April 27, 1926. 1,582,187

M. C. MORRIS

CARBURETOR FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 14, 1925

Fig. 1

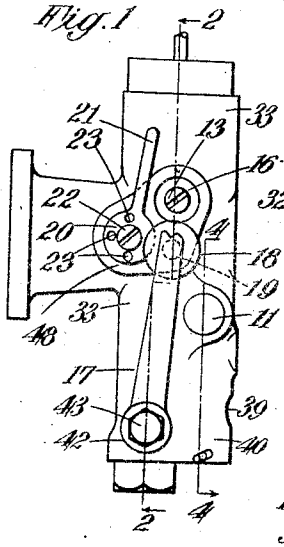


Fig. 8.



Fig. 2.

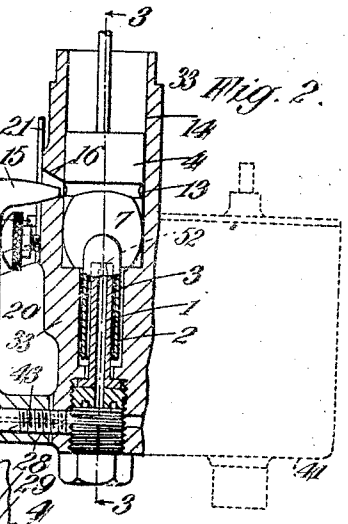


Fig. 7.

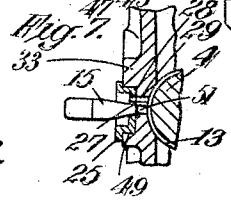


Fig. 3.

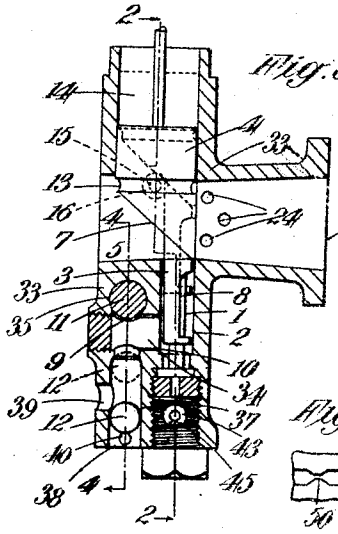


Fig. 4.

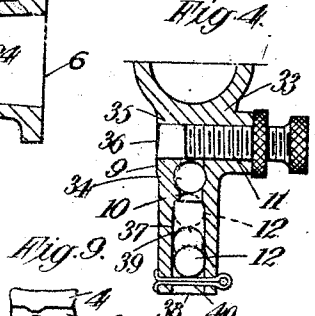


Fig. 9.

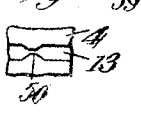


Fig. 5.

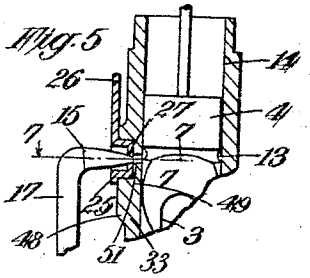
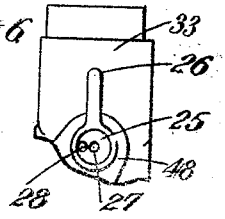


Fig. 6.



Inventor
Max Cyril Morris
By Pennie, Davis, Marvin & Edmonds
Attorneys

Patented Apr. 27, 1926. 1,582,187

UNITED STATES PATENT OFFICE.

MAX CYRIL MORRIS, OF WESTMINSTER, LONDON, ENGLAND.

CARBURETOR FOR INTERNAL-COMBUSTION ENGINES.

Application filed October 14, 1925. Serial No. 62,415.

To all whom it may concern:

Be it known that I, MAX CYRIL MORRIS, a subject of the King of Great Britain, residing at Westminster, in the county of London, England, have invented certain new and useful Improvements in Carburetors for Internal-Combustion Engines, of which the following is a specification.

The present invention relates to carburetors for internal combustion engines and more especially to such as are intended for use in connection with motor road vehicles.

The principal object of the present invention is to provide a carburetor which affords the following combination of features, namely, which is of simple and robust construction, which does not involve any complicated or delicate elements giving rise to difficulty and expense in manufacture, which are easily damaged or put out of adjustment in use, which supplies a suitable proportion of fuel and air mixture to the engine throughout the full range of opening of the throttle valve without calling for any manual operation during running beyond that of opening or closing the throttle valve, which comprises simple means providing for semi-permanent adjustment of the carburetor for different fuels or engines of different sizes or different engine or atmospheric conditions, and which comprises efficient provision for starting the engine and running it "idle" with the throttle valve in the fully closed position. A further object is to attain the latter end whilst obviating the employment of a very small starting or pilot jet which as is well known is usually employed for the purpose mentioned and which is subject to the disadvantage that it easily becomes choked.

With these objects in view, the present invention comprises a carburetor which includes in its construction a certain combination of elements to which no claim is made in the present application such combination being the subject of claims made in my co-pending application Serial No. 667602 and in addition thereto an auxiliary fuel supply nozzle which is so combined with the known elements as to co-operate therewith to attain two main functions, namely, to correct a defect in the mixture proportions which arises at large throttle openings in connection with the known combination of elements and to afford means for engine starting and idling with the throttle valve in the fully closed position. A construction of carburetor embracing these features and by which the objects indicated are attained is illustrated in the accompanying drawings wherein like numerals of reference indicate like parts in the several figures.

Figure 1 is an upright elevation looking from left to right of Figure 2 with the upper part of the auxiliary nozzle arm broken away.

Figure 2 is an upright sectional view with parts in elevation, the section being taken substantially on planes indicated by the stepped line 2—2 of Figure 1 and Figure 3 and at right angles to the axis of the main passage through the carburetor.

Figure 3 is a vertical section on the line 3—3 of Figure 2.

Figure 4 is a fragmentary vertical section on the line 4—4 of Figure 3.

Figure 5 is a fragmentary upright sectional view of a similar nature to Figure 2 and illustrating an alternative means for controlling the flow of fuel from the auxiliary nozzle.

Figure 6 is a side elevation looking from left to right of Figure 5 with the auxiliary nozzle removed.

Figure 7 is a section on the line 7—7 of Figure 5.

Figure 8 is a detail view showing alternative means for adjusting the position of the auxiliary nozzle towards or from the axial line of the throttle plunger.

Figure 9 is a detail view showing a restriction in the groove on the throttle plunger.

Referring to these drawings 33 is the main casing of the carburetor provided with a horizontal passage therethrough comprising the air inlet 5 and the mixture outlet 6. 1 is the main fuel nozzle fed from a float chamber 41 of conventional form (indicated in dotted lines in Figure 2 only) and with the fuel outlet orifice 52 at its upper extremity. The main nozzle is located in a vertical well 2 formed in the casing and hereinafter termed the nozzle chamber. 4 is the throttle valve consisting of a plunger capable of being reciprocated vertically across the main passage to control the flow therethrough, it being guided in its movement by an upright bore 14 formed in the casing and in which it has a sliding fit. This throttle plunger is cut

away obliquely to form an inclined face 7 on the air entry side and it carries depending from its lower end a tubular shroud 3 which is open at its lower end and closed at its upper end and which, following the movements of the throttle plunger, slides loosely up and down within the nozzle chamber 2 and over the main nozzle 1. 8 is a longitudinal opening in the tubular shroud 3 on the engine side thereof. A bore 34 is provided in the casing the said bore opening into the lower part of the nozzle chamber 2 and communicating through an orifice 9 with another bore 35 which is screw threaded and provided with a screw threaded plug 11 constituting an adjustable valve controlling the effective area of orifice 9. By turning this plug in one direction or the other the effective area of the orifice 9 may be varied, thus providing for the admission of a variable amount of extra air through the open end 36 of the bore 35 and the orifice 9 into the nozzle chamber 2, from whence it passes up through the spaces between the nozzle tube 1 and the shroud 3 and the wall of the nozzle chamber 2 direct into the main air stream. Another inlet orifice 10 for admitting air into the bore 34 and thence into the nozzle chamber, is provided at the top of a vertical bore 37 formed in the casing, the said bore being open to the outer air at its lower end 38 and provided also with an orifice 39 at the side. Within this bore is located a ball 12 which normally rests upon a pin 40 extending across the lower open end 38 of the bore 37. A groove 13 is formed on the throttle plunger which provides a small channel for passage of air through the carburetor when the throttle is in the fully closed position, this groove being so disposed as to become occluded by the wall of the guide bore 14 as soon as the throttle is slightly raised.

The combination of elements so far described forms the subject of claims in my copending application hereinbefore referred to and no claim is made in the present application to this combination of elements per se. The construction described, it will be observed, provides a very simple and robust structure which is free from complicated and delicate details. The functions associated with the construction so far described are briefly as follows. At small throttle openings the ratio of the air speed over the top of the main nozzle 1 and nozzle chamber 2, to the volume of air passing is high, due to the restriction of the passage at this point by the throttle piston and this ratio will steadily decrease with increasing opening of the throttle so that a steady gradient of correction is applied to counteract the disproportionate increase of fuel with increasing volume of air passing which occurs in a carburetor wherein a simple nozzle is located in a choke tube or main passage of fixed cross sectional area. Another effect is that throughout the range of throttle opening, the main fuel nozzle being shielded by the shroud 3 from direct impact of the entering air, the fuel issues therefrom in an upwardly directed stream, impinges upon the upper closed end of the shroud and is then thrown down again through the opening 8 in the shroud where it is caught up in the main air stream which has had imparted to it a considerable degree of complex whirling motion due to downward deflection by the inclined face 7 of the throttle plunger and lateral deflection by the cylindrical surface of the shroud. A very thorough atomization of the fuel is thus brought about. A further effect which arises from the construction described is that at small throttle openings the annular spaces between the main fuel nozzle 1, the shroud 3 and the wall of the nozzle chamber 2 becomes filled with a very rich fuel-air mixture, which serves as an immediately available reserve upon which the engine can draw when the throttling opening is increased to accelerate. At very small throttling openings, however, the velocity of air over the main nozzle and therefore the suction thereon relatively to the volume of air passing would be unduly high without some provision, made to meet this defect, and the construction described embraces two provisions for making compensation relatively to this point. Thus the suction on the main nozzle during the very smallest opening movement of the throttle plunger is reduced owing to the fact that air can pass directly through the carburetor by way of the channel 13 formed on the throttle plunger. Moreover, the admission of air to the nozzle chamber 2 by way of orifices 39 and 10 and bore 34 provides further for reducing the relative suction on the main nozzle by the admission of air upwardly and direct into the main air stream at or in advance of the main fuel outlet. This reduction of relative suction is operative throughout a greater degree of opening movement of the throttle plunger but when a certain opening has been reached the increasing suction of the engine automatically draws up the ball 12 into the position shown in dotted lines in Figures 3 and 4 thus closing the orifice 10 and cutting off the supply of air therethrough. The effective area of the orifice 9 may be varied by turning the screw threaded plug 11 in one direction or the other, which provides for the admission of a predetermined and permanent inleak of air from outside the carburetor through the open end 36 of the bore 35 and this it will be observed is operative throughout the entire range of movement

of the throttle plunger. Thus is provided a ready means for setting one and the same carburetor for fuels of different quality or for engines of different sizes or for different atmospheric or engine conditions. Moreover adjustment of the effective area of the opening 9 co-operates with the action of the ball valve 12 in that it determines the point at which the latter operates and this co-operation in such that the desired object is attained. Thus assuming certain conditions which require a larger proportion of air to fuel than the carburetor happens to be adjusted for, the screw threaded plug 11 will be turned so as to enlarge the effective area of the orifice 9 thus increasing the proportion of extra air and correspondingly increasing the degree of diminution of relative suction on the main nozzle. The area of the orifice 10 being invariable the increase of effective area of orifice 12 will have the effect of delaying the operation of the ball 12 that is to say delaying the point of throttle opening at which the supply of air tending to reduce the flow of fuel is cut off. This conforms to the assumed requirement of increased air proportion throughout the whole range of throttle opening.

It follows from the construction so far described however that as the throttle valve 4 is raised and with it the shroud 3 the obstruction offered by the latter to the passage of air from the nozzle chamber 2 into the main air stream is progressively reduced, and when the throttle valve is nearly in the fully open position this has an appreciable effect in admitting a greater proportion of extra air than would otherwise be the case and thus causing a falling off of the relative suction on the main fuel orifice and consequent reduction in the proportion of fuel which is not desired at this point.

It is the object of the present invention to remove this defect and, as hereinbefore stated, to adapt the carburetor at the same time for engine starting and "idling" with the throttle valve in the fully closed position.

This double object is attained by the provision of a secondary or auxiliary fuel nozzle which is adapted to deliver fuel through the casing and into the carburetor at a point which coincides with the position occupied by the channel 13 when the throttle valve is in the fully closed position. This auxiliary nozzle may be adapted to deliver the fuel through the casing without any provision for admission of air at this point, or it may be arranged to protrude into an orifice large in relation to the size of the auxiliary nozzle so that air can enter around it, or means may be provided for admitting air through independent orifices in the casing in the immediate vicinity of the auxiliary nozzle. The amount of fuel admitted by the auxiliary nozzle may be varied by varying the amount of air admitted at or in its immediate vicinity, which may be effected for example by varying the position of the nozzle towards or from the axial line of the throttle valve or by varying the position which the auxiliary nozzle occupies within the bounding wall of a relatively large orifice in the casing when such is provided.

Referring now more particularly to Figures 1–3, 15 is the auxiliary nozzle carried by an arm 17 integral with a hollow boss 42 and provided with an internal fuel channel 44. The said boss 42 is attached to the lower part of the carburetor casing by the assembly screw 43 and the fuel has access to the auxiliary nozzle through the channels 45 and 46 in the screw 43, the groove 47 formed upon the said screw, and the channel 44 in the arm 17. This auxiliary nozzle 15 protrudes into a conical hole 16 in the wall of the casing which hole is large relatively to the size of the portion of the auxiliary nozzle which enters it. The relative positions are such that when the throttle valve is in the fully closed position, fuel issuing from the auxiliary nozzle is delivered into the channel 13, so that on the engine being turned, air is drawn through the carburetor by way of channel 13 and the suction produced also draws in a proportion of fuel from the auxiliary nozzle 15 The amount of fuel delivered by the auxiliary nozzle is varied in the form shown by adjustment of the latter towards or from the axial line of the throttle valve. This adjustment is effected by arranging that the arm 17 carrying the auxiliary nozzle 15 tends normally to press the latter towards the axial line of the throttle valve whilst between the arm 17 and the casing of the carburetor a finger nut 18 is provided working upon a screw threaded stud 19 carried by the carburetor casing. By turning the finger nut 18 the arm 17 can be sprung back carrying the auxiliary nozzle 15 with it so as to vary the admission of air around the nozzle and consequently the suction effect and the proportion of fuel which is admitted therefrom. The resiliency of the arm 17, which is naturally of metal, permits all the movement required, the maximum of necessary movement being very small. In order to supply additional air to this preliminary mixture, a plate 20 working on a machined face 48 on the side of the casing may be provided this plate being furnished with a finger lever 21 whereby it may be turned about the stud 22 by which the said plate is pivoted to the casing. The plate is provided with a number of holes 23 which may be brought into any desired degree of coincidence with corresponding holes 24 (Figure 3) so as to admit more or less additional air

as may be desired. Thus a sufficient supply of fuel and air mixture is supplied for starting the engine and running it "idle", with the throttle valve in the fully closed position.

As has been previously mentioned, the channel 13 is so disposed that it may be occluded within the vertical guide way 14 during the smallest opening movement of the throttle valve. Stated otherwise, when the throttle valve is in the closed position the said channel is very close to the top of the passage through the carburetor. The auxiliary nozzle being adapted to deliver fuel through the casing at this level, it will be apparent that when the throttle valve approaches the completely open position (see the dotted lines in Figure 3) the auxiliary nozzle will be uncovered and will deliver an additional supply of fuel into the carburetor which will overcome the defect hereinbefore referred to, namely, the falling off in the proportion of fuel which occurs at large throttle openings due to the reduced degree of obstruction offered by the lower extremity of the shroud 3 to the upward passage of air through the nozzle chamber 2.

The provision of means for controlling the out-flow of fuel from the auxiliary nozzle by means of variable air admission at or in the immediate vicinity of the said nozzle has a distinct advantage in this respect, namely that without any such arrangement the orifice for supplying fuel for the purpose of starting and running the engine "idle" with the throttle closed would necessarily be extremely small, and very small jets are, as is well known, subject to choking by small solid impurities in the fuel and to other defects. With the controlling arrangement described, however, any convenient size of auxiliary jet as may be required for its intended function at full throttle opening may be employed.

Other means for admitting a controlled supply of air in the immediate vicinity of the auxiliary nozzle appear in Figures 5, 6 and 7. The extremity of the auxiliary nozzle 15 forms a working fit in a central orifice 27 made in a shallow "thimble" 25 which works within a cylindrical recess 49 in the wall of the carburetor casing, and is provided with a small operating lever 26. In the bottom of the recess an aperture 51 is provided in the casing through which fuel from the nozzle may pass into the interior of the carburetor when the throttle valve is fully raised, or into the channel 13 when the said valve is fully closed, as the case may be. The thimble 25 is also provided with an eccentrically disposed orifice 28 which, by operating the lever 26 to turn the thimble 25 in its recess 49, may be brought into any desired degree of coincidence with another orifice 29 in the casing in order to vary the air admitted immediately in advance of the auxiliary nozzle 15 and on the engine side thereof. As an additional provision for restricting the flow of fuel from the auxiliary nozzle, the channel 13 may be contracted immediately adjacent to the said nozzle and on the engine side thereof. In the case of the arrangement shown in Figures 5, 6 and 7, for example, the portion of the said channel which extends between the point of fuel admission from the auxiliary nozzle 15 and the point of air admission through the orifice 29 may be contracted to a very small passage 50 as shown in Figure 9.

Another way of controlling the amount of fuel issuing from the auxiliary nozzle 15 with a construction similar to that shown in Figures 1–3 would by varying the position of the said jet in relation to the bounding line of the orifice 16. Thus the arm 17 might be adjusted angularly so as to set the auxiliary nozzle towards or from that side of the opening 16 which is towards the engine or outlet side 6 of the carburetor and the proportion of fuel admitted would be greater the nearer the nozzle were located to the engine side of the opening 16.

It is preferred, however, to control the fuel by adjusting the position of the auxiliary nozzle 15 towards or from the axial line of the throttle valve and another method of effecting this is shown in Figure 8. Here the arm 17 is provided at its upper extremity and beyond the auxiliary nozzle 15 with a fork 30 and the said arm is normally so disposed as to support the auxiliary nozzle in an extreme position away from the axial line of the throttle valve 4. A screw threaded stud 31 projects from the casing and between the two limbs of the fork and is provided outside the said fork with a finger nut 32, by turning which the position of the auxiliary nozzle towards or from the axial line of the throttle valve may be adjusted. By making the stud 31 of such size as to fit closely between the limbs of the fork 30, any maladjustment through angular movement of the arm 17 may be prevented.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a carburetor, the combination of an air inlet, a main fuel supply, a mixture outlet, a throttle plunger provided with an inclined face, and an auxiliary fuel nozzle, said auxiliary fuel nozzle being covered by the throttle plunger when the throttle is in closed position, but adapted to be uncovered by the inclined face of the throttle when the throttle has been opened a predetermined amount.

2. In a carburetor, the combination of an air inlet, a main fuel supply, a mixture outlet, a throttle plunger provided with a channel, and an auxiliary fuel nozzle, said auxiliary fuel nozzle communicating with the

channel in the throttle plunger and the mixture outlet when the throttle is in closed position, and adapted to have said communication cut off when the throttle is opened a predetermined amount.

3. In a carburetor, the combination of an air inlet, a main fuel inlet, a mixture outlet, a throttle plunger provided with an inclined face and a channel, and an auxiliary fuel nozzle communicating with the channel in the throttle plunger and the mixture outlet when the throttle is in closed position, and adaped to have said communication with the mixture outlet cut off when the throttle has been opened a predetermined amount, and re-established when the throttle has been opened a still further amount.

4. In a carburetor, the combination of a main air inlet, a main fuel supply, a mixture outlet, a throttle plunger provided with an inclined face, and an auxiliary fuel and air inlet, said auxiliary inlet being covered by the throttle when the throttle is in closed position, but adapted to be uncovered by the inclined face of the throttle when the throttle has been opened a predetermined amount.

5. In a carburetor, the combination of a main air inlet, a main fuel inlet, a mixture outlet, a throttle plunger provided with a channel and an auxiliary fuel and air inlet, said auxiliary inlet communicating with the channel in the throttle plunger and the mixture outlet when the throttle is in closed position, and adapted to have said communication cut off when the throttle is opened a predetermined amount.

6. In a carburetor, the combination of a main air inlet, a main fuel inlet, a mixture outlet, a throttle plunger provided with an inclined face and a channel, and an auxiliary fuel and air inlet communicating with the channel in the throttle plunger and the mixture outlet when the throttle is in closed position, and adapted to have said communication with the mixture outlet cut off when the throttle has been opened a predetermined amount, and re-established when the throttle has been opened a still further amount.

7. In a carburetor, the combination of a main air inlet, a main fuel inlet, a mixture outlet, a throttle plunger provided with an inclined face and a channel, an auxiliary air inlet, and a regulable auxiliary fuel inlet communicating with the channel in the throttle plunger and the mixture outlet when the throttle is in closed position, and adapted to have said communication with the mixture outlet cut off when the throttle has been opened a predetermined amount, and re-established when the throttle has been opened a still further amount.

8. In a carburetor, the combination of a casing, a main passage therethrough with an air inlet at one end and a mixture outlet at the other end, a main fuel supply to said passage, a throttle valve comprising a plunger adapted to be reciprocated in a guideway formed in the casing and across the main passage between the air inlet and mixture outlet, the said plunger having a channel formed in its periphery which provides a relatively small passage from the air inlet side to the mixture outlet side of the main passage when the throttle is in fully closed position, and which is closed by occlusion within the wall of the guideway immediately the throttle plunger is slightly opened, and an auxiliary fuel nozzle adapted to deliver an auxiliary supply of fuel into the channel when the throttle valve is closed.

9. In a carburetor, the combination of a casing, a main passage therethrough with an air inlet at one end and a mixture outlet at the other end, a main fuel supply to said passage, a throttle valve comprising a plunger adapted to be reciprocated in a guideway formed in the casing and across the main passage between the air inlet and the mixture outlet, the said plunger having a channel formed in its periphery which provides a relatively small passage from the air inlet side to the mixture outlet side of the main passage when the throttle is in fully closed position, and which is closed by occlusion within the wall of the guideway immediately the throttle plunger is slightly opened, and an auxiliary fuel nozzle adapted to deliver an auxiliary supply of fuel into the channel when the throttle valve is closed and to deliver an auxiliary supply of fuel into the main passage when the throttle plunger has nearly reached its fully opened position.

10. In a carburetor, the combination of a casing, a main passage therethrough with an air inlet at one end and a mixture outlet at the other end, a main fuel supply to said passage, a throttle valve comprising a plunger adapted to be reciprocated in a guideway formed in the casing and across the main passage between the air inlet and the mixture outlet, said plunger having a channel formed in its periphery which provides a relatively small passage from the air inlet side to the mixture outlet side of the main passage when the throttle is in fully closed position, and which is closed by occlusion within the wall of the guideway immediately the throttle plunger is slightly opened, an auxiliary fuel nozzle adapted to deliver an auxiliary supply of fuel into the channel when the throttle valve is closed, and to deliver an auxiliary supply of fuel into the main passage when the throttle plunger has nearly reached its fully opened position, the said nozzle protruding into an opening in the side of the casing relatively large in re-

lation to the size of said nozzle, and means for adjusting the position of the auxiliary nozzle towards or from the axial line of said throttle plunger.

11. In a carburetor, the combination of a casing, a main passage therethrough with an air inlet at one end and a mixture outlet at the other end, a main fuel supply to said passage, a throttle valve comprising a plunger adapted to be reciprocated in a guideway formed in the casing and across the main passage between the air inlet and the mixture outlet, the said plunger having a channel formed in its periphery which provides a relatively small passage from the air inlet side to the mixture outlet side of the main passage when the throttle is in fully closed position, and which is closed by occlusion within the wall of the guideway immeditely the throttle plunger is slightly opened, an auxiliary fuel nozzle adapted to deliver fuel through the wall of the casing into the channel upon the throttle plunger when the latter is in fully closed position, and directly into the main passage when the said throttle has nearly reached its fully opened position, means for admitting a supply of air variable at will through the casing in the immediate vicinity of said auxiliary nozzle and means for admitting a supply of air variable at will from outside the carburetor into the main passage at a point beyond the throttle valve and on the mixture outlet side thereof.

MAX CYRIL MORRIS.