Aug. 15, 1967 C. SHORROCK 3,336,014

FLUID FLOW JETS, PARTICULARLY FOR CARBURETTERS

Filed Feb. 28, 1966

2 Sheets-Sheet 1

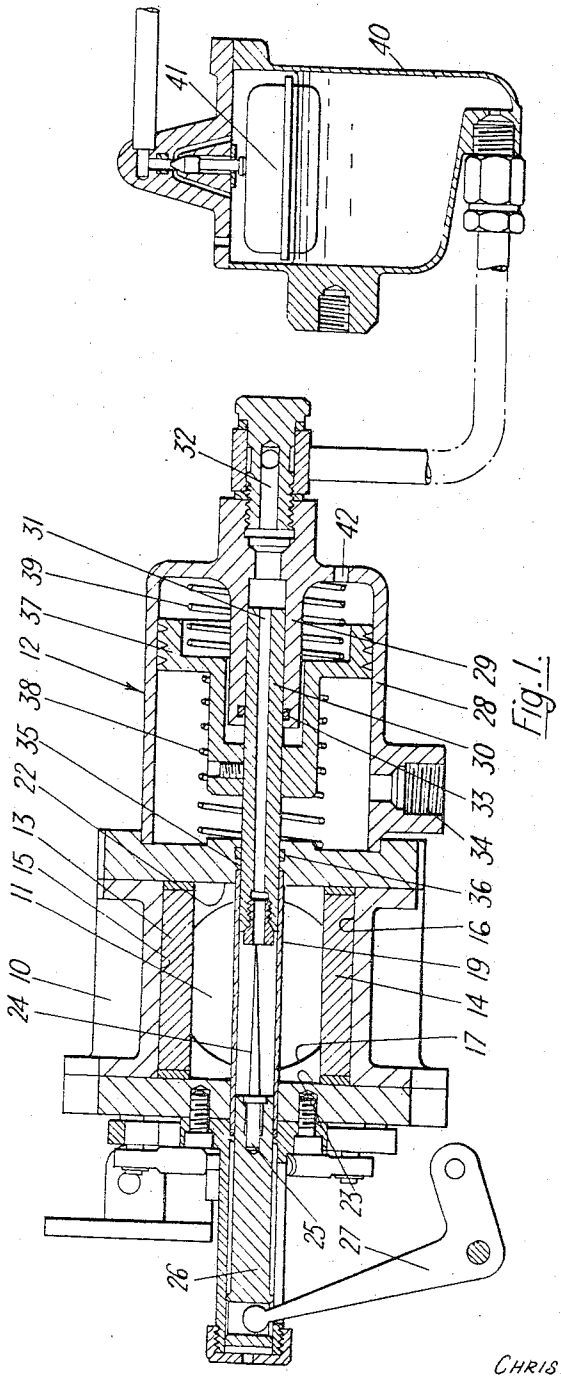

Fig. 1.

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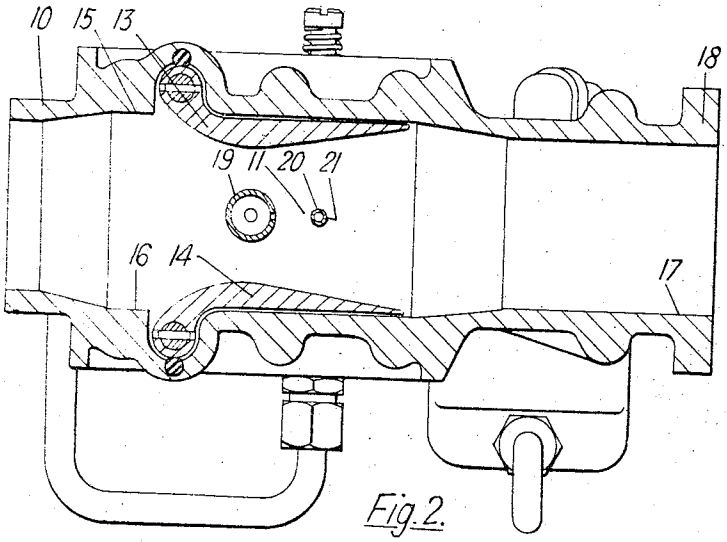

Fig. 2.

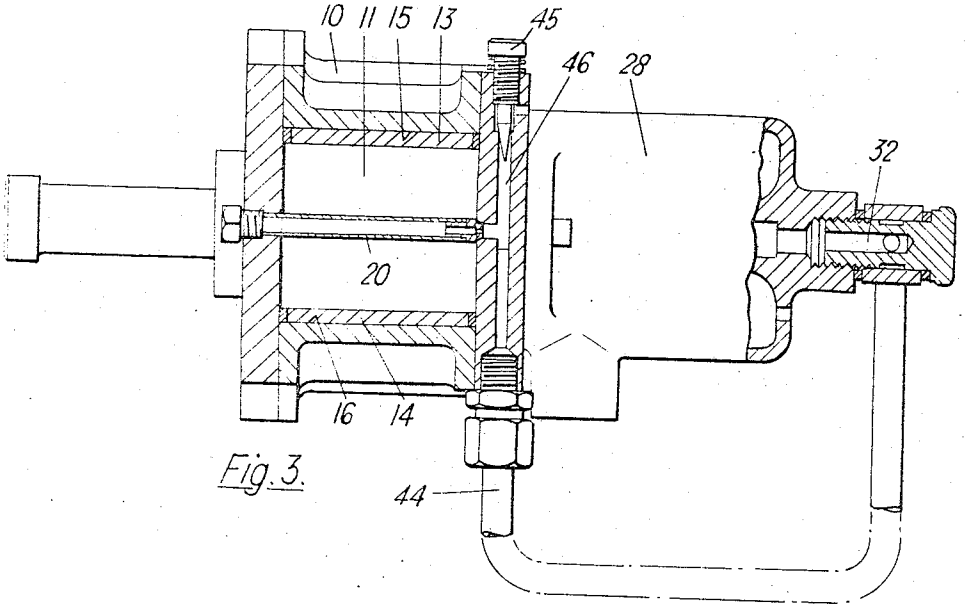

Fig. 3.

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FLUID FLOW JETS, PARTICULARLY FOR CARBURETTERS

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4 Claims. (Cl. 261—41)

ABSTRACT OF THE DISCLOSURE

A fluid flow jet for a carburetter for an internal combustion engine, including a mixing chamber, a main jet emulsion tube extending transversely across the mixing chamber, a fluid supply conduit extending into the main jet emulsion tube, a closure member extending into the main jet emulsion tube, and a variable venturi throttle comprising two plates pivotally attached to opposed walls of a rectangular section portion of the mixing chamber and being provided with curved facing faces which direct a flow of fluid through the fluid flow jet with a minimum of turbulence, the fuel supply into the mixing chamber being quantitatively controlled by linkage means.

This invention relates to fluid flow jets, particularly for carburetters for internal combustion engines.

By the term "mixing chamber" used hereinafter is meant the part of a carburetter in which air and fuel mix to provide the air-fuel mixture before passing into the inlet manifold of the internal combustion engine, the fuel passing into the mixing chamber by means of a main jet and usually also a compensating jet.

It is intended to provide in one instrument the following advantages:

(1) Uni-directional, or axial, flow of fuel-air mixture from an air intake to an inlet port of an internal combustion engine, irrespective of throttle opening.

(2) Automatic control of the fuel-air ratio throughout the entire range of operation with either atmosphere induction or supercharged engines. The theoretical chemically correct fuel-air ratio is controlled by the throttle opening, correction throughout variable speed-load conditions being provided by manifold depression.

(3) Near constant air velocity conditions over both main and compensating jets irrespective of throttle opening.

(4) Integral displacement pump providing temporary mixture enrichment when the manifold depression is reduced (i.e. during acceleration or increase of load).

According to the present invention there is provided in a carburetter for an internal combustion engine a fluid flow jet including a tube having at least one discharge outlet, a fluid supply conduit extending into the tube, a closure member extending into the tube also, and means for moving the conduit and the closure member together and apart to permit control of the quantitative supply of fluid from said conduit into the tube.

The present invention provides further a carburetter for an internal combustion engine, a jet for the supply of fuel into the carburetter mixing chamber, the jet including a tube having at least one discharge outlet, a fluid supply conduit extending into the tube, a closure member extending into the tube also, and means for moving the conduit and the closure member together and apart to permit control of the supply of fluid from the conduit into the tube.

Preferably one of the conduit and the closure member is arranged to be movable with and in proportion to

movement of the carburetter throttle valve, and the other is arranged to be movable under the influence of the pressure within the inlet manifold of the internal combustion engine when the carburetter is fitted to the engine, whereby the conduit and the closure member will move apart when the throttle valve is opened and the inlet manifold pressure increases.

Preferably also the conduit comprises a hollow tube and the closure member comprises a tapered needle arranged to move axially into and out of the bore of the tube to permit control of the quantitative supply of fluid from said conduit.

One embodiment of the present invention will now be described by way of example with reference to the accompanying drawings of which:

FIG. 1 shows a transverse section through a conduit and a carburetter mounted on the conduit.

FIG. 2 shows an axial section of said conduit and

FIG. 3 shows a transverse section through the conduit downstream of the section shown in FIG. 1.

A conduit **10** connects the mixing chamber **11** of a carburetter **12** with the inlet manifold of an internal combustion engine (not shown), the mixing chamber **11** being rectangular in section and accommodating a throttle valve comprising two plates **13, 14**, attached pivotally on two sides **15, 16** of the chamber **11**. The rectangular section of the mixing chamber **11** is preferably developed into a circular section **17** downstream of the throttle valve plates **13, 14**, and terminates at a flange **18** which can be bolted to the inlet manifold.

Situated in the mixing chamber **11** upstream of the said throttle valve plates **13, 14**, lying in a horizontal plane which bisects the chamber, are two emulsion tubes, being a main jet emulsion tube **19** and a compensating jet emulsion tube **20**.

The interfunction of jets **19** and **20**, with regard to discharge of fuel therefrom, is a basic and important consideration and is only achieved by the design of the venturi throat. For starting and slow running, maximum depression is achieved on the compensating jet **20**, this depression continuing with progressively diminishing effect until depression is obtained, due to an increased throttle opening, on both jets **19** and **20**. Further opening of the throttle decreases the depression on jet **20**, at which point jet **19** takes over, after which there is no or very little discharge from jet **20**. It is by means of the location of the two jets in relation to the venturi throat that progressive mixture control is to a large extent dependent.

Both the aforementioned emulsion tubes **19, 20** are suitably drilled and slotted for example at **21** to enable the fuel or air within them to be drawn into the mixing chamber **11** by the air flow over the tubes.

The main jet tube **19**, which is upstream of the compensating jet tube **20**, protrudes into the mixing chamber **11** from one side **22** thereof and protruding in from the opposite side **23** is a tapered needle **24** which is co-axial with the main jet tube **19**, the larger diameter end **25** of the needle **24** being connected by a rod **26** to a lever linkage **27** which can move the needle **24** axially to cause the tapered end of the needle to move axially in the main jet tube **19**. The lever linkage **27** is operated by the mechanism (not shown) controlling the opening and closing movement of the aforementioned throttle valve plates **13, 14**, consequently the extent of axial movement of the needle **24** is proportional to the movement of the said plates **13, 14**. Mounted on the side **22** of the mixing chamber is a cylindrical casing **28**. Inside and concentric with the casing **28** is a hollow cylindrical sleeve **29** which houses a hollow spindle **30** through which fuel can pass, the bore **31** of the sleeve communicating with an inlet port **32** through the casing **28**, and this inlet port **32** being connected to a fuel supply tank **40** having

a float valve **41**. The fuel is prevented from leaking from the sleeve **29** into the casing **28** by a sealing ring **33** between the sleeve and the spindle **30**. A radial opening **34** is provided in the casing adjacent the mixing chamber, and suitable piping (not shown) is used to connect this opening with the inlet manifold of the engine.

The hollow spindle **30** extends from its housing in the sleeve through an aperture **35** in the wall **22** of the mixing chamber into the main jet tube **19**, a sealing ring **36** being provided between the spindle **30** and the aperture wall.

Attached to the periphery of the spindle **30** and located around the sleeve **29**, but not being in contact with the sleeve, is a piston **37** having a portion of outside diameter such as to be a sliding fit within the casing. The movement of the piston **37** is controlled by two compression springs, acting in opposite directions to one another, one spring **38** abutting between the outside wall of the mixing chamber and the adjacent face of the piston, and the other spring **39** abutting between the closed end of the casing and the other face of the piston.

The aforementioned springs are chosen of stiffness such that when the inlet manifold pressure is less than atmospheric, or less than supercharger compressor discharge pressure in the case of a supercharged engine, the piston **37** is caused to move axially towards the mixing chamber **11** against the said one spring **38**, air being admitted to the casing **28** through an aperture **42**. If the manifold pressure is greater that atmospheric the piston will move away from the mixing chamber against the other spring **39** and since the spindle **30** is attached to the piston **37** it will move axially in the main jet emulsion tube **19** as the piston moves.

Af the aforementioned tapered needle **24** is co-axial with the spindle **30**, its movement, in conjunction with the movement of the spindle, varies the fuel supplied to the mixing chamber, the amount of fuel being governed by the penetration of the needle into the bore **31** of the spindle. The actual extent of penetration of the needle within the spindle will depend on two factors, firstly, the position of the spindle due to manifold pressure, and secondly, the position of the needle due to a given throttle valve opening. Either or both factors will cause variation in fuel flow.

During acceleration of sudden increase of load it is desirable to have temporary mixture enrichment. This is achieved by the action of the aforesaid piston movement of which is governed by pressure changes in the engine manifold which are transmitted to the interior of the casing **28** by the aforesaid piping. When the throttle plates **13**, **14** are suddenly opened the pressure change in the inlet manifold is transmitted to the interior of the casing causing the piston **37** and spindle **30** to move axially awy from the needle **24**, so leaving behind in the mixing chamber **11**, a portion of fuel which had been contained within the spindle, thus enriching temporarily the mixture in the mixing chamber. Also, as the throttle plates are opened the tapered needle moves axially in the direction away from the spindle, causing an increase in jet aperture and consequently an increase in fuel supplied.

The aforementioned compensating jet tube **20** shown in FIG. 3 is supplied with fuel through a conduit **44** directly from the float chamber **40** and incorporates an adjustable air bleed **45** to regulate the fuel-air mixture supplied to the mixing chamber **11** through a conduit **46**, at idling speeds.

In a modification of the present invention the piston **37** is replaced by a diaphragm or bellows device to obtain lateral movement of the jet conduit.

I claim:

1. In a carburetter for an internal combustion engine a fluid flow jet including a mixing chamber having at least one discharge outlet, a main jet emulsion tube extending transversely across the mixing chamber, a fluid supply conduit extending into the main jet emulsion tube, a closure member extending into the main jet emulsion tube, linkage means connectible to said fluid supply conduit and closure member to cause movement of the fluid supply conduit and closure member together and apart, a fuel supply into the mixing chamber being thereby quantitative-controlled, the fluid flow jet further including a variable venturi throttle comprising two plates pivotally attached to opposed walls of a rectangular section portion of the mixing chamber and being provided with curved facing faces which direct a flow of fluid through the fluid flow jet with a minimum of turbulence.

2. A fluid flow jet as claimed in claim **1** having a piston connected, externally of the mixing chamber, to the fluid supply conduit, the side of the piston adjacent the mixing chamber being in direct communication with the inlet manifold of an internal combustion engine and the other side of the piston being in direct communication with atmosphere, a spring on each side of the piston providing control of movement of the fluid supply conduit and piston when the piston is moved by a change in pressure in the inlet manifold.

3. A fluid flow jet according to claim **1**, in which the fluid supply conduit is movable under the direct influence of a charge of pressure within the inlet manifold of an internal combustion engine to which the carburetter is attached.

4. A fluid flow jet according to claim **3** in which the closure member comprises a tapered needle movable with and in proportion to the movement of the variable venturi throttle and is movable axially into and out of the fluid supply conduit.

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