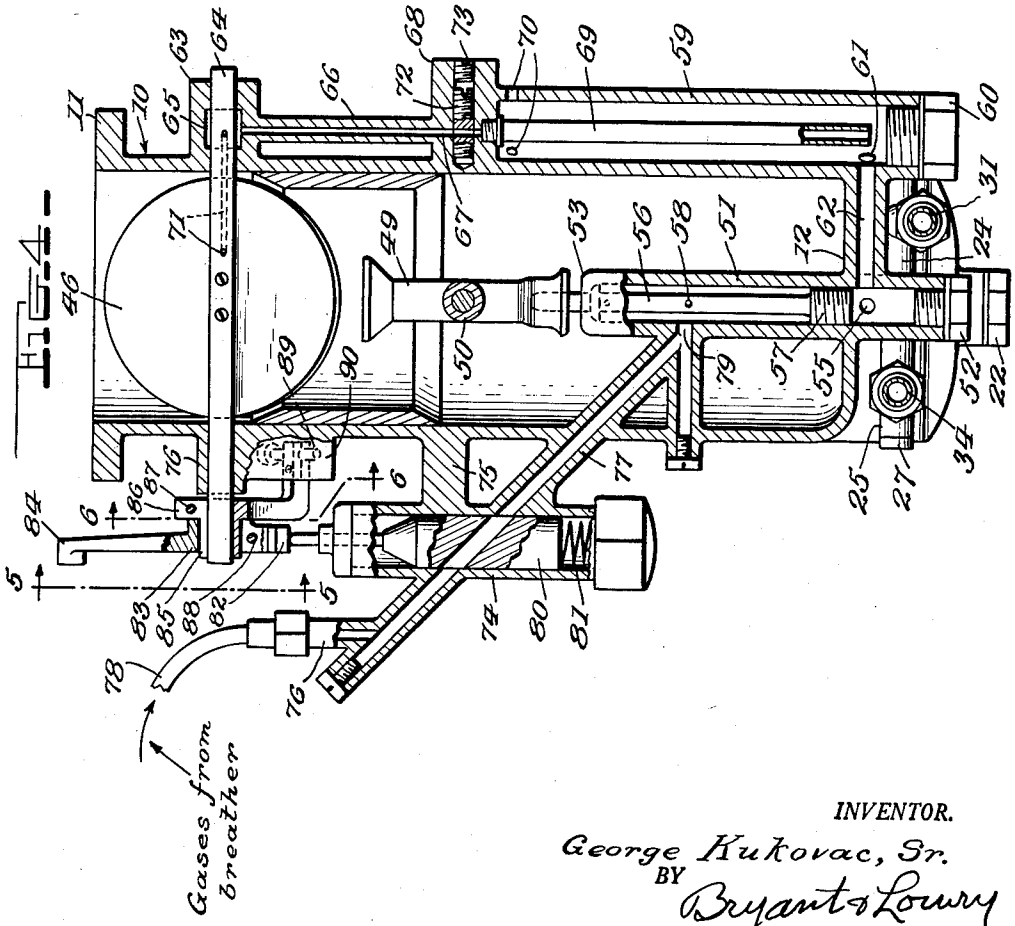


FIG. 4



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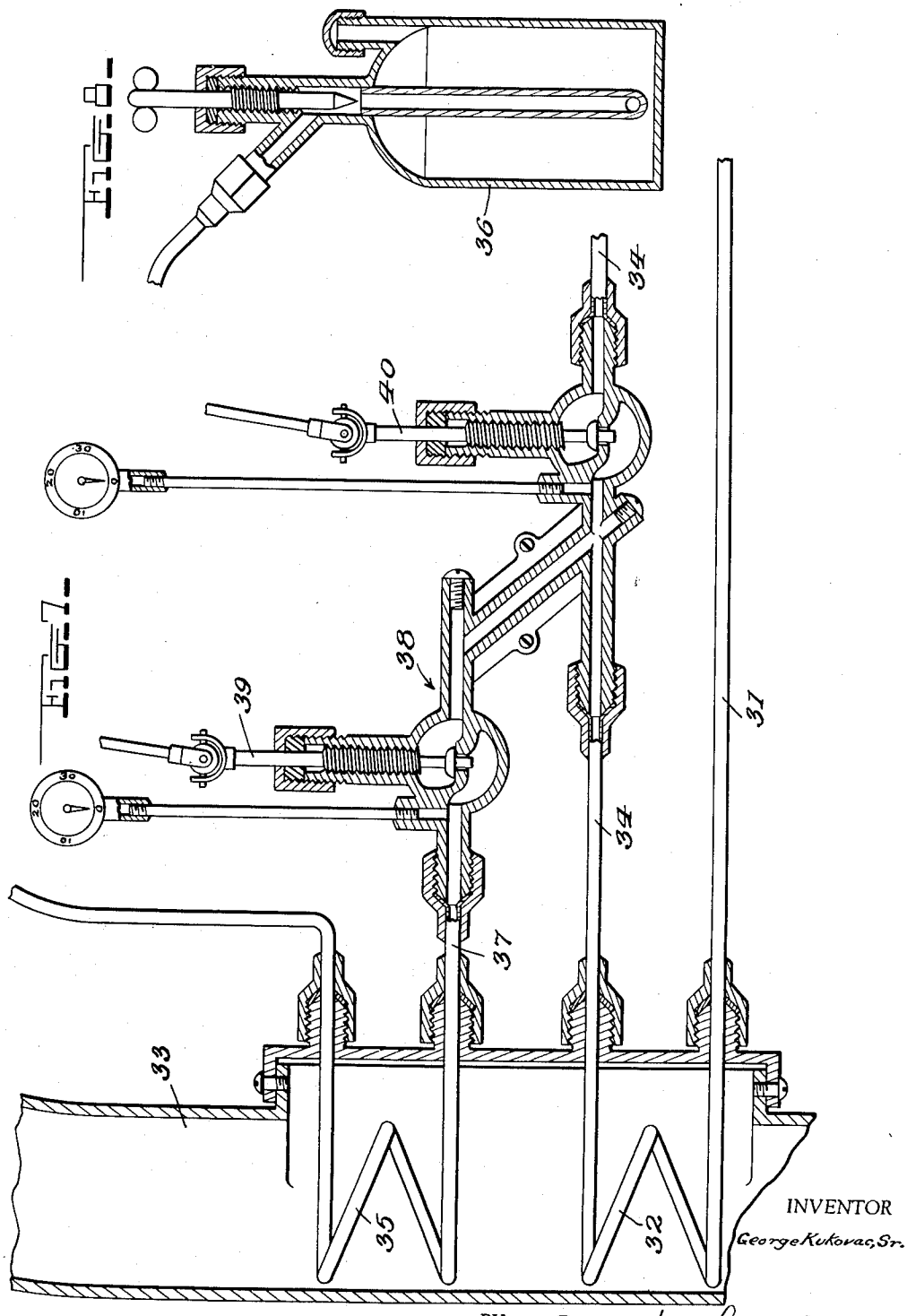
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COMBINATION CHARGE FORMING VAPORIZER AND CARBURETOR FOR INTERNAL COMBUSTION ENGINES

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FIG. 1



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COMBINATION CHARGE FORMING VAPORIZER AND CARBURETOR FOR INTERNAL COMBUSTION ENGINES

George Kukovac, Sr., Chicago, Ill.

Application October 26, 1953, Serial No. 388,280

9 Claims. (Cl. 123—25)

This invention relates to a new and improved fuel carbureting means for internal combustion engines.

The principal object of the invention is to provide a novel carbureting means which will make it possible to operate an engine more economically and more efficiently.

In carrying out the above object, a further object is to provide for heating the fuel to form fuel vapor, heating water to form water vapor, and mixing the two vapors, thus forming a moisture laden combustible gas in readiness for instant firing.

Another object of the invention is to utilize the hot exhaust gases in the usual exhaust manifold to vaporize the fuel and the water.

A further object is to provide novel means for salvaging any combustible gases which may leak past the engine pistons into the crank case and for adding these gases to the above mentioned mixture.

A still further object is to provide for admission of only a small quantity of crank case gases at low engine speeds and a gradually increasing amount as engine speed is increased, overcoming the possibility of said gases causing jerky operation at low speeds.

Another object is to utilize the throttle valve movements to control the admission of the crank case gases.

Yet another object is to provide a relatively simple and inexpensive construction yet one which will be highly efficient.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings, and claimed.

In the drawings:

Fig. 1 is a vertical sectional view of the carburetor, partly in elevation;

Fig. 2 is a horizontal sectional view on line 2—2 of Fig. 1, more or less diagrammatically showing the fuel and water vaporizing means connected with the carburetor;

Fig. 3 is a detail horizontal sectional view on line 3—3 of Fig. 1;

Fig. 4 is a vertical transverse sectional view on line 4—4 of Figs. 1 and 2;

Fig. 5 is a detail elevation as indicated by line 5—5 of Fig. 4, showing the crank case vapor control valve and the stop means for limiting throttle valve movements;

Fig. 6 is a detail vertical sectional view on line 6—6 of Fig. 4, showing throttle valve stop means.

Fig. 7 is an enlarged sectional view showing the preferred form of mixing valve and the lines and pressure gauges connected therewith; and

Fig. 8 is a sectional view showing the preferred form of water tank and valve.

A preferred construction has been shown in the drawings and will be rather specifically described, but it is to be understood that numerous variations may be made without departing from the spirit and scope of the invention as claimed.

An upright barrel **10** is provided having a flange **11** at its upper end for connecting it with an intake manifold. The lower end of this barrel is closed by a bottom **12** and immediately above this bottom an air inlet neck **13** communicates with said barrel. This neck **13** is adapted for connection with a suitable air cleaner **14** and said neck has an appropriate choke valve **15**.

At one side of the barrel **10** there is an appropriate fuel bowl **16** having a float-controlled valve **17** for admitting liquid fuel from the line **18**. The fuel outlet **19**, as shown in Fig. 3, from the bowl **16**, is adequately screened at **20** and provided with a needle valve **21**. The bottom of the bowl **16** has the usual drain plug **22**.

Between the barrel **10** and the fuel bowl **16** and integral with both thereof, is a fixed vertical tube **23** having two lateral tubular branches **24** and **25** near its lower end (Figs. 2 and 3). The branch **24** has a line connecting nipple **24a** and the branch **25** has a similar nipple **25a**. The outer ends of the branches **24** and **25** are plugged at **26** and **27**, respectively, and the branch **24** is plugged off from communication with the vertical tube **23** as seen at **28** in Figure 3. The fuel outlet **19** from the bowl **16** discharges into this branch **24** between the two plugs **26** and **28** as also seen in Fig. 3. The lower end of the vertical tube **23** is plugged at **29** and the upper end of said tube has an integral closure.

A line **31** as illustrated in Fig. 2 is coupled to the nipple **24a** of the branch **24** and extends to a coil **32** in the engine exhaust manifold **33**, and a return line **34** from said coil is coupled to the nipple **25a** of the branch **25**. Thus, liquid fuel will flow from the bowl **16** to the coil **32** through the outlet **19**, branch **24**, nipple **24a** and line **31**. This fuel will be vaporized in said coil, and the fuel vapor will flow into the vertical tube **23** through the line **34**, nipple **25a** and nipple **25**.

Water vapor is mixed with the fuel vapor before it enters the branch **25**. To accomplish this, a coil **35** in the exhaust manifold **33** receives a supply of water from a tank **36** and converts the water into water vapor, and this water vapor is discharged through a line **37** which is placed in communication with the above described line **34**. The two lines **34** and **37** communicate through a mixing valve **38**, said valve having one manually adjustable valve member **39** for the water vapor, and a similar valve member **40** for controlling the onward flow of the mixture of water vapor and fuel vapor from the valve **38**. This mixture enters the lower end of the vertical tube **23** through the nipple **25a** and branch **25** and from said lower end, the mixture is conducted to a number of points of discharge into the barrel **10**.

A jet tube **41** is disposed longitudinally within the tube **23**, the lower end of said jet tube **41** being provided with a head **42** which is threaded into said tube **23** somewhat above the branch **25**. The lower end of the jet tube **41** communicates directly with the portion of the tube **23** below the head **42** and said jet tube **41** has perforations **43** which place it in restricted communication with the portion of said tube **23** above said head **42**. The upper extremity of the jet tube **41** is not in communication with the tube **23** but discharges into a port **44** in the closure **30**, said port **44** having restricted communication through an orifice **45** with the barrel **10** in the vicinity of the throttle valve **46**. Below the port **44**, an orifice **47** establishes communication between the tube **23** and the barrel **10**, said orifice **47** being adjustable by means of a needle valve **48**.

Below the throttle valve **46**, a vertical Venturi tube **49** is mounted in the barrel **10**, appropriate mounting means being shown at **50**. Directly under this Venturi tube **49**

and in axial alignment therewith, there is a fixed vertical nozzle tube 51 which is integral with the barrel bottom 12 and extends somewhat below said bottom. The lower end of the nozzle tube 51 is plugged at 52 and its upper end has a centrally apertured closure 53. This tube 51 is placed in communication with the tube 23 by an upper passage 54 and a lower passage 55. Passage 54 is above the head 42 of the jet tube 41 and passage 55 is below said head 42.

A jet tube 56 is disposed longitudinally within the nozzle tube 51 and extends through the central aperture of the closure 53 into the lower end of the Venturi tube 49. The lower end of the jet tube 56 has a head 57 threaded into the nozzle tube 51 between the passages 54 and 55. This jet tube 56 is in direct communication with the portion of the nozzle tube 51 below the head 57 and said jet tube 56 is formed with perforations 58 placing it in restricted communication with the portion of said tube 51 above said head 57.

At one side of the barrel 10 and integral with said barrel, is a second fixed vertical tube 59 as shown in Figs. 2, 3, and 4, this tube 59 being spaced 90° from the first mentionted fixed tube 23. The lower end of the fixed tube 59 is plugged at 60, and directly above the plug, said tube 59 communicates with the lower end of the tube 23 by means of a diagonal passage member 61 (Figs. 2 and 3). The lower end of the fixed tube 59 is also connected with the lower end of the nozzle tube 51 by means of a passage member 62 (Figs. 2, 3, and 4).

The fixed tube 59 terminates below one of the bearings 63 for the throttle valve shaft 64 as seen in Fig. 4. This bearing has a chamber 65 connected by a tubular passage member 66 with a port 67 in the head 68 for the upper end of the tube 59. Within this tube 59 and threaded into the head 68, is a small-diameter tube 69 which communicates with the port 67, the lower end of said tube 69 being open. The tube 59 has air admission perforations 70 at its upper end.

From the chamber 65, a small port 71 extends through the throttle valve shaft 64 and throttle valve 46, said port 71 being open at one side of said throttle valve. The amount of mixture entering the chamber 65 may be changed as required by a suitable valve screw 72 for the port 67, said valve screw being threaded into the head 68 and being guarded against tampering by means of a plug 73.

A vertical slide valve casing 74 is rigidly mounted at 75 below the second bearing 76 of the throttle valve shaft 64. This casing 74 is provided with an inlet 76 and with an outlet passage 77. The inlet 76 is connected with a line 78 leading from the breather of the engine for conducting crank case gases to the slide valve casing 74. The outlet passage 77 communicates at 79 with the nozzle tube 51.

A vertically movable slide valve 80 is mounted in the casing 74 for controlling the passage of crank case gases from the line 78 to the nozzle tube 51, according to the engine speed. This slide valve 80 is urged upwardly toward closed position by means of a spring 81, and a cam 82 is mounted on the throttle valve shaft 64 to gradually open said valve 80 as the throttle is opened.

As shown, the cam 82 is integral with the split hub 83 of the operating arm 84 for the shaft 64. This hub 83 is mounted on the split hub 85 of a forked stop member 86 which limits the throttle valve movements. One screw 87 is provided for clamping the hub 85 upon the shaft 64, and another screw 88 is employed for clamping the hub 83 upon said hub 85. The stop member 86 carries adjustable stop screws 89 cooperable with a fixed stop 90 on the barrel 10.

In operation, liquid fuel from the bowl 16 flows through the line 31 to the coil 32 in the intake manifold 33. In this coil the liquid fuel is converted to fuel vapor and this vapor enters the valve 38. At the same time, water from the tank 36 is converted into water vapor by the coil 35 and this water vapor also enters the valve 38. The two vapors (fuel and water) are mixed in the valve 38 and the mixture travels through the line 34 and branch 25 into the vertical tube 23. From this vertical tube 23, some of the mixture travels through the jet tube 41 and the orifices 45 and 47 into the barrel 10. The rest of the mixture from the tube 23 enters the nozzle tube 51 and the tube 59 through the passages 54—55 and 61, respectively. The mixture entering the nozzle tube 51 becomes mixed with crank case gases entering said nozzle tube at 79 and this three-ingredient mixture supplies the jet tube 56. The mixture entering the tube 59 is mixed with air entering through the perforations 70 and flows into the barrel 10 by way of tube 69, port 67, passage member 66, chamber 65, and port 71. Some of the mixture from the tube 59 also enters the nozzle tube 51 through the passage 62. The major supply of air of course enters through the neck 13.

It will be seen from the foregoing that a novel and advantageous construction has been provided for supplying a mixture of fuel vapor, water vapor, crank case gases and air to the engine, to insure efficient and economical operation. While preferences have been disclosed (diagrammatically to some extent), it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

I claim.

1. In an engine fuel mixture supply means, a carburetor barrel having an air inlet and Venturi with an aspirating nozzle therein, means for vaporizing liquid fuel, means for vaporizing water, means for mixing the fuel vapor and water vapor, means for conducting the mixture to said nozzle, and means for conducting crank case gases and mixing them with said mixture.

2. A structure as specified in claim 1, together with a throttle valve for said barrel, a second valve for controlling the amount of crank case gases to be mixed with said mixture, and means for opening said second valve proportionately with throttle valve opening.

3. A structure as specified in claim 1, together with a throttle valve for said barrel, a second valve for controlling the amount of crank case gases to be mixed with said mixture, and means for opening said second valve proportionately with the throttle valve opening, the latter means including a cam on the throttle valve shaft for opening said second valve, and a spring urging said second valve toward closed position.

4. A carburetor comprising a barrel having an air inlet at its lower end, a throttle valve near its upper end, a Venturi tube between its ends, and a nozzle under said Venturi tube; a fuel bowl at one side of said barrel and having a float-controlled liquid fuel admission valve, a liquid fuel outlet from said bowl and adapted for line connection with a fuel vaporizer, vaporized fuel conducting means leading to said nozzle and adapted for line connection with the fuel vaporizer, and crank case gas conducting means extending to said nozzle and including a second valve operatively connected with said throttle valve to open proportionately with the latter.

5. A carburetor comprising a barrel having an air inlet at its lower end, a throttle valve near its upper end, a Venturi tube between its ends and a nozzle under said Venturi tube; a fuel bowl at one side of said barrel and having a float-controlled liquid fuel admission valve, a liquid fuel outlet from said bowl and adapted for line connection with a fuel vaporizer, a vaporized fuel-receiving chamber adjacent said barrel, said chamber having a vaporized fuel inlet from line connection with the fuel vaporizer, conducting means from said chamber to said nozzle, additional conducting means from said chamber into the portion of said barrel in the region of said throttle valve, and crank case gas conducting means extending to said nozzle and including a second valve operatively con-

nected with said throttle valve to open proportionately with the latter.

6. A carburetor comprising a vertical barrel having a bottom and an air inlet near said bottom, a throttle valve mounted in the upper end portion of said barrel, a Venturi tube mounted in said barrel under said throttle valve, a nozzle tube rising from said bottom and closed at both of its ends, a jet tube in said nozzle tube and having a head secured in the latter above the closed lower end of the same, the upper end of said jet tube extending through the closed upper end of said nozzle tube to said Venturi tube, said jet tube being in restricted communication with said nozzle tube above said head, a fixed vertical tube at the exterior of said barrel and closed at its lower end, the upper end of said fixed vertical tube having an upper orifice and a lower orifice both opening into said barrel near said throttle valve, another jet tube within said fixed vertical tube and communicating with said upper orifice, a valve for said lower orifice, said other jet tube having a head at its lower end secured in said fixed vertical tube above the closed lower end of the latter, said other jet tube being in restricted communication with said fixed vertical tube above said head of said other jet tube, an upper passage connecting said nozzle tube with said fixed vertical tube above the two jet tube heads, a lower passage connecting said nozzle tube with said fixed vertical tube below said heads, and a vaporized fuel inlet into said fixed vertical tube below the head of said other jet tube.

7. A structure as specified in claim 6, together with a second fixed vertical tube disposed externally of said barrel and closed at its upper and lower ends, said second fixed vertical tube having an air inlet, a passage connecting the lower end of said second fixed vertical tube with the lower end of the first mentioned fixed vertical tube, another passage connecting the lower end of said second fixed vertical tube with the lower end of said nozzle tube, a conducting tube within said second fixed vertical tube

and having an open lower end, the upper end of said conducting tube being secured to the closed upper end of said second fixed vertical tube, and conducting means from said conducting tube and opening through one side of said throttle valve.

8. In a carburetor having a barrel, a nozzle in said barrel, a throttle valve shaft extending across said barrel, a throttle valve on said shaft, and fuel supply means for said nozzle; a valve casing at the exterior of said barrel near one end of said throttle valve shaft, said valve casing having an inlet for crank case gases and an outlet for these gases, said outlet extending to said nozzle, a valve in said casing controlling communication between said inlet and outlet, a cam on said throttle valve shaft operatively associated with said valve for opening the latter proportionately with throttle valve opening, and a return spring for said valve.

9. In a carburetor having a barrel, a throttle valve shaft projecting to the exterior of said barrel, and a gas admitting valve near said shaft, a forked stop cooperable with said fixed stop and having a split hub adjustably clamped around said shaft, a shaft-operating arm having a split hub adjustably clamped around the hub of said forked stop, and a cam on said arm cooperable with said valve.

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