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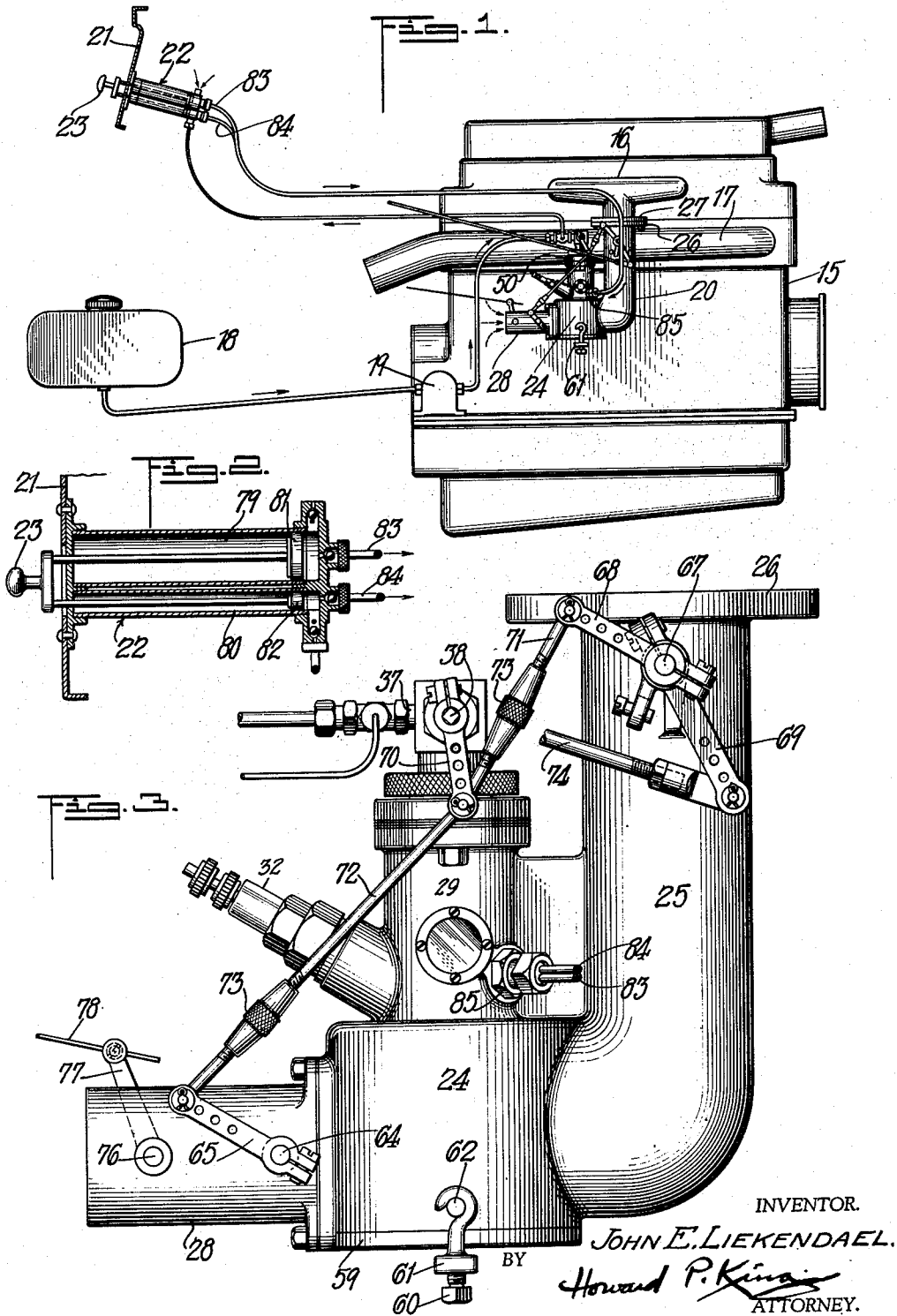
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CARBURETOR

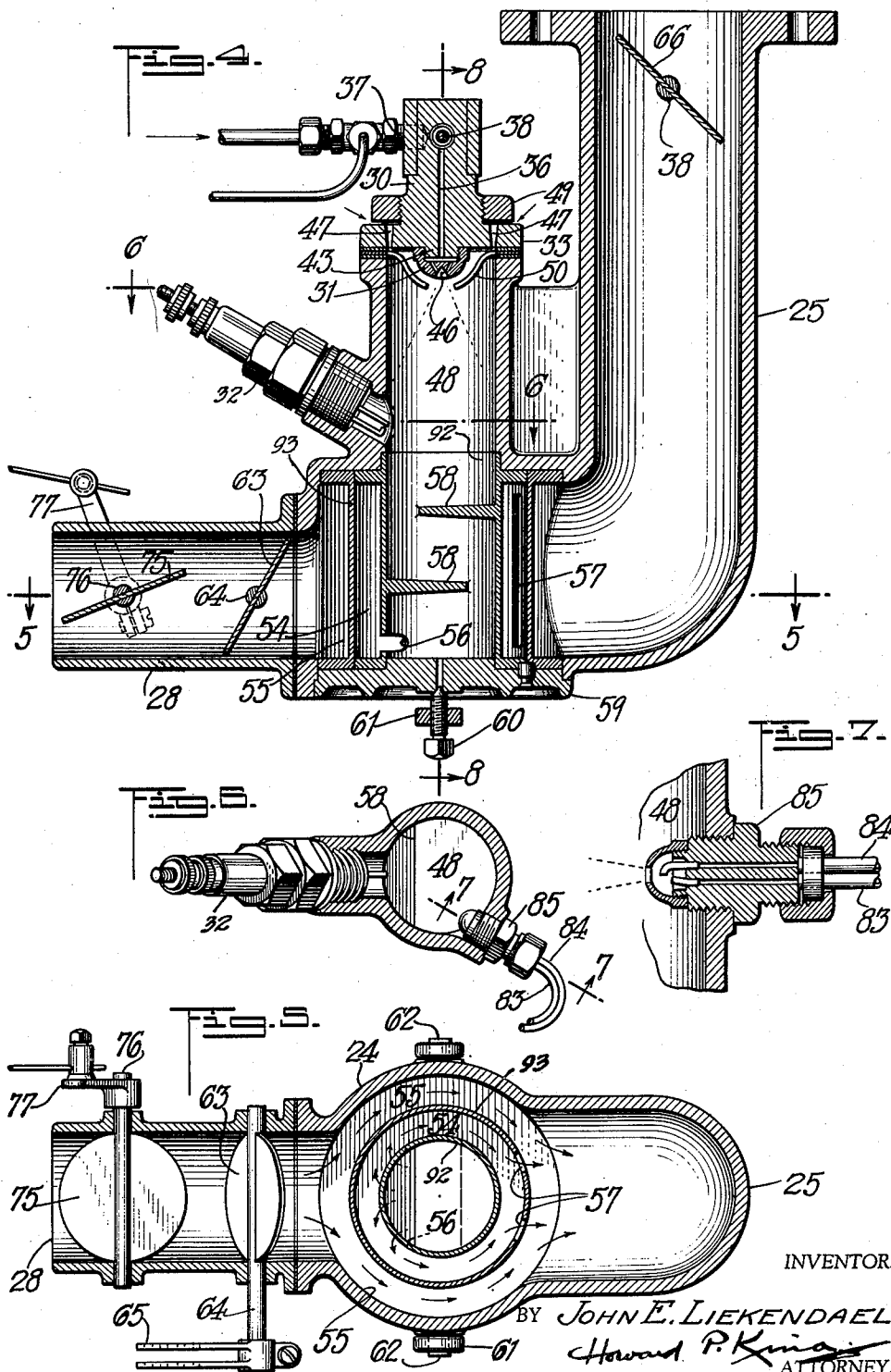
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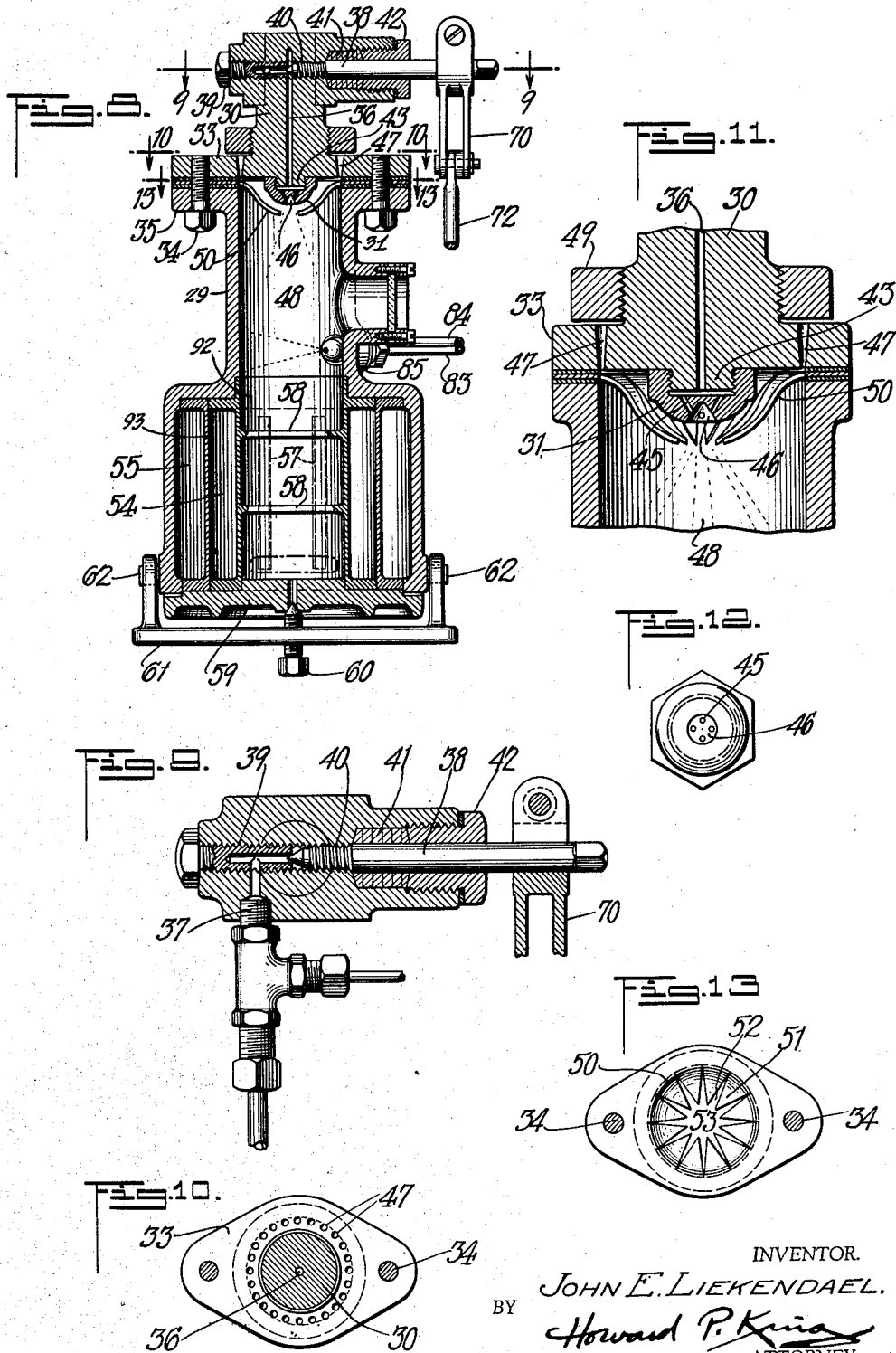
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2,225,647

CARBURETOR

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Application July 14, 1937, Serial No. 153,491

5 Claims. (Cl. 48—107)

This invention relates to vaporizers, carburetors and the like, and more particularly to apparatus of that type which will vaporize oil, such as crude oil, kerosene, and similar fuels to condition that type of fuel for use for power purposes in engines and elsewhere.

The invention is capable of successful operation for the vaporization and use of hydrocarbon oils including the range from lighter oils such as gasoline and kerosene, down to heavier fuel oils having a density as low as 16° Baumé.

The objects of the invention are to provide an apparatus of the type specified capable of use upon internal combustion engines of present-day structure, that is, engines which are now employed in trucks, automobiles, motor boats, airplanes, and the like. Heretofore, it has been almost invariably necessary to modify the engine structure for use of the hydrocarbon oils heavier than gasoline, the engines thus modified using the heavier oils usually being of the Diesel type. This is for the reason that the heavier oils are not sufficiently explosive at ordinary temperatures to be fired by a spark within the engine. An object of the present invention accordingly is to provide a vaporizer, carburetor and the like, which will so precondition the oil to render it a highly explosive fuel when introduced into the engine.

A further object of the invention is to introduce the fuel into the engine by the usual suction now employed for introducing gasoline into an internal combustion engine; to enable the engine to be promptly started whenever desired, even with the engine cold when starting is effected; to enable the liquid fuel to be fed by gravity as is now customary with use of gasoline as a fuel; to provide an apparatus for feeding only appropriate amounts of fuel to the engine for obtaining complete combustion; to thus avoid present-day incomplete combustion evidenced by smoke from the exhaust as occurs in all prior art engines utilizing hydrocarbon oils heavier than gasoline; to adequately remove all of the fuel remaining in liquid form before introduction of the fuel into the engine; to enable the operator to manipulate an instrumentality on the dash board corresponding to the present-day "choke" with which operators are now familiar, for injecting an initial supply of fuel for starting the motor; to provide mechanical control between various parts of the carburetor; to regulate the fuel and air supply with the regulation of mixture admitted to the engine; to maintain proper proportion of fuel and air with the variation in quantity of mixture required; to avoid accumu-

lation of carbon; to protect fuel in the nozzle; to provide a primary admission of air for obtaining a vaporizing flame, and intermingle the flame with the fuel being vaporized; to avoid excessively heating the carburetor and yet obtain adequate heat for vaporization of the fuel; to expose excess accumulation of unvaporized fuel to vaporization action within the carburetor prior to contact with the main supply of combustion air; to provide a structure which is readily adjusted and readily taken apart for cleaning and other purposes; to secure simplicity of construction and operation; and to obtain other advantages and results as may be brought out in the following description.

Referring to the accompanying drawings in which like numerals of reference indicate similar parts throughout the several views:

Figure 1 is an elevation of an internal combustion engine and associated parts to which my invention is applied;

Figure 2 is a longitudinal sectional view of fuel and air injecting means for starting purposes;

Figure 3 is an elevation of my improved carburetor similar to the showing thereof in Figure 1 but on a larger scale and detached from the engine;

Figure 4 is a sectional view on a vertical plane parallel to the plane of projection of the elevation of Figs. 1 and 3 taken centrally of the carburetor;

Figure 5 is a sectional view on line 5—5 of Fig. 4;

Figure 6 is a sectional view on line 6—6 of Fig. 4;

Figure 7 is a sectional view on line 7—7 of Fig. 6;

Figure 8 is a sectional view on line 8—8 of Fig. 4;

Figures 9 and 10 are sectional views on line 9—9 and 10—10 respectively of Figure 8;

Figure 11 is an enlarged sectional view similar to Figure 8 showing the nozzle assembly;

Figure 12 is an underneath plan of the jet nozzle; and

Figure 13 is a sectional view beneath the nozzle showing the shield in elevation taken substantially on line 13—13 of Figure 8.

In the specific embodiment of the invention illustrated in said drawings, reference numeral 15 designates generally an internal combustion engine having an intake manifold 16 and an exhaust manifold 17. In connection with the engine is likewise shown a fuel supply tank 18 and a pump 19 for causing the fuel to flow from the

tank to my improved carburetor designated generally by the numeral 20. It will be understood that appropriate pipe connections are made between the pump and the carburetor and the pump and the vacuum tank. It likewise is to be understood that the invention may likewise utilize a vacuum tank and gravity feed to the carburetor from the vacuum tank as heretofore commonly employed in connection with internal combustion engines of motor vehicles.

The general showing of Figure 1 likewise illustrates a dash board 21 illustrative of a part of the vehicle in which the engine is employed, such as in land vehicles, water vehicles or air vehicles. Attached to the rear side of the dash board is an injector pump 22 which will be hereinafter more fully described. Suffice it to say for the moment that the pump provides a handle or operating knob 23 at the side of the dash board toward the operator and the construction of the pump is such as to permit injection of a starting supply of air and fuel in the carburetor for purposes of obtaining an explosive mixture for starting the engine.

The details of construction of the particular carburetor herein disclosed comprises a lower body portion 24 from one side of which extends a neck 25 which bends upwardly and has a flange 26 at its top for securing the carburetor to a similar flange 27 on the intake manifold 16. Projecting from the body portion 24 at the opposite side thereof from the neck 25 in an air intake collar 28. From the top of the lower body portion 24 is an extension 29 constituting the upper body portion. At the top of the upper body portion is mounted a head 30 at the lower end of which within the said upper body portion is a nozzle 31. At one side of the carburetor, for instance above the intake collar 28 is provided a spark plug or other igniting means 32 the points of which where the spark is created being within the body portion substantially where the upper body portion and lower body portion merge with respect to each other.

The above outline will give a general picture of the carburetor, details of which will now be more fully described. Head 30 is shown as having a lower flange 33 which may be attached by bolts 34 to an upper flange 35 on the upper end of the upper body portion. This head provides a central passage 36 receiving fuel from the pump by way of a connection 37 extending laterally from the head. The quantity of flow of the fuel is controlled by a needle valve 38 the inner point of which may be adjusted with respect to a seat at the inner end of a removable seat member 39 which is hollow at its inner end and in connection with said supply connection 37. Needle valve 38 may be rotated and advanced or retracted from its seat by virtue of screw threaded engagement 40 between the needle and head. Leakage of fuel around the needle valve is prevented by packing 41 compressed by drilled plug 42 screwed into the opening from which the needle valve projects. At the lower end of the head 30, projecting within the body portion is a threaded boss 43 axially coincident with the fuel passage 36, said passage opening at the lower end of said boss. Upon this boss is screwed a jet nozzle 31 the details of which will most apparently be seen in Figures 11 and 12. This nozzle provides a plurality of minute orifices 45 opening into a conical recess 46 at the under side of and centrally located with respect to the nozzle. The orifices will spray minute streams of

fuel in adverse direction, that is, the streams converge and impinge on each other just outside the nozzle, thereby breaking the fuel up into misty sprays which more or less intermingle and have a general downward but spreading direction in continuing away from the nozzle.

The said head 30 is preferably provided with a circular series of orifices 47 which preferably admit a small supply of primary air next adjacent the inner surface of the cylindrical passage 48 of the body portion. The amount of primary air which can be admitted may be readily controlled, for instance by means of the knurled nut 49 shown threaded upon said head 30 immediately above flange 33 and overlying the upper ends of said primary air orifices 47.

Immediately below the orifices 47 and deflecting downwardly inward so as to partially underlie jet nozzle 31 is a shield 50. This shield is made from a sheet of metal stamped with a plurality of radial slits thus providing a circular series of triangular tongues 51, these tongues being curled downwardly and inward thereby providing diverging openings crevices 52 therebetween and a central opening 53 substantially as large as the lower end of the conical recess 46 of the nozzle. Primary air entering through the orifice 47 will be directed essentially toward the nozzle discharge recess by virtue of the shield 50, and will consequently obtain a very considerable mixture of the air with the fuel jet or spray. The crevices 52 between tongues 51 function to permit part of the air to enter the passage 48 and intermingle with fuel within the passage and likewise function to prevent any trapping of fuel between the shield and the nozzle. The shield functions effectively to prevent back pressure, frequently exerted by the engine, from producing any deposit of carbon upon the jet nozzle. The apparent reason is that while the carburetor is in operation, and by virtue of primary air and fuel within the chamber 48 and continuous operation of spark plug 32, a considerable degree of heat will develop within the passage 48. The heat is less intense at the top of the passage because of the cooling effect of the fuel jet and primary air intake. Consequently the head and jet nozzle are relatively cool, and without the shield any back pressure exerted would tend to force the flame back toward the head and nozzle and suspended carbon immediately condenses or adheres upon the cooler surface of head and nozzle. However, by virtue of the interposed shield of relative light material and with the radial crevices, a sufficiently intense heat is maintained in the shield to prevent the condensation or adhesion of carbon thereto, the back pressure being insufficient to force the ignited gases through the crevices of the shield or into contact with the nozzle. It is important to note that the flame produced within the chamber 48 is, as nearly as possible, existent throughout the entire chamber, and is not merely a shell of flame nor a core of flame, although I prefer that the flame tend more toward being a core than being a shell in order that the material comprising the wall of the chamber shall not be heated beyond a moderate temperature. The important factor is to introduce sufficient primary air to consume only such part of the fuel as found necessary to effectively vaporize the remaining part of the fuel. Actually, the proportion of fuel which is burned within the carburetor itself is less than 2% of fuel introduced into the carburetor. The heat is developed throughout the chamber and the

fuel is diffused throughout the chamber so that the heat will be most effective upon the small particles of fuel contacted. I thus economize on the amount of fuel required to vaporize the remaining proportion of fuel, and obtain the most effective vaporization thereof. As shown the shield 50 provides an outer margin which lies between the flanges 33 and 35 of the head and body portion and is clamped therebetween with suitable gaskets interposed as will be understood by those skilled in the art as functioning to prevent leakage.

At the lower part of the carburetor within the lower body portion I provide a plurality of steps and baffles. The inner baffle 92 is preferably of a general cylindrical shape with the interior passage thereof in continuation of the passage 48 heretofore described in the upper part of the body portion. The said baffle has exterior upper and lower flanges for positioning it within the body portion and for holding an outer baffle 93 spaced therearound and thereby providing an annular passage 54 between the two baffles. Similarly, the outer baffle 93 has upper and lower outside flanges which space said baffle from the cylindrical wall of the body portion to provide an outer annular passage 55 therebetween. Entry of the vapor from passage 48 through the baffle 92 to the first annular passage 54 is effected through a slot 56 shown at the bottom of the baffle in Figure 4 toward the side of the carburetor having inlet collar 28. The vapor thus introduced into the first or inner annular passage 54 has to travel around to the other side of the carburetor to arrive at a vertical slot 57 in the outer baffle 93 in order to enter the outer annular passage 55. These vertical slots 57 are at the side of the carburetor toward the inlet neck 25, and the suction of the engine will tend to draw the vapor through such slots into said neck. The outer annular passage 55 is likewise connected with the inlet neck 28, and the same suction of the engine will tend to draw air into said inlet collar around the annular passage and by the Venturi action in passing slots 57, will both draw any additional supply of vapor and will attain a thorough and explosive mixture of the air and fuel vapor. As the baffle is hot from the gases, the combustion air passing around it will be heated. The inlet neck 25 is preferably long so as to give ample opportunity for mixing of the air and vapor and present a highly explosive and effective mixture into the engine manifold and thence to the cylinders of the engine.

Within the inner shield 92 I preferably provide a plurality of staggered steps 58. In the passage 48 for the vapor, any globules or drops of the fuel which have not been vaporized will land upon the steps, and since these steps are directly in the path of the flame, they will be very hot and the combination of this heat with the licking action of the vapor necessarily sweeping across the steps, will result in absorption or vaporization of any liquid fuel which may happen to pass that far. Furthermore, the several baffles are preferably supported upon a lower cap 59 locked in position by a central screw 60 projecting upwardly through a yoke 61 the ends of which hook upon studs 62 projecting diametrically from a lower part of the lower body portion. By release of the yoke, the bottom cap may be removed and the several baffles will drop out at the same time, thus making them readily renewable and easily inspected. It will be understood that the flame provided within the chamber 48 is confined sub-

stantially within the chamber both by virtue of the control of primary air admitted, to create the flame and also by the devious path of the resultant vapor over the steps and through slots of the baffles and around the annular chambers 5 around the baffles. Actual operation proves that no flame ever passes through the carburetor to the explosive mixture within neck 25, but that only the vapor created by the heat of the flame within chamber 48 passes out of the slots 47 into said neck to mix with the air from collar 28.

In collar 28 is provided a mixture controlling butterfly valve 63 mounted upon an axle 64 projecting through the side of the neck and having a crank arm 65 applied thereto. Likewise, in the neck 25, preferably near the upper end thereof is a mixture controlling butterfly valve 66 also mounted upon an axle 67 projecting from the side of the neck 25 and having two crank arms 68, 69 mounted thereon. Preferably both axles 64 and 67 of the butterfly valves just described are parallel to each other and project from the same side of the carburetor. Likewise, it is preferable that the heretofore described needle valve 38 is parallel to these butterfly axles and projects at the same side of the carburetor as the axles and has a crank arm 70 attached thereto. An adjustable link 71 connects one of the crank arms of the mixture controlling butterfly valve in the neck 25 with the crank arm 70 of the needle valve, and another adjustable link 72 connects the needle valve crank arm 70 with the crank arm 65 of the other butterfly valve axle 64. The links each may be made adjustable in length by turn-buckles 73 and may also be made adjustable as to point of attachment on the crank arm by provision of a plurality of holes in said crank arms for the pivot pins mounting the links with respect to the crank arms. By these several adjustments I am enabled to obtain the precise proportion of secondary or explosion air with respect to the amount of fuel introduced and the corresponding proper opening of the passage for the mixture for the intake manifold in proportion to the air and fuel supply. This mechanical control between these several parts is of utmost importance in that the proportions must be maintained with precision in order to obtain efficiency at all speeds and for all conditions of fuel consumption. The second arm 69 of the butterfly valve 66 is connected by suitable link 74 to a control, such as an accelerator pedal (not shown) for actuation by the operator. I have likewise shown in the air intake collar 28 a choke butterfly 75. This butterfly 75 is upon an axle 76 having a crank arm 77 provided with a connection 78 under the control of the operator.

In order to supply a combustible spray mixture in the carburetor to ignite and begin to vaporize the major portion of the fuel, I provide some means such as the fuel pump heretofore mentioned. This fuel pump provides a properly valved large cylinder 79 and a small cylinder 80 arranged parallel to and adjacent each other and each having a corresponding piston 81, 82. The small cylinder is connected with the fuel supply and the large cylinder is arranged to suck in air as the piston is retracted by the operator pulling upon knob 23. Thus a proportion of air and fuel are obtained in the respective cylinders, and then as the operator pushes down on the knob 23 the two pistons advance simultaneously and force the air and fuel through pipes 83, 84 respectively to an auxiliary nozzle 85 screwed into the body portion of the carburetor at a place

substantially opposite the spark plug. The spray mixture will immediately ignite and create the necessary heat to vaporize some of the fuel, and as the engine is turned over, sufficient of the vapor is drawn in to start the engine whereupon the carburetor will proceed to function by virtue of the supply of fuel and air and continued presence of the flame as heretofore described.

I wish to emphasize that my carburetor is intended primarily for use of fuel such as fuel oil of the type now in general use for household fuel burners, and also including kerosene. When using any of these fuels the spark plug in the carburetor is essential. The invention is also applicable for use with gasoline, and when that fuel is used the spark plug in the carburetor does not have to be used in view of the high volatile nature of such fuel. However, with the amount of primary air reduced to a very small quantity the spark plug may still be used and somewhat better efficiency obtained as a result. It is to be noted that operation of my improved carburetor obtains a spraying of the fuel as the first step, a vaporization of the fuel in chamber 48 as the second step, and a gasifying of the fuel by mixture with the combustion air as the two mix and pass upwardly together through neck 25. With fuel oil, kerosene and if desired, with gasoline, the spraying and vaporizing is accompanied with admission of primary air and an intermixed flame intimately heating all the atomized particles of fuel which pass directly through the flame. This is true both as to the starting fuel supply and as to the main fuel supply.

I claim:

1. A carburetor having a nozzle for establishing a fuel jet therein and a primary air inlet opening into the carburetor at the nozzle end thereof and a spark plug for igniting a part of the fuel, and a shield for the nozzle of relatively small mass subject to the heat of the burning fuel in the carburetor and positioned forwardly of and adjacent the nozzle and in front of the air inlet and maintained at high temperature by the burning fuel in the carburetor for preventing condensation and deposit of carbon at the nozzle end of the carburetor and preventing carbon from having access to the air inlet, said shield having a restricted opening directly in front of the said nozzle for unimpaired passage of the jet there-through.

2. A carburetor comprising in combination a partial combustion chamber through which passes all fuel to be consumed, a fuel nozzle at one end of and directing a jet centrally of said chamber for injecting fuel longitudinally of the chamber through the middle thereof, said chamber having air inlets admitting a primary limited air supply next the sides of said chamber at the end thereof having said nozzle, a spark plug in said chamber, and a shield with a central orifice opposite the nozzle and with radiating crevices from said orifice, said shield underlying said air inlets and having direct contact with the flame and thereby maintained at high temperature for protecting the inlets and for deflecting said primary

limited air supply toward the middle of the chamber and thereby obtain a core of intense flame at the middle of the chamber and less intense heat next the side walls of the chamber.

3. A carburetor providing a partial combustion chamber through which passes all fuel to be consumed, a fuel nozzle directing a jet centrally of said chamber for injecting fuel longitudinally of the chamber through the middle thereof, said chamber having air inlets admitting a primary limited air supply next the sides of said chamber at the end thereof having said nozzle, a spark plug in said chamber, means for deflecting said primary limited air supply toward the middle of the chamber, ledges projecting beyond the middle of said chamber in the direct path of the jet and flame for receiving, spreading and vaporizing any free fuel carried thereto by the jet, and a plurality of baffles receiving the vaporized fuel there-between from said chamber for quenching the flame and discharging the vaporized fuel.

4. A carburetor providing a partial combustion chamber through which passes all fuel to be consumed, a fuel nozzle directing a jet centrally of said chamber for injecting fuel longitudinally of the chamber through the middle thereof, said chamber having air inlets admitting a primary limited air supply next the sides of said chamber at the end thereof having said nozzle, a spark plug in said chamber, means for deflecting said primary limited air supply toward the middle of the chamber, ledges projecting beyond the middle of said chamber in the direct path of the jet and flame for receiving, spreading and vaporizing any free fuel carried thereto by the jet, the far end of said chamber from the nozzle having a discharge opening for the vaporized fuel, a plurality of baffles outside the said far end of said chamber for quenching the flame and conveying the vaporized fuel, and an enclosure around said baffles for passage of combustion air both to cool the baffle and to ultimately mix with said fuel at the far side of the enclosure from where the air is admitted, and means receiving said combustion air and fuel for admixture and further conveyance thereof ready for use.

5. A carburetor providing a partial combustion chamber through which passes all fuel to be consumed, a fuel nozzle directing a jet centrally of said chamber for injecting fuel longitudinally of the chamber through the middle thereof, said chamber having air inlets admitting a primary limited air supply next the sides of said chamber at the end thereof having said nozzle, a spark plug in said chamber, a shield below and adjacent said air inlets sloping downwardly therefrom toward and substantially to the nozzle for deflecting said primary limited air supply toward the middle of the chamber, means below the nozzle in the direct path of the jet and flame for receiving, spreading and vaporizing any free fuel carried thereto by the jet, and means receiving the vaporized fuel from said chamber for quenching the flame and discharging the vaporized fuel.

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