

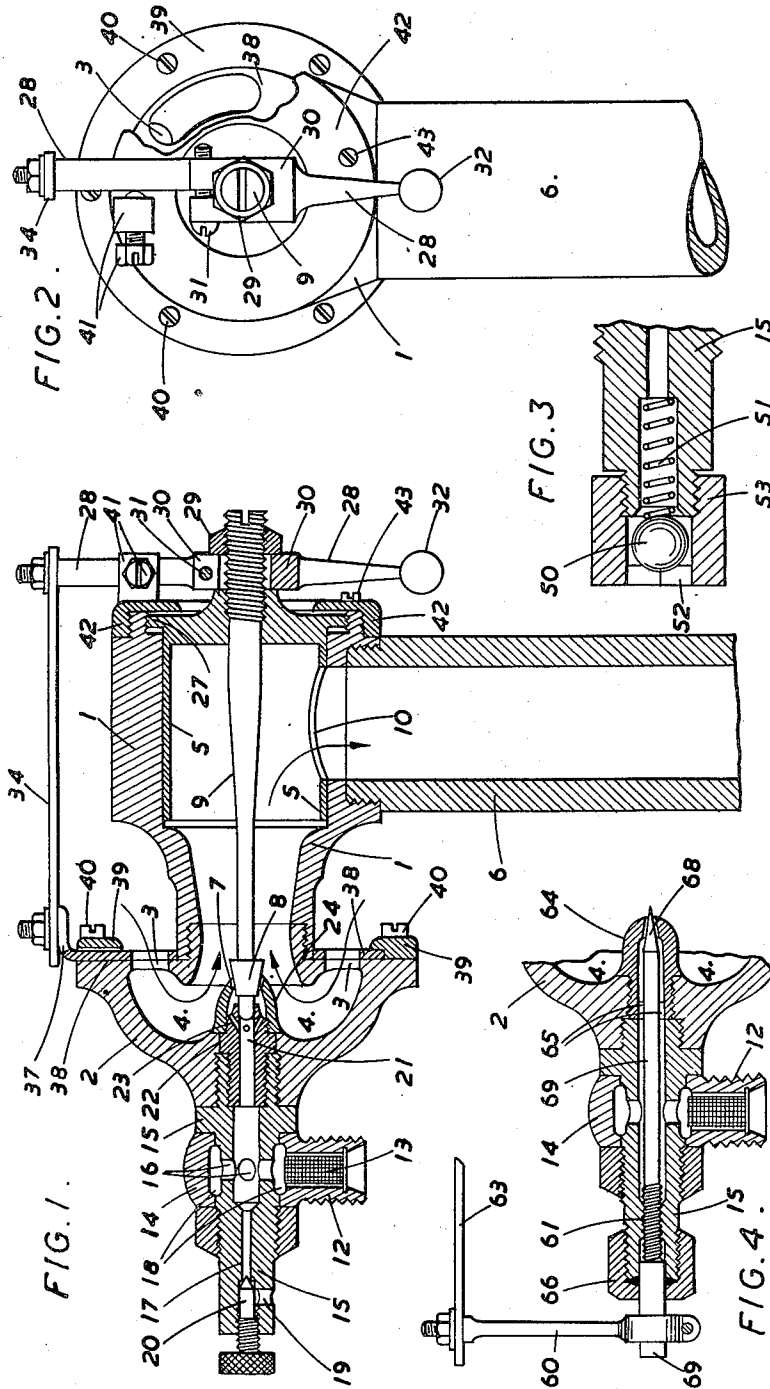
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LIQUID FUEL ATOMIZER OR CARBURETOR

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LIQUID FUEL ATOMIZER OR CARBURETOR

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This invention relates to carburettors or liquid fuel atomisers for supplying combustible fuel and air mixtures to internal combustion engines, turbines and jet propulsion units hereafter referred to as internal combustion engines, and has more especial reference to those for use with piston type engines in which the reduction in pressure in the inlet manifold during the working of the engine is utilised to raise liquid fuel from a storage receptacle or tank to the atomiser or carburetter without recourse to a mechanical pump and without the float chamber provided in conventional carburettors.

It is the object of the invention to provide such a carburetter which is simple and cheap to manufacture while being reliable, economical and efficient in use.

In a carburetter or liquid fuel atomiser according to the invention comprising a fuel jet having an orifice regulated by a small tapered or conical valve hereinafter referred to as a needle and a main throttle located on the engine side thereof, the jet and the main throttle are coaxially mounted and means effecting rotary movement of the throttle simultaneously cause relative axial movement between the needle and the jet to vary the fuel metering at the jet orifice, the mixture being formed with air induced as an annular stream around the jet and thence flowing in line therewith through a mixing chamber to the passage controlled by the throttle.

Preferably the jet needle and the main throttle are arranged for rotation together, axial movement of the needle within the jet being effected by screw means and the needle being guided during such movement by bearing surfaces provided in the fuel duct leading to the jet.

The throttle may be of the ported disc or of the butterfly type, but preferably it is of barrel or hollow plug construction having a peripheral port or ports to control the passage of mixture from its open end, which forms a continuation of the mixing chamber, to the inlet manifold.

The main air supply may be induced through a part spherical or toroidal annular intake duct past the jet, where it effects entrainment of the liquid fuel, and thence through a Venturi-like constriction in the mixing chamber where a depression is produced which aids entrainment of the fuel.

The throttle and needle may be mounted for rotation on a common shaft passing through the mixing chamber, longitudinal movement of the assembly being caused, upon rotation, by screw means to vary the fuel metering orifice, or the throttle may be coupled by an external bridge to

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the needle stem which in this case projects from the opposite end of the carburetter.

The carburetter according to the invention may operate in conjunction with a conventional fuel pump and float chamber, but preferably the carburetter itself utilises the suction in the inlet manifold to raise fuel from the tank or reservoir, and advantageously in such case a main air inlet valve is provided in addition to or in place of a conventional independent choke and is coupled to the throttle and needle for simultaneous operation by a single control pedal or lever.

Reference will now be had to the drawings in which two embodiments of the invention applied to fuel-lift carburettors not requiring a pump or float chamber are illustrated by way of example, and in which

Figs. 1 and 2 are a central longitudinal section and an end view respectively of a carburetter according to one embodiment,

Fig. 3 shows a modification of a detail thereof to a larger scale, and

Fig. 4 is a fragmentary view of a section similar to Fig. 1 of the other embodiment.

Referring now to the drawings and more particularly to Figs. 1 and 2, a hollow body member 1 carries screwed into its front end a member 2 formed with main air inlet ports 3 and a quasi hemispherical air inlet duct 4 converging on a jet 7, 8 and terminating in a Venturi-like constriction before merging into a wider cylindrical mixture passage in the body 1. A port formed under the body 1, at right angles to its axis, is controlled by a ported barrel throttle 5 having a co-operating port 10 which regulates passage of the mixture to the engine through a conduit 6 which is either connected to or forms part of the induction manifold.

The variable jet is located at the centre of the air intake duct 4 and on the axis of the apparatus where it permits entrainment by the induced annular air stream, of liquid fuel from a metering orifice 7 the effective area of which is varied in consonance with the movements of the throttle 5 by axial displacement of a needle valve 8 formed on a shaft 9 secured coaxially to the rear end of the throttle 5.

In the fuel lift carburetter illustrated, the liquid fuel is drawn directly from the fuel tank through a pipe (not shown) to a union 12 containing a filter 13 and formed radially on a collar 14 clamped on a fuel conduit 15 screwed into the front of the air intake 2, such conduit having ports 16 which lead the fuel to the jet from an annular space 18 formed inside the collar 14.

A small quantity of primary air may be ad-

mitted through a lateral port 19 to a duct 17 in a forward extension of the conduit 15 adjusted by a bleed-screw 20. At its rear end the conduit 15 carries a screwed nozzle 22 having a bore 21 and branch channels 23, such bore serving as a bearing for the end of the shaft 9 and the channels being located beyond its stroke so that the fuel supply to the metering orifice 7 is not obstructed by axial movement of the shaft. This orifice is formed in a cap nozzle 24 screwed on the nozzle 22 clear of the channels 23, the outer surface of the cap blending smoothly into that of the air intake duct 4.

A flange 27 formed at the rear of the throttle 5 has a left hand thread and rides in a tapped portion of the body 1 so that rotation of the throttle by means of an operating arm 28 linked in any appropriate manner to the accelerator pedal or lever will control the admission of mixture to the inlet conduit 6 via the throttle port 10 while also causing a small axial movement of the throttle and needle assembly whereby the metering orifice is simultaneously varied by the needle 8. The rear end of the shaft 9 is threaded and screwed into the throttle 5 so that it can be adjusted axially to set the metering orifice datum and then be locked in the set position by a locking nut 29. The arm 28 is formed with a clamp 30 adjustably mounted on the end of the rod 9 and held by means of a clamping screw 31. The arm carries at one end a ball 32 for universal connection to the accelerator pedal linkage, while in the fuel lift carburetter illustrated, its other end is rigidly coupled by a bridge 34 to a tongue 37 formed on a ported disc 38 regulating the main air intake and rotatably held against the air inlet ports 3 by means of a flanged ring 39 secured to the intake member 2 by screws 40 and cut away over an arc to pass the tongue 37.

Since the main air intake valve 38 is thus coupled for rotation with the throttle, control of the intake of air will be effected simultaneously with that of the fuel and mixture by the varying register between the ports 3 and those of the main air valve 38, and the arrangement is more clearly illustrated in Fig. 2, where a portion of the body is broken away to show one of the ports 3 almost closed by the valve 38 when the rotating valve assembly is in the slow running position as determined by a screw-adjusted limit stop 41 against which the arm 28 comes to bear.

An annular cap 42 screwed on to the rear end of the body 1 is locked by a screw 43 and serves to limit the axial travel of the throttle 5 while also mounting the stop 41.

The primary air valve and port 19, 20 may be replaced by the arrangement shown in Fig. 3 and comprising a ball 50 urged by a spring 51 against a square seat 52 formed in a hollow nut or cap 53.

Fig. 4 shows an alternative arrangement wherein the arm 28 is coupled by a bridge 63 to a lever 60 whereby to control a fuel needle valve 68 from the front of the carburetter by rotation of its stem 69. The internal shaft 9 is thus dispensed with and, since the valve stem 69 is itself threaded and rides in the conduit 15 where it is tapped at 61, as the throttle 5 is opened the latter need not partake of the axial movement of the needle valve.

In this embodiment the metering orifice is formed in a cap nozzle 64 having internal centralising ribs 65 with bearing surfaces to guide the valve stem 69, and the supply of primary air is dispensed with, the projecting end of the stem 69 extending through a packing gland 66.

It will be understood that the invention is not limited to the embodiments illustrated and, for instance, a gauze or similar mixing device may be fitted across the mixing chamber, while clutching means may be provided to permit the main air inlet valve to be operated independently when desired or a supplementary independent choke may be fitted.

Similarly, the throttle arrangement shown in Fig. 1 may be duplicated, the throttle having two diametrically opposite ports 10 to control the passage of mixture to a pair of horizontal intake ducts each serving half the cylinders of a piston type engine.

While fuel consumption has been found to be exceptionally low, still further economy may be achieved by the provision of an automatic or manually controlled extra air admission valve in the inlet duct 6.

The throttle may be a ported disc valve similar to the main air inlet valve illustrated, in which case the duct leading to the inlet manifold may be a straight continuation of the mixing chamber. Alternatively the throttle may be of the butterfly type with its axis lying in the plane of the flat side of a D-section extension of the mixing chamber so as to control the passage of mixture from such D-shaped duct to the mouth of a cylindrical or it may be polygonal inlet duct mounted at right angles thereto.

The main air intake duct may be arranged to pass air directly to the jet as an annular stream from the front of the carburetter, while the main air valve, where provided, may be coupled directly by a spider to the needle stem for rotation therewith.

As aforementioned, the needle itself need not necessarily rotate with the throttle. Thus for example it may have a polygonal or splined shank riding in a fixed guide while its stem is threaded and engaged by a tapped throttle for reciproaction upon rotation of the throttle.

Moreover, instead of the needle being associated for movement with the throttle, the jet nozzle may be arranged to reciprocate over a stationary needle to provide variation of the metering orifice in consonance with the throttle movement.

By the present invention an improved and simplified carburetter or liquid fuel atomiser for internal combustion engines is provided which is reliable and efficient in use, giving a low fuel consumption, while being easy and cheap to manufacture.

What I claim is:

1. A carburetter for an internal combustion engine comprising in combination a body providing a Venturi mixing chamber and a cylindrical housing for a throttle in line with said mixing chamber, a fuel jet having an orifice at the mouth of the mixing chamber and co-axial therewith, a tapering fuel regulating valve reciprocable in said orifice, an annular toroidal main air intake duct converging on said jet and leading from an annular series of air inlet ports to the Venturi mixing chamber, a ported annular air inlet valve for controlling said ports, a ported hollow plug throttle located in said housing between said chamber and the engine, a driving shaft coaxial in said throttle extending through the mixing chamber and mounting said fuel valve, means coupling said air inlet valve for rotation with said driving shaft and means operative, on turning of said shaft to effect opening of the throttle and air inlet valve, simultaneously to effect axial movement of the fuel valve in the jet orifice to

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vary the supply of liquid fuel in consonance with the throttle and inlet valve opening.

2. A carburetter according to claim 1 wherein the jet is constructed as a double nozzle with an intermediate fuel space, the outer or cap nozzle being formed with the metering orifice while the inner nozzle has a fuel conduit coaxial with the jet the end of which conduit guides a cylindrical extension of the needle in its axial movement, and the fuel by-passing such guided portion of the needle through narrow channels connecting a portion of the conduit beyond its stroke with the intermediate fuel space.

3. A carburetter for an internal combustion engine comprising in combination a body providing a Venturi mixing chamber and having a tapped portion near one of its ends, a fuel jet having an orifice opposite said tapped portion of the body and coaxial therewith, a tapering fuel regulating valve reciprocable in said orifice, an annular toroidal main air intake duct converging on said jet and leading from an annular series of air inlet ports to the Venturi mixing chamber, a ported annular air inlet valve for controlling said ports, an externally screw-threaded ported hollow plug throttle located in the body between said chamber and the engine with its screw threads riding in said tapped portion of the body, a driving shaft coaxial in said throttle

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extending through the mixing chamber and mounting said fuel valve, means coupling said air inlet valve for rotation with said driving shaft and means operative, on turning of said shaft to effect opening of the throttle and air inlet valve, simultaneously to effect, through said screw threads on the throttle, axial movement of the fuel valve in the jet orifice to vary the supply of liquid fuel in consonance with the throttle and inlet valve opening.

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