May 20, 1952 S. P. JONES 2,597,335

FUEL CARBURETING APPARATUS

Filed July 8, 1946 4 Sheets-Sheet 1

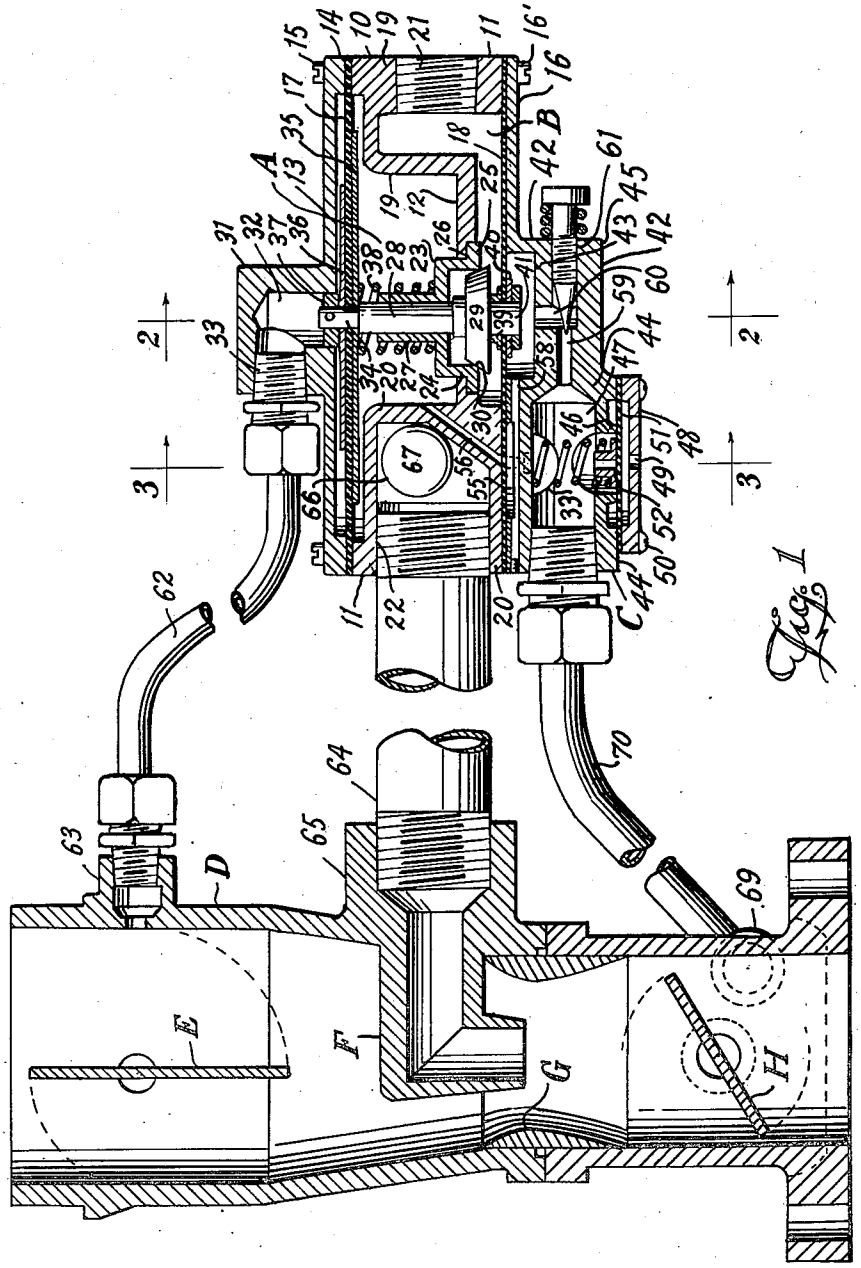


Fig. 1

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FUEL CARBURETING APPARATUS

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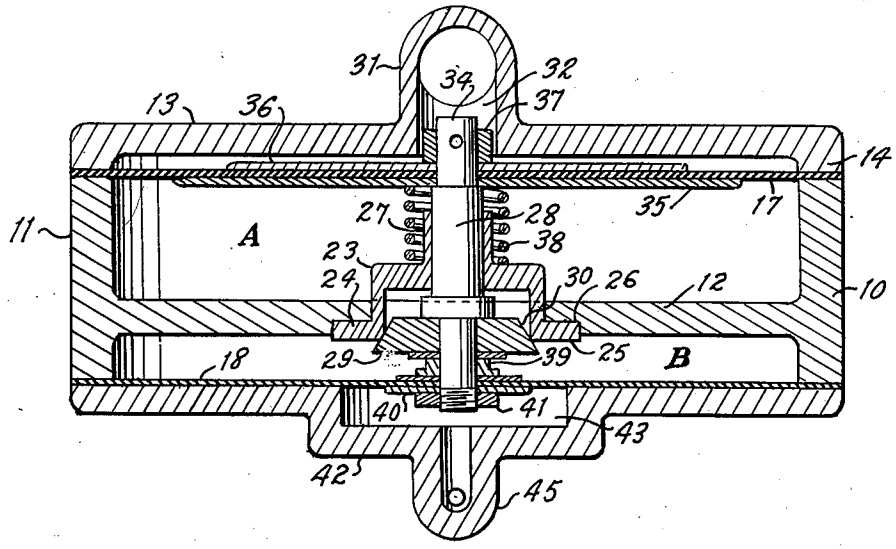


Fig. 2

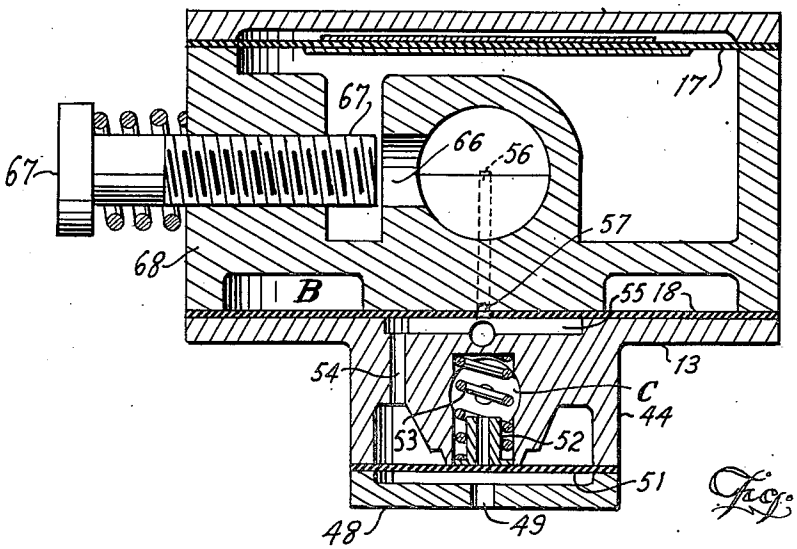


Fig. 3

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FUEL CARBURETING APPARATUS

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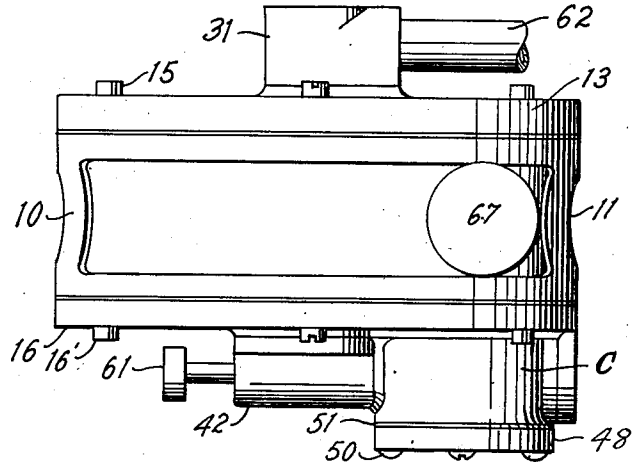


Fig. 4

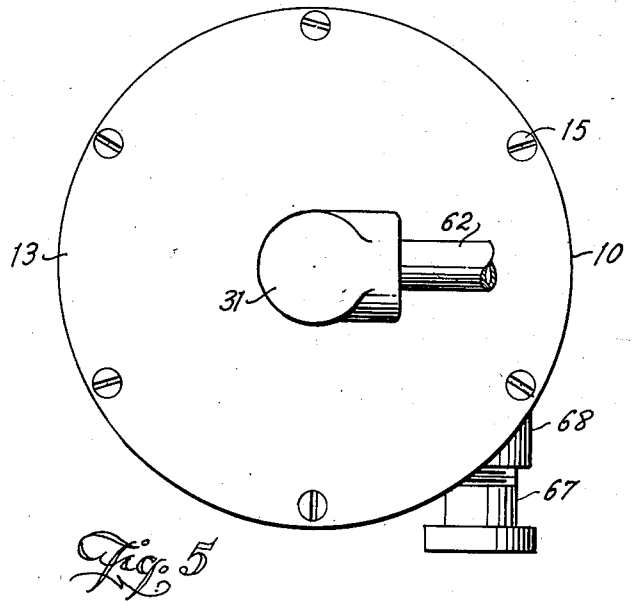


Fig. 5

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FUEL CARBURETING APPARATUS

Filed July 8, 1946 4 Sheets-Sheet 4

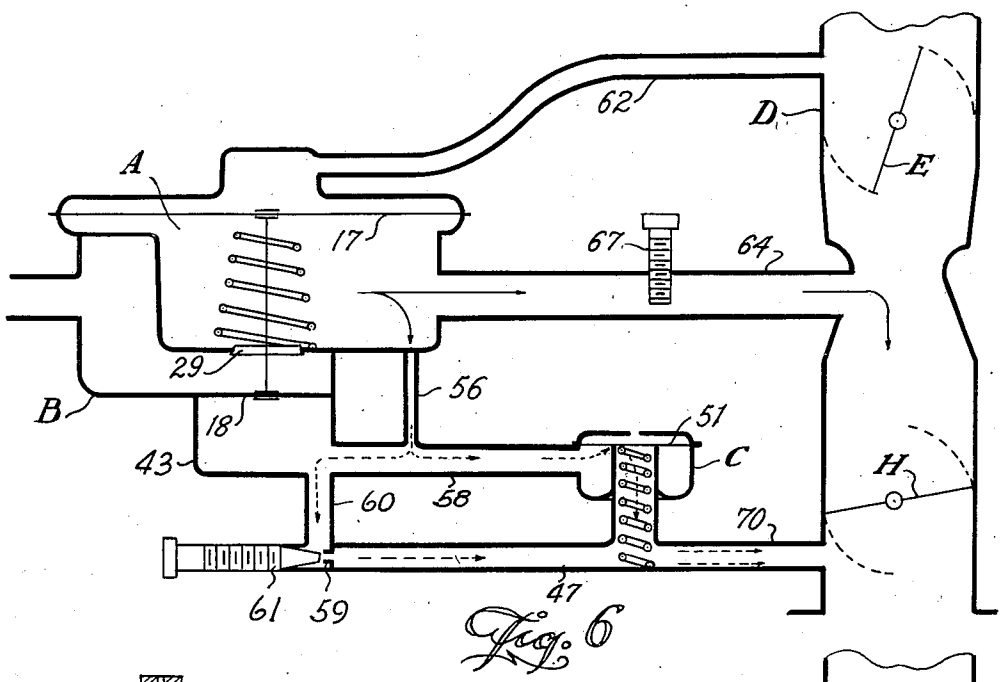


Fig. 6

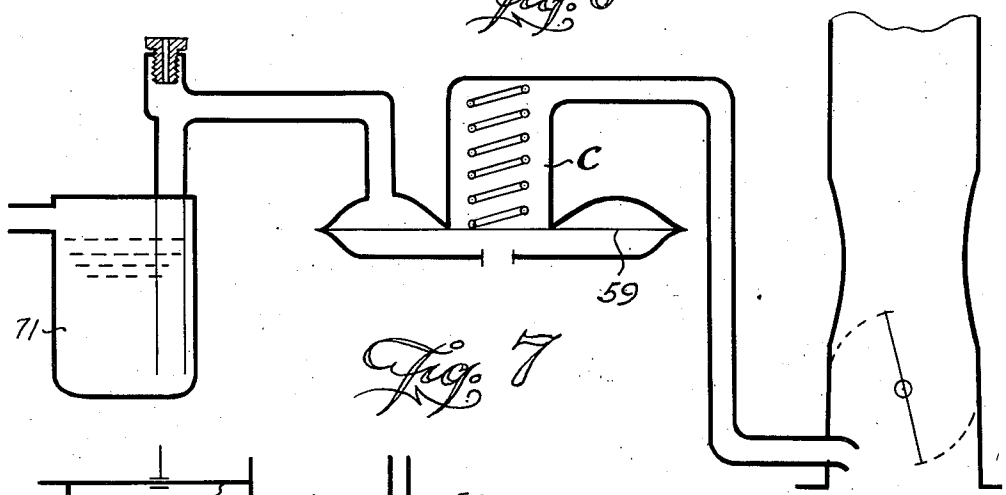


Fig. 7

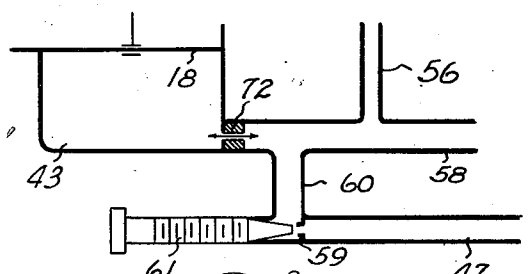


Fig. 8

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Patented May 20, 1952 2,597,335

UNITED STATES PATENT OFFICE

2,597,335

FUEL CARBURETING APPARATUS

Sam P. Jones, Dallas, Tex., assignor to J & S Carburetor Co., Dallas, Tex., a corporation of Texas

Application July 8, 1946, Serial No. 682,019

7 Claims. (Cl. 48—180)

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This invention relates to new and useful improvements in fuel carbureting apparatus. This application is filed as a continuation-in-part of my co-pending application, Serial No. 625,069, filed October 27, 1945, abandoned November 2, 1946.

One object of the invention is to provide an improved fuel carbureting apparatus which is highly efficient in supplying fuel in proportion to the engine load and at the same time is economical under varying engine loads.

A particular object of the invention is to provide an improved fuel carbureting apparatus having means responsive to the manifold pressure of an internal combustion engine for increasing the fuel pressure in the fuel chamber of the carburetor to supply additional fuel and thereby enrich the fuel mixture in proportion to the engine demand, under heavy or peak loads, which loads may be applied to the engine either suddenly or gradually, whereby smoother engine operation is obtained and approximately ideal fuel mixtures are supplied under all conditions and also whereby, the fuel-to-air ratio is increased as the load increases, but adequate additional fuel is supplied to meet the load, thus making for economy in the use of fuel and better engine performance.

A further object of the invention is to provide improved carbureting means responsive to the engine manifold pressure acting through the intake manifold, whereby when the manifold pressure is too high or the air velocity through the intake stock is insufficient to draw in adequate fuel to provide a proper fuel-to-air ratio for the particular engine load, additional fuel is supplied, particularly at heavy or peak range loads; thus assuring a substantially ideal fuel mixture for a given load and conserving fuel when additional fuel is not required, which makes for smoother engine performance under all loads and substantially eliminates flat spots or momentary stalling in the carburetion.

An important object of the invention is to provide an improved carbureting apparatus which enriches the fuel mixture by supplying additional fuel to the fuel chamber of the carburetor and by drawing in additional fuel through an auxiliary channel.

A still further object of the invention is to provide an improved fuel carbureting apparatus wherein an increasing manifold pressure due to an increasing load, is utilized to create an auxiliary force for supplying fuel sufficient to enrich the fuel mixture for heavy engine loads.

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Another object of the invention is to provide an improved carbureting apparatus having the usual primary fuel supply means, responsive to the engine manifold pressure, and auxiliary means, responsive to the engine manifold pressure, arranged to aid the primary fuel supply means under engine loads above a predetermined value when the primary fuel supply becomes inadequate to meet the load demand, whereby the fuel supply is enriched in proportion to the increasing load demands above a certain load without a waste of fuel below said load and more efficient and economical engine operation is obtained.

Another object of the invention is to provide an improved fuel carburetor adapted to be connected with inlets of an engine intake tube above and below the throttle valve thereof and having a fuel chamber adapted to be connected with the tube inlet above the throttle valve thereof and also provided with auxiliary pressure-responsive means adapted to be connected with the tube inlet below the throttle valve thereof, whereby an increase of pressure above a certain magnitude in the tube actuates said means and causes enrichment of the fuel supply.

An important object of the invention is to provide an improved carburetor having a fuel chamber, a fuel inlet valve thereto and pressure-responsive means for opening said valve, as in the ordinary gas carburetor; together with auxiliary pressure-responsive means acting to further open said inlet valve and supply additional fuel to said chamber to enrich the normal fuel supply to the engine under increased engine loads.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Fig. 1 is a longitudinal, vertical, sectional view of a carbureting apparatus constructed in accordance with the invention and connected to the intake tube of a gas engine,

Fig. 2 is an enlarged transverse, sectional view of the carburetor taken on the line 2—2 of Fig. 1,

Fig. 3 is an enlarged transverse, sectional view taken on the line 3—3 of Fig. 1,

Fig. 4 is an elevation of the carburetor,

Fig. 5 is a plan view of the carburetor,

Fig. 6 is a schematic view of the carbureting apparatus,

Fig. 7 is a schematic view of the apparatus modified for use with a liquid fuel, and

Fig. 8 is a schematic view of a further modification of the apparatus as shown in Fig. 6.

Reference is made to my copending application, Serial No. 200,971, filed December 15, 1950, wherein the diaphragm valve shown herein is claimed.

In the drawings, the numeral 10 designates generally a cylindrical hollow body having an annular, upright outer wall 11 and a transverse partition or false bottom 12, cast integral therewith. The partition forms the bottom of a fuel chamber A. A flat circular cover plate 13 is provided on its underside with a marginal rib 14 which registers with the top of the annular wall 11. The cover plate is removably secured to the body wall by machine screws 15.

A flat circular bottom plate 16 is removably fastened to the bottom of the body 11 by machine screws 16'. A circular diaphragm 17 is secured between the rib 14 of the cover plate; while a circular diaphragm 18 is secured between the bottom plate and the body wall. These diaphragms serve as packings between the body and the plates.

The body is formed with diametrically opposite hollow inlet and outlet bosses 19 and 20, respectively, directed inwardly and cast integral with the wall 11 and the partition 12. A screw-threaded opening 21 is provided in the body wall and boss 19 to receive a fuel-line supply connection (not shown). The outlet boss 20 and the body wall are provided with a screw-threaded outlet opening 22. The bottom of the inlet box 19 is open to the space B between the bottom diaphragm 18 and the partition 12; while the bottom of the outlet boss 20 is closed and engages the upper side of said diaphragm.

The partition 12 is provided with an annular seat spider 23, snugly secured in an opening 24 therein. The spider has an outwardly directed bottom flange 25 secured in a complementary recess 26 in the underside of said partition. Above the partition the spider is open, whereby a passage is formed from the space B to the chamber A. A guide thimble 27 extends upwardly at the center of the spider and a valve stem 28 has a sliding fit therein. A frusto-conical valve 29 secured around the stem engages a seat 30 in the bottom of said spider.

The cover plate 13 is cast with an upstanding hollow boss 31 at its center and a central opening 32. A lateral screw-threaded opening 33 is provided in one side of the boss. The upper end of the valve stem 28 is reduced to form a shouldered stud 34 which passes centrally through a bottom disk 35, the upper diaphragm 17 and an upper disk 36 of less diameter than the disk 35. The disk 35 rests upon the shoulder of the stud and a collar 37, pinned on the stud, engages the top disk 36. By this arrangement the diaphragm is secured between the disks and attached to the valve stem. A coiled spring 38, surrounding the thimble 27 rests upon the spider and engages the underside of the disk 35, at its upper end. This spring is under sufficient compression to support the diaphragm and hold the valve 29 to its seat. The valve is preferably formed of elastic material such as synthetic rubber; however, other materials may be utilized.

The valve stem 28 extends below the valve 29 and receives a flanged collar 39 which is interposed between said valve and the bottom diaphragm 18. The valve stem extends through the center of the bottom diaphragm and has its lower

end screw-threaded. A washer 40 is confined against the underside of the diaphragm by a nut 41 screwed onto the valve stem. The bottom plate 16 is formed with a hollow depending boss 42 at its center, which provides a cylindrical sump 43 below the diaphragm 18. It is pointed out that the entire area of the bottom diaphragm 18 is supported on the bottom plate except that portion at the center which overlies the sump 43 and this central portion may be convoluted so as to confine the flexing of said diaphragm to this portion.

One of the important features of the invention is the economizer or auxiliary fuel supply device C which includes a small annular box 44 cast on the underside of the bottom plate and underlying outlet boss 20. A radial duct 45 integral with the bottom of the boss 42 and the box, extends across said boss and diametrically through the box. The outer end of this duct is internally screw-threaded. At the center of the box the duct is bisected by a vertical integral sleeve 46 which communicates with the passage 47 of the duct.

The bottom edge of the sleeve is finished to provide a smooth surface and to lie in the horizontal plane of the bottom of the box 44. The bottom of the box is closed by a circular plate 48 dished on its upper side and provided with a central port 49, open to the atmosphere. The plate is removably secured to the box by machine screws 50. A small circular diaphragm 51 is confined between the plate and the annular wall of the box and contacts and seals the lower end of the sleeve 46. An externally flanged spring follower 52 has a snug sliding fit in the sleeve and rests upon the diaphragm. A light weight coiled spring 53 disposed in the sleeve, has its lower end supported in said follower and its upper end engaging in the passage 47 of the duct. The spring serves to force the diaphragm away from the sleeve 46 and unseal the latter.

A port 54 leads from the top of the box 44 at one side of the duct, through the bottom plate 16 to the bottom of a shallow recess 55 in said plate. A small passage 56 extends from the fuel chamber A of the body 10 down through the wall of the outlet box 20 to an opening 57 in the diaphragm 18, whereby communication is established with the port 54. A small port 58 establishes communication between the recess 55 and the sump 43. The duct passage 47 is reduced beyond the box as is shown at 59 and this reduced passage intersects a vertical bore 60 opening into the bottom of the sump 43. A needle valve 61 screw-threaded in the inner end of the duct 45, has its needle projecting into the passage 59 to restrict the flow therethrough. This valve provides an adjustment for idling.

In using the carburetor, the body 10 is supported in any suitable manner and the inlet boss 19 is connected with a fuel supply line in the usual manner. Any suitable or desirable type of gaseous fuel such as propane, butane, natural gas, or the like, or mixtures thereof, may be employed. A pipe 62 connected in the opening 33 of the boss 31 is connected at its opposite end to a nipple 63 in the side of the upper end of the engine air intake tube or down draft stack D at a point above the full closed position of the choke valve E. The stack is of the usual construction having a fuel intake elbow F cast therein, surrounded by a Venturi section G and a throttle valve H below said section.

A fuel feed pipe 64 connects the nipple 65 of the elbow F with the outlet opening 22 of the

outlet boss 20. The outlet boss has the usual fuel regulating or load opening 66 in one side and a regulating or load screw 67 threaded through a collar 68, cast in the body wall 11, has its inner end registering with said opening for restricting the flow of fuel from the chamber A into said boss. By the use of the economizer C it is possible to adjust the screw 67 to more closely restrict the opening 66, because when additional fuel is required under heavy loads, such fuel is supplied by operation of the economizer and therefore, the screw does not have to be set for an overall fuel supply.

Below the throttle valve H, a nipple 69 is provided and a suction pipe 70 extends from this nipple to the opening of the economizer duct 45. Manifold pressure acting through this pipe 70 and the duct will also act upon the box diaphragm 51 and allow atmospheric pressure to hold it in sealing relation with the lower end of the sleeve 46, until the manifold increases to a point where the expansive force of the springs 53 will prevail and move the diaphragm from the sleeve.

In Fig. 6 of the drawings, is shown a schematic diagram of the carbureting apparatus. This view is provided to illustrate more clearly the operation of the apparatus. Reference to this figure in connection with the following explanation of operation will clarify the principles involved.

Under intermediate loads and at idling speeds, the diaphragm 51 is held in sealing contact with the lower end of the sleeve 46. The engine suction draws in air through the top of the stack D. Such intake air is drawn around the elbow F and through the Venturi section G. The increased air velocity within the venturi causes a reduced pressure and fuel flows from the chamber A and is mixed with the intake air. The reduced pressure caused by the venturi is proportional to the quantity of air flowing through the stack D so that as more air is drawn into the engine, additional fuel is supplied to maintain an economical fuel-to-air ratio over a large portion of the load range of the engine. It is obvious that the quantity of fuel drawn into the Venturi section G, in the ordinary apparatus, is dependent upon the volume and velocity of the air passing through the venturi and such velocity depends upon the manifold pressure acting through the stack D. In this manner, when the volume of air is decreased, the supply of fuel decreases proportionately.

When the engine is idling, the throttle valve H will be nearly closed and consequently the volume of air flowing through the stack D will be low with a resultant low velocity in the venturi, so that very little fuel would ordinarily be drawn through the elbow F, pipe 64 and outlet boss 20 from the chamber A. However, the manifold pressure below the throttling valve is low and is acting through the pipe 70, passages 47 and 59, bore 60 and sump 43 against the underside of diaphragm 18. Fuel is being supplied to the chamber B under pressure and acts against the upper side of the diaphragm. The diaphragm is thus forced down sufficiently to open the valve 29 to a degree adequate to supply and build up a fuel pressure in the gas chamber A, whereby fuel is supplied to the stack D through pipe 64 in such quantity as to maintain the idling operation. The pressure acting against the diaphragm 18 is controlled by the adjustment of the idling valve 61. A small quantity of fuel will

be drawn from the fuel chamber A by way of duct 56, recess 55 and port 58 into sump 43 and thence by way of elements 60, 59, 47 and 70 into the stack below the throttle valve H. By properly adjusting the needle valve 61, fuel may be supplied to economically support idling of the engine.

When the throttle valve H is opened to speed up the engine and/or to pick up the load, there will be an increase in the manifold pressure acting through the pipe 70 and against the underside of the diaphragm 18. This would occur in going from idling to the intermediate load ranges. The demand for fuel would cause a pressure drop in the fuel chamber A because the opening of the throttle has caused an increase in the volume and the velocity of air flowing past the elbow F and thus fuel will be drawn into the stack by way of the pipe 64. The reduced pressure acting through the pipe 64 will act against the underside of the upper diaphragm 17 to allow the substantially atmospheric pressure within the pipe 62 to depress the diaphragm, thus opening the valve 29. The air-to-fuel ratio in this intermediate load range will be controlled by the setting of the screw 67 and by the action of the diaphragm 17. Increased air velocities through the stack D and Venturi G, will cause decreased pressures, up to a certain point, within the nipple F and thus the chamber A. In this manner, with increased demands by the engine for fuel mixture, an increasing pressure differential across the diaphragm 17 is provided, since the pressure above the diaphragm remains substantially constant, or varies only slightly. The increasing pressure differential serves to open the valve 29 increasingly wider so that fuel is furnished in proper quantities in accordance with the volume of air being utilized. Thus, the diaphragm 17 meters the fuel in compliance with the demand, while the screw 67 controls the overall fuel-to-air ratio within the intermediate load zone.

It is pointed out, that the increased manifold pressure under intermediate loads still acts through the passages 47 and 59 against the underside of the diaphragm 18 but the restriction of the needle valve 61 coupled with the increased pressure, or reduced suction, causes the diaphragm 18 to be more or less inoperative at these loads, although it will be flexed by the movements of the diaphragm 17.

This invention is largely concerned with heavy or peak load ranges. In practice, it has been found desirable to enrich the fuel mixture at loads above 90% of the full load capacity of the engine. It is pointed out that neither speed nor the position of the throttle valve H is controlling, since the load may be increased at any speed or it may be suddenly increased; moreover, loads about 90% frequently occur at low speeds. For economy, the fuel-to-air ratio must be low, and at loads about 90% the quantity of fuel drawn in through the primary supply pipe 64 is insufficient to meet the load demand of the engine. This is in accordance with well established principles. An engine under a load approaching its maximum power output must be provided with a rich fuel mixture to prevent overheating with resultant detonation and other undesirable results, and to allow the engine to reach its maximum output of power.

Since the manifold pressure acting through the pipe 70 increases as the load increases and since additional fuel is required above a 90% load, a critical point is reached in this pressure incline above which the fuel mixture should be enriched.

This critical point has been determined to be at substantially 24–26 inches of mercury, and at and above this point the fuel mixture must be enriched, and the enrichment must be increased as the load increases in order to maintain an ideal fuel mixture. The spring 53 is calibrated to push the diaphragm 51 away from the bottom of the sleeve 46 when the pressure acting on the central area of said diaphragm, within said sleeve, increases to substantially 24–26 inches of mercury which is the critical point at which the engine load reaches about 90%.

As pointed out hereinbefore, this pressure is still acting through the passages 47 and 59 against the underside of the diaphragm 18, but the restriction of the needle valve 61 negates this pressure until the diaphragm 51 opens. When this occurs, the entire area of the diaphragm 51 is exposed to the manifold pressure which is below atmospheric, and fuel is drawn through the restricted opening 56, the opening 57, the chamber 55, the passage 54 and the box 44 to the passage 47. The pressure in the passages enumerated is, before the diaphragm 51 opens, slightly below atmospheric but above the manifold pressure. Fuel thus flows through the passage 47 to the manifold to enrich the fuel mixture.

It might be presumed, that exposing the entire area of the diaphragm to the manifold pressure would result in the diaphragm again collapsing against the lower end of the sleeve 46. However, such is not the case. The central area of the diaphragm is the most flexible portion in that it is not held by the plate 48, and hence pressures exerted in the central portion are more or less controlling in the movements of the diaphragm. Also the pressures created are kinetic rather than static, and their resultant forces on the diaphragm allow the spring 53 to hold the diaphragm in a partially opened position. It is considered unnecessarily limiting to go into specific pressures, since such would apply to only one specific design, and this invention is applicable in its broader aspects to many designs and many forms of carburetors.

The pressure within the recess 55 will be reduced by the opening of the diaphragm 51, and this pressure reduction will not be altogether compensated by fuel flowing through the opening 56. This opening is restricted so that a certain amount of flow resistance is set up, and the pressure differential between the chamber A and the recess 55 will not be entirely overcome. The reduced pressure will be communicated through the port 58 to the sump 43 to allow the fuel pressure within the chamber B to depress the diaphragm 18 and open the valve 29 a small additional amount. An additional force, over and above that exerted by the diaphragm 17, is thus provided to open the valve 29 in excess of that amount which would normally be caused by the velocity and volume of air flowing through the stack D. In this manner, additional fuel and an increased fuel-to-air ratio is provided for heavy and peak load ranges.

In addition, this supplemental fuel supply is controlled in accordance with the increased power load being taken from the engine. When the diaphragm 51 opens there is a throttling action across the bottom of the sleeve 46 which is controlled by the movement of said diaphragm. Thus as the throttle H is opened further, and the pressure acting through the pipe 70 increases from 24 inches of mercury to 25 inches, to 26 inches, and up to 29 inches or more, the diaphragm moves further away from the sleeve and decreases the throttling action whereby more fuel is drawn into the sleeve 46. Since the pressure increase runs with load increase from 90% up, the throttle action conserves fuel, but furnishes an increasing amount of fuel as the load increases beyond 90%. And as the diaphragm continues to open with a load increasing from 90% to 95%, or to 100%, the pressure within the recess 55 continues to drop and approach the manifold pressure. As the diaphragm opens more fuel is drawn through the passage 56 because of the increased pressure differential, and the restriction of the passage offers greater resistance with the increased velocity through the passage. This is in accordance with well-established principles controlling the flow of fluids. The passage becomes less and less able to supply sufficient fuel to the recess 55 so that the pressure in the recess continues to drop.

This continuing drop in pressure is communicated through the port 58 to the sump 43 so that the diaphragm 18 is further actuated to open the valve 29 an additional amount.

If the load on the engine is increased from 80% to about 96%, the economizer will function to enrich the fuel mixture. As the load reaches about 90%, the diaphragm 51 will open so that additional fuel is provided through the opening 47 and the valve 29, as described hereinbefore. The diaphragm 51 will continue to open as the load approaches 96%, so that increasing amounts of fuel are provided through the opening 47 and the valve 29. Throughout the entire load increase, the increased air velocity through the venturi G, will also open the valve 29 an additional amount to provide for the increased load.

If a constant load of about 96% is maintained, the diaphragm 51 and the entire carbureting apparatus will reach an equilibrium point. A certain pressure will be exerted on the diaphragm 17 to open the valve 29 enough to provide fuel for a lean mixture in accordance with the volume of air being drawn into the engine. The reduced pressure in the recess 55 will act upon the diaphragm 18 to allow the diaphragm to move and open the valve 29 an additional amount to enrich the fuel mixture, and additional fuel will be drawn through the passage 47 to enrich the fuel mixture further. These pressures will be substantially fixed at a constant load, and, of course, all these operations take place simultaneously and substantially instantaneously.

As the load is increased to 98% or 100%, the diaphragm 51 moves further away from the sleeve 46, so that additional pressure changes within the recess 55 and below the diaphragm 18 take place, and a fuel mixture is furnished the engine richer than that furnished at 90% or 96% loads. As any load becomes constant, the diaphragms 17, 18 and 51 reach an equilibrium position and a constant flow of fuel is provided. It is to be noted that the diaphragm 51 functions both as a valve and as pressure-responsive means for actuating said valve, and further that the normal position of the diaphragm when the engine is not in operation is out of engagement with the sleeve or valve seat 46. The diaphragm valve 51 functions to regulate or meter the supply of fuel to the engine in accordance with the manifold pressure and thus may be described as a normally-open, pressure-actuated, metering valve. It is further to be noted that the box 44 forms a housing for such valve.

From the foregoing, it will be seen that the ap-

paratus is solely responsive to variations in the manifold pressure and air demand of the engine and operation of the economizer C is entirely controlled by engine loads. It is obvious that the apparatus enriches the fuel mixture by two methods, one of which is building up a pressure in the fuel chamber A to supply gas through the primary feed pipe 64, which permits the load screw 67 to be adjusted to more closely restrict the opening 66 and provide an economical fuel-to-air ratio at intermediate loads. The other method is the supplying of additional fuel by way of the passage 56 and pipe 70 as an auxiliary channel.

This invention may be utilized to advantage with any fluid fuel. The structure shown in Figs. 1 through 5 is designed primarily for a gaseous fuel. However, minor changes, obvious to anyone skilled in the art, would adapt this structure to a liquid fuel. In Fig. 7 of the drawings, a schematic modification is shown for utilizing a liquid fuel, such as gasoline, benzene, alcohol, and the like.

In this figure is shown a float chamber 71, which may be of any desirable construction to furnish a body of liquid fuel which may be drawn upon the pressure differential existing between the recess 55 and the space above the fuel within the float chamber. Obviously, this float chamber may be replaced by a fuel chamber merely containing fuel under pressure. The chamber may of course supply fuel to the balance of the apparatus, although this portion is not shown in the drawings. For reasons of simplicity, only the economizer C is shown. Having furnished a supply of fuel to the economizer, the operation of the latter and of the balance of the carbureting apparatus is the same as set out hereinbefore.

A modification of the housing for the diaphram 18 is shown in Fig. 8. The modification is shown schematically since the principle involved can be effected with several alternate structures. The primary change involved in this modification is relocation of the bore 60. In the previous form, the bore communicated between the restricted passage 59 and the sump 43, fuel being drawn through the passages 56 and 58 to the sump, and through the bore 60 to the passage 59. In the form shown in Fig. 8, the bore 60 communicates between the passage 59 and the passage 58, the sump 43 having communication with the passage 58 through a pin hole or orifice 72. Idling fuel is thus drawn directly from the passage 58, and at the same time the relatively low pressure or high vacuum in the pipes 70 and passage 47 is communicated to the diaphragm 17 to open the valve 29 and provide idling fuel.

The orifice 72 serves merely to equalize pressures between the sump 43 and the passage 58 and prevents excessive flows therebetween. Thus, should the diaphragm 18 rupture only a neglectably small leakage of fuel through the orifice would occur. Other leakage would be shut off by the valve 29.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. The combination with a fluid fuel carbureting apparatus for internal combustion engines including; an engine intake stack with a fuel inlet and a throttle valve downstream of said inlet, a carburetor body having a fuel chamber, a conductor connecting the fuel chamber with the intake stack fuel inlet, a fuel inlet valve in the body controlling the supply of fuel to the chamber thereof, pressure responsive means in the body responsive to a suction in the conductor for operating said inlet valve in accordance with said suction, said pressure responsive means having a low pressure side upon which application of a reduced pressure will bias the fuel inlet valve toward an open position; of a fuel supply device including; a restricted passage communicating with the low pressure side of the pressure responsive means for a zone of higher pressure; a conductor connecting the pressure responsive means with the intake stack downstream of the throttle valve; a valve connected into the last-named conductor; said valve including, a housing, a valve seat in the housing, a diaphragm adapted to engage the seat, and a spring urging the diaphragm from the seat, the seat engaging face of the diaphragm being exposed through the last-named conductor to the intake stack downstream of the throttle valve.

2. A fuel carbureting apparatus for an internal combustion engine having an engine intake stack with a fuel inlet and a throttle valve downstream of said fuel inlet, including, a fuel control valve for supplying fuel to the engine intake stack, a diaphragm connected to the fuel control valve and responsive to air flow in the stack for operating the fuel control valve, a second diaphragm connected to the fuel control valve having a low pressure side upon which application of a reduced pressure will result in biasing of the fuel control valve toward an open position, a restricted passage communicating with the low pressure side of the second diaphragm from a zone of higher pressure, a conductor extending between the low pressure side of the second diaphragm and the engine intake stack downstream of the throttle valve, and a flow regulating valve connected into said conductor, the latter valve being adapted to control flow through the latter conductor and responsive to an increasing pressure in the intake stack downstream of the throttle valve to commence opening and progressively communicate increasing percentages of the latter pressure to the low pressure side of the second diaphragm.

3. A fuel carbureting apparatus as set forth in claim 2 wherein the flow regulating valve connected into said conductor includes, a valve seat, a diaphragm adapted to engage said seat to close off communication through said conductor, a spring constantly urging the diaphragm from the valve seat, the diaphragm and valve seat being so arranged that pressure exerted from the intake stack downstream of the throttle valve tends to urge the diaphragm from engagement with the seat and to supplement the action of the spring in such movement of the diaphragm.

4. A fuel carbureting apparatus for an internal combustion engine having an engine intake stack with a fuel inlet and a throttle valve downstream of said fuel inlet, including, a carburetor body having a fuel chamber, a conductor for connecting the fuel chamber of the body with the fuel inlet in the engine intake stack, a fuel inlet valve in the body controlling the supply of fuel to the chamber thereof, a first diaphragm in the body operatively connected to the valve and responsive to air flow in the stack for operating said inlet valve, a second diaphragm connected to the fuel inlet valve having a low pressure side upon which

application of a reduced pressure will result in biasing of the fuel inlet valve toward an open position, a second conductor extending between the low pressure side of the diaphragm and the engine intake stack downstream of the throttle valve, a flow regulating valve connected into said latter conductor responsive to an increasing pressure in the intake stack downstream of the throttle valve to commence opening and progressively communicate increasing percentages of the latter pressure to the low pressure side of the second diaphragm, and a restricted conductor extending between the fuel chamber of the carburetor body and the low pressure side of the second diaphragm.

5. A fuel carbureting apparatus as set forth in claim 4, wherein the opposite side of the second diaphragm is exposed to the pressure of the fuel supply upstream of the fuel inlet valve.

6. In a fluid fuel carbureting apparatus for internal combustion engines having an engine intake stack with a fuel inlet, a throttle valve downstream of said inlet, and a diaphragm-operated valve in which the diaphragm has a low pressure side upon which application of a reduced pressure will increase the flow of fuel to the engine, a fuel supply device including; a restricted passage communicating with the low pressure side of the diaphragm from a zone of higher pressure, a conductor extending from the low pressure side of the diaphragm of the carbureting apparatus and adapted to be connected to the engine intake stack downstream of the throttle valve, a pressure-actuated metering valve connected into said conductor, said valve being adapted to control flow through the latter conductor and including, a seat, a valve member adapted to engage said seat to close off the last-named conductor, said valve member having a face adapted to engage the seat and adapted to be exposed through the conductor to the engine intake stack downstream of the throttle valve, and means constantly urging the valve member from the seat.

7. In a fluid fuel carbureting apparatus for internal combustion engines having an engine intake stack with a fuel inlet, a throttle valve downstream of said inlet, and a diaphragm-operated valve in which the diaphragm has a low pressure side upon which application of a reduced pressure will increase the flow of fuel to the engine, a fuel supply device including, a restricted passage communicating with the low pressure of the diaphragm from a zone of higher pressure, a conductor extending from the diaphragm of the carbureting apparatus and adapted to be connected to the engine intake stack downstream of the throttle valve, a pressure-actuated metering valve connected into said conductor and normally closing the same, said valve including; a valve seat, a diaphragm having one face adapted to engage said seat, said face being adapted to be exposed through the conductor to the engine intake stack downstream of the throttle valve, and resilient means constantly urging the diaphragm from the seat.

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