

April 22, 1969

J. E. L. SIMONET
CARBURETTING SYSTEM

3,439,658

Filed July 25, 1967

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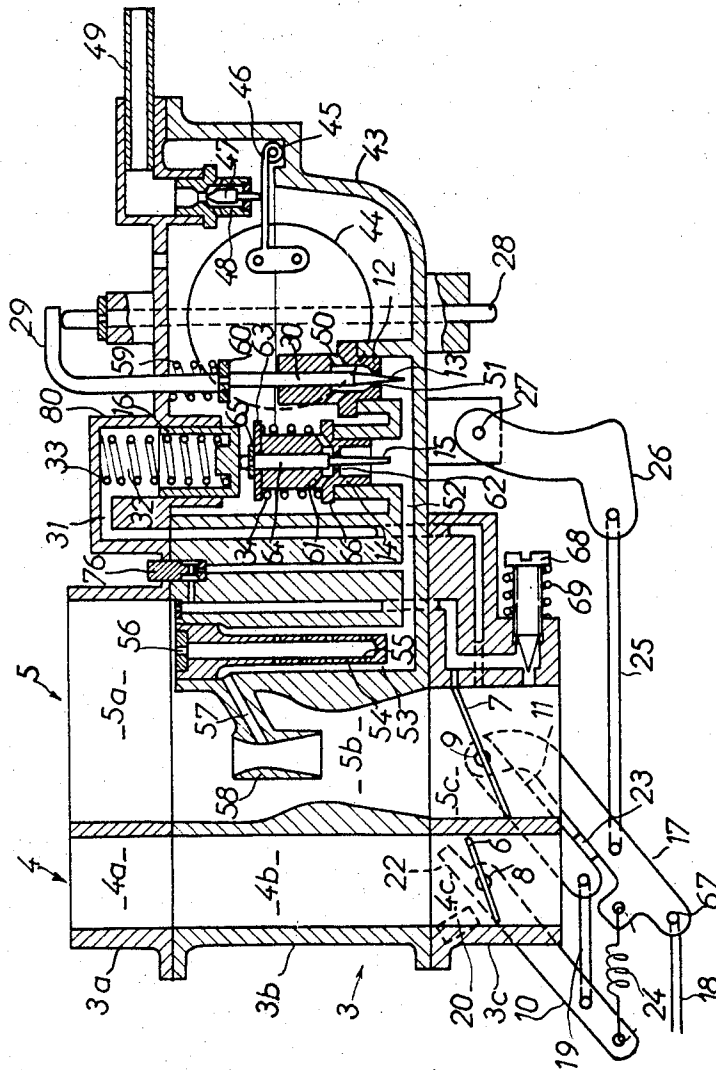


Fig. 1

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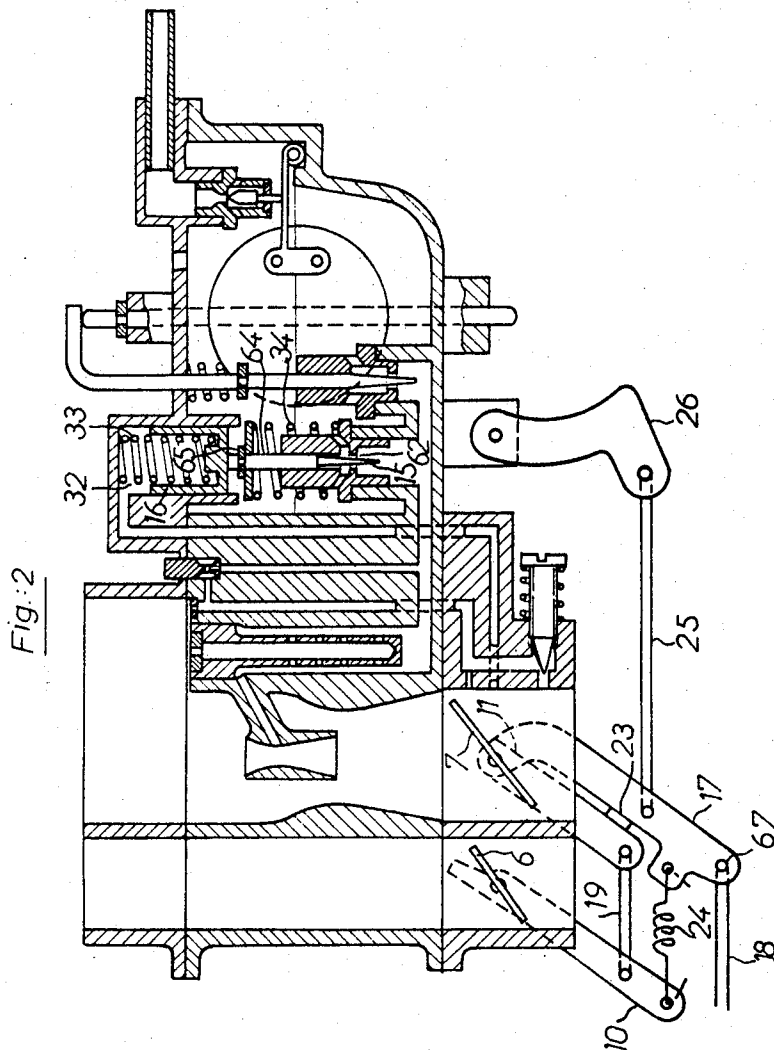
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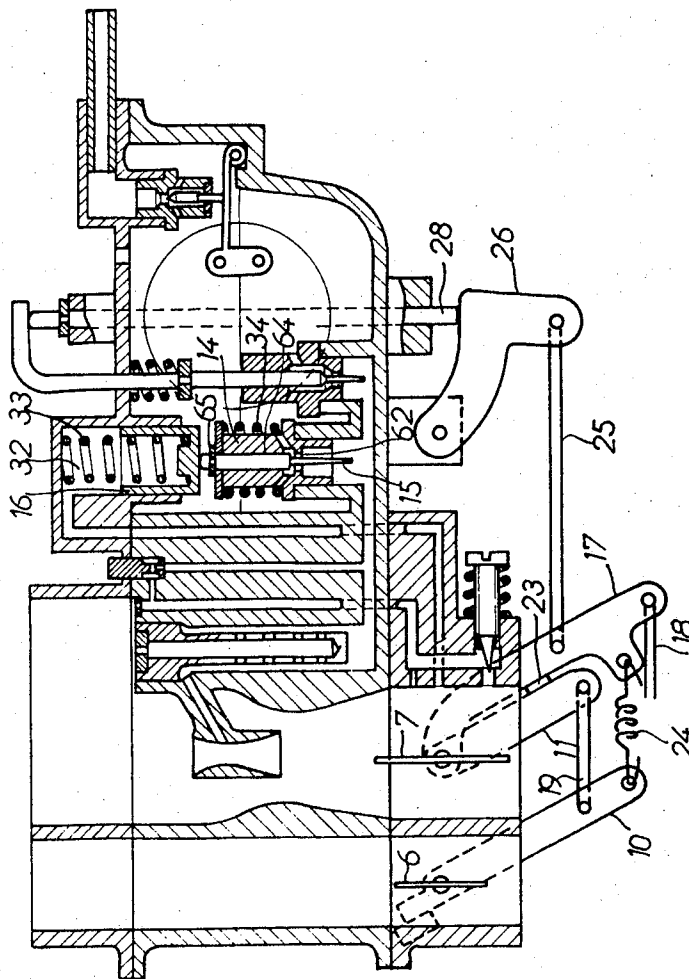
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Fig. 3



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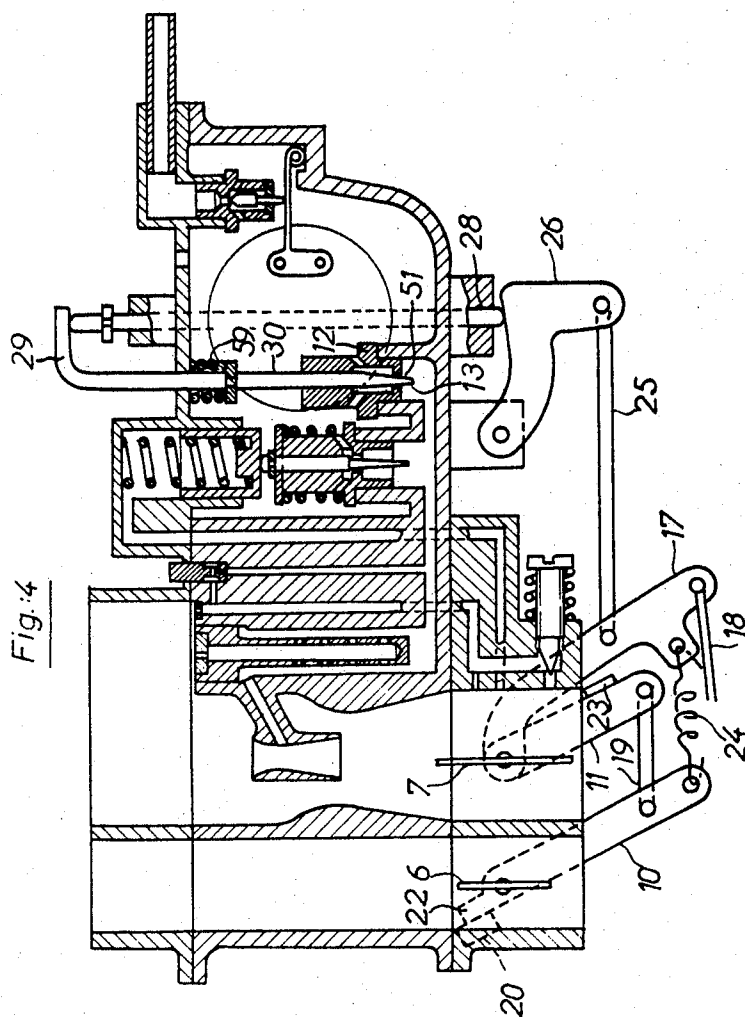
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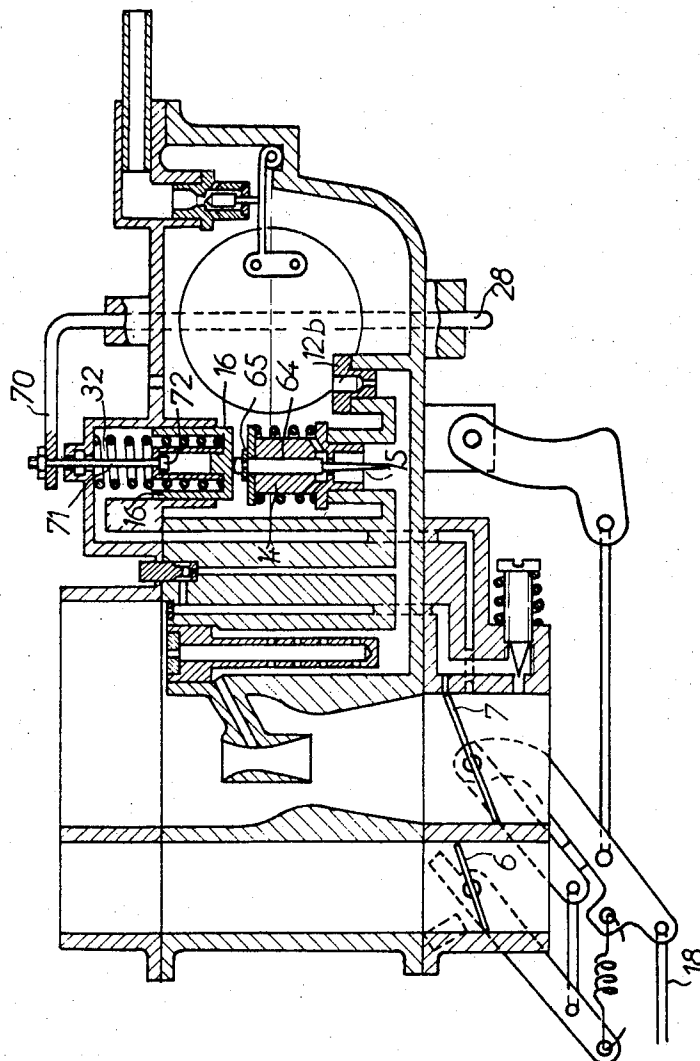
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Fig. 5



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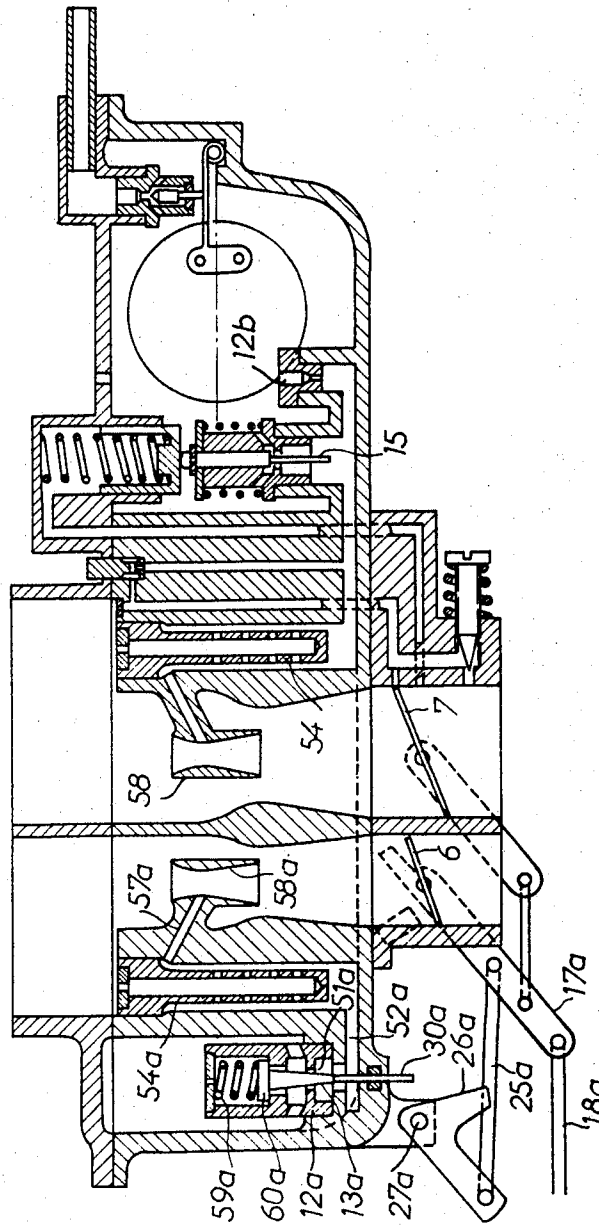
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Fig. 6



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CARBURETTING SYSTEM

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Filed July 25, 1967, Ser. No. 655,867

Claims priority, application France, Aug. 2, 1966, 71,787

Int. Cl. F02m 13/04, 13/06; F02b 17/00

U.S. Cl. 123—75

6 Claims

ABSTRACT OF THE DISCLOSURE

To feed an internal combustion engine with so-called stratified charges through separate channels with mixtures of different fuel richnesses, there is provided an additional input of fuel including for instance an additional jet subjected to the pressure prevailing in the corresponding air-feeding channel on the downstream side of the throttle in the latter. Said jet may be in fact the same as the normal jet for said channel.

The present invention has for its object a carburetting system adapted to feed internal combustion engines through at least two separate channels feeding the engine with mixtures of different fuel richnesses. It is applicable in particular to the feeding of engines operating with so-called stratified charges and wherein, during the compression stroke, the mixture inside the cylinder remains heterogeneous with a richer area in which the ignition takes place, the combustion being then propagated throughout the mixture.

Such engines are adapted to operate, when the engine does not produce its maximum power, with a total richness which is lower than that which is required for the operation of engines wherein the carburetting is performed in a conventional manner and consequently the final combustion in the case considered can be complete. This cuts out the pollution of the atmosphere by the exhaust gases and leads to reduced specific consumptions.

It has been found that the optimum richness during operation decreases with the speed of rotation of the engine for an unvarying opening of the carburettor throttle valve. Furthermore, since the normal richness required for the operation of the engine considered is lower than in the case of an engine operating under conventional carburetting conditions, for powers which are lower than maximum power, whereas it remains substantially the same under maximum power conditions as for such conventional operation, the increase in richness required for operating under full power conditions is proportionally much larger than in the case of an engine operating in accordance with a conventional carburetting procedure and this leads to large modifications in the power supplied by the engine.

The carburetting system according to the present invention includes two channels or passageways for the air, of which one encloses a throttle, a float chamber for liquid fuel, a space or chamber communicating with the vat through an adjustable opening controlled by a movable member and with the above-mentioned channel on the upstream side of the throttle, said channel being connected furthermore on the downstream side of the throttle with said movable member so that the latter is subjected to the pressure of air within said channel on the downstream side of the throttle and thereby causes the adjustable opening to increase in size when said pressure is reduced.

It will be assumed hereinafter that the carburetting means are constituted by a sole and single carburettor

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provided with two separate air channels, but it may as well be constituted by two separate carburettors controlled simultaneously and in unison by the accelerator pedal.

The following description of several embodiments of the invention, given by way of exemplification and by no means in a limiting sense, illustrates how the invention can be executed, reference being made to the accompanying drawings. The features appearing in the drawings and in the specification form obviously part of the invention defined by the accompanying claims.

In said drawings, FIGS. 1 to 4 are vertical longitudinal diagrammatic cross-sections of a first embodiment of a carburetting system according to the invention, said carburettor including a second air-feeding channel provided with a second throttle. These cross-sections show four different successive positions of the parts controlled by the accelerator pedal, to wit:

FIG. 1 corresponds to the position for which both throttles are closed.

FIG. 2 corresponds to the position for which both throttles are half open.

FIG. 3 corresponds to the position for which the two throttles are completely open.

FIG. 4 corresponds to a position of the accelerator pedal beyond that illustrated in FIG. 3 for which both throttles are completely open.

The engine is assumed to be at a standstill in FIG. 1 and operative in FIGS. 2 to 4.

FIGS. 5 and 6 are diagrammatic cross-sections of two other embodiments of the carburettor according to the invention.

A number of references relating to stationary parts and the references relating to parts outside the scope of the invention have been shown in FIG. 1 only.

The carburettor illustrated in FIGS. 1 to 4 shows the following advantageous features:

The richness of one of the mixtures passing through the two channels is zero, that is only pure air is admitted through the latter;

The two throttles are controlled simultaneously by the accelerator pedal, which controls furthermore an arrangement for the gradual increase in richness of the mixture supplied by one of the channels when said pedal has moved beyond a predetermined point of its path in a direction corresponding to the opening of the throttles, said point of the path of the accelerator pedal is that for which both throttles have reached their position of full opening.

In FIGS. 1 to 4, the references designate the following parts: 5 a first passageway or channel feeding carburetted air, 7 a first throttle controlling said first channel, 4 a second passageway or channel feeding pure air and 6 a second throttle controlling said second channel.

The body 3 of the carburettor includes three sections in mutual contacting relationship along horizontal planes to wit: an upper section 3a forming the cover and enclosing two sections 4a and 5a of the air channels, a central body 3b enclosing two further sections 4b and 5b forming continuations of the corresponding channel sections 4a and 5a and a lower section 3c enclosing the two sections 4c and 5c forming continuations of said channel sections 4b and 5b and connected each with one of the separate pipes feeding an internal combustion engine.

No fuel is introduced into the channel 4 which feeds consequently only pure air.

The central body 3b encloses conventionally a constant level float chamber 43; 44 designates a float, 45 a pivotal axis and 46 a blade secured to the float 44 and adapted to rock around the axis 45. The blade 46 is in contacting relationship with a needle valve 47 adapted to close more or less a seat 48 so as to thus adjust the

through-put of fuel fed by a pipe 49 carried by the upper section 3a. The central body 3b encloses furthermore a main jet 12 provided with two lateral oblique input bores 50 and with a gauged output port 51 controlled by a main needle 13.

This main needle 13 is rigid with a rod 30 carrying a collar 60. A spring 59 compressed between the collar 60 and a plate rigid with the body 3a urges the main needle 13 into its lower position closing partly the gauged port 51. Said position is illustrated in FIGS. 1 to 3. Outside the body 3 of the carburettor, the rod 30 extends into a section 29 folded horizontally and engaging the upper end of a vertically sliding rod 28.

The gauged port 51 communicates with a channel 52 formed in the central body 3b and opening into a space or chamber 53 enclosing an emulsion-forming tube 54 provided with lateral ports, while its upper end opens at 56 so as to communicate with the channel 5. The chamber 53 is furthermore connected laterally through a channel 57 with a venturi 58 extending longitudinally inside the channel 5.

The body 3 of the carburettor includes a vertical cylinder 80 inside which is shiftably mounted a piston 16 which defines above it a chamber 32 inside the cylinder 80. A gauged spring 33 urges said piston 16 downwardly.

The carburettor includes an auxiliary jet 14 provided with lateral ports 61 and a gauged axial port 62 opening also into the channel 52. Said auxiliary jet 14 is provided near its lower end with an outer collar 66 in contacting relationship with a tubular member forming part of the body 3b of the carburettor. An auxiliary needle 15 controlled by the piston 16 engages the gauged port 62. It is carried by a rod 64 provided with a groove engaged by circlips 65. A plate 63 is held fast between said circlips 65 and the auxiliary underlying jet 14. A spring 34 fitted between the lower surface of the plate 63 and the upper surface of the collar 66 urges upwardly said plate 63 and consequently also the rod 64. The latter remains therefore constantly in contact with the piston 16.

A duct 31 connects a point of the first output channel 5c on the downstream side of the first throttle 7 with the chamber 32 above the piston 16. 76 designates the idling jet, 68 the corresponding adjusting screw and 69 a braking spring. These form parts outside the ambit of the invention.

9 designates a rotary spindle to which are rigidly secured the first throttle 7 and a lever 11 carrying a bent projecting lug 23. 8 designates another rotary spindle to which are rigidly secured the second throttle 6 and a lever 10 of which one end forms a flap 22. A stop 20 rigid with the lower section 3c of the carburettor limits the rotary movement of the flaps 22 terminating the lever 10 and defines thus the position of the second throttle 16 when fully open. 17 designates a lever turning freely around the spindle 9. 18 designates a rod controlled by the accelerator pedal and pivotally connected with the lever 17. A spring 24 acting tractionally is fitted between the two levers 10 and 17 to which it is hooked so as to normally urge the lever 17 against the bent lug 23.

A bell crank 26 adapted to revolve around a pivot 27 is connected with the lever 17 through the link 25. It may, as illustrated in FIG. 3, engage the rod 28 and, as illustrated in FIG. 4, urge the latter upwardly. A link 19, equal in length to the spacing between the two spindles 9 and 10 and parallel with the line connecting their axes in the plane of the drawing interconnects the two levers 11 and 10 and the whole arrangement is mounted in a manner such that the two throttles 7 and 6 may open simultaneously by equal angles.

The operation of the carburetting system described is as follows: when the engine and the accelerator-controlled rod 18 occupies a position for which the first throttle 7 is set for instance in a half-open position as illustrated in FIG. 2, the reduced pressure prevailing in the channel 5c on the downstream side of said throttle is transmitted

to the chamber 32 through the agency of the duct 31. The piston 16 enters a position of equilibrium which depends on the value of said reduced pressure and on the stress exerted by the gauged spring 33. The auxiliary needle 15 enters consequently also a position which depends on the reduced pressure prevailing in said channel 5c in the section 3c of the carburettor.

Assuming the first throttle 7 remains in its unaltered open position and the speed of rotation of the engine decreases, the reduction in pressure inside said section 3c and consequently inside the chamber 32 is also decreased, so that the piston 16 moves downwardly into a new position of equilibrium together with the auxiliary needle 15. The outline of the needle 15 is designed in a manner such that the downward movement of the needle reduces the cross-sectional area left free at 62 in the jet 14 and this leads to a reduction in the richness of the mixture, which is the result sought for.

When the rod 18 controlled by the accelerator pedal occupies a position for which the first throttle 7 reaches its position of maximum opening (FIG. 3), no reduced pressure is any longer exerted on the downstream side of said first throttle 7 and consequently the needle 15 remains in its lowermost position, whereby the richness of the mixture fed by the channel 5 is at a maximum. Under such conditions, the total mixture includes an excess of air and the engine develops only a fraction of its maximum power.

If the accelerator-controlled rod 18 is pushed still further as illustrated in FIG. 4 in the direction of the opening of the throttles 6 and 7, the latter remain in their fully open position because the flap 22 terminating the lever 10 is arrested by the stop 20. The lever 17 moves then away from its position of engagement with the bent lug 23 on the lever 11 and it continues rocking together with the bell crank 26 which, having engaged the rod 28 raises the latter together with the main needle 13. The outline of said needle is such that its upward movement releases an increasing cross-sectional area in the gauged port 51 of the jet 12 and consequently the richness of the mixture increases and the engine runs at full power. Within said range of operation, the adjustment of the power of the engine is obtained solely by a modification in the richness of the mixture and by no means by a modification in the opening of the throttle or throttles as is the case for conventional carburetors.

In the embodiment illustrated in FIGS. 1 to 4, the main needle 13 begins rising only when the throttles 6 and 7 have reached their fully open position. However, the bell crank 26 may also engage the rod 28 earlier. The rising of the needle 13 begins then enriching the mixture, while the throttles finish their opening movement. The rising of the needle 13 may even be executed entirely during said finishing of the opening of the throttles. The increase in the amount of the mixture admitted into the engine as a consequence of the increase in the opening of the throttles cooperates then in the usual manner in an increase in the power of the engine. However, the increase in the richness of the mixture produced by the rising of the needle 13 remains certainly the predominant reason of the increase in the engine power up to maximum value.

FIG. 5 illustrates a preferred embodiment wherein the means adjusting the feed of fuel in accordance with the pressure of admission into the engine include a needle the position of which is also controlled by the accelerator-controlled rod.

In FIG. 5, the rod 28 includes an upper horizontally bent section 70 to which is secured a rod 71 terminating with a head 72 at its lower end, which engages an opening in the piston 16. The latter is thus subjected simultaneously to the pressure prevailing on the downstream side of the first throttle 7 and to the shifting imparted to the rod 28 by the accelerator-controlled rod 18 at the end of its operative stroke.

The jet 12 of FIGS. 1 to 4 controlled by the needle 13

is replaced in the case of FIG. 5 by a jet 12b showing an unvarying cross-section.

In the embodiments described hereinabove, the channel 4 feeds pure air. The relative cross-sections to be given to the channels 4 and 5 depend on the structure of the engine and on the means provided for introducing the two streams into the engine cylinders, which structure and means do not form part of the present invention. In certain cases the introduction of the totality of the fuel into one stream while the other is constituted by pure air may lead to a defective operation by reason of the excess richness of said one stream. It is then necessary to also introduce fuel into the second stream. Furthermore, it may be necessary, with a view to allowing the engine to develop its maximum power for the two streams the richnesses of which are different for partial powers, to reach equal richnesses under maximum power conditions.

FIG. 6 illustrates an embodiment wherein each of the two channels includes an arrangement for feeding fuel while pressure-controlled means adjust the feed of fuel into one of the channels and further means controlled by the accelerator pedal adjust the feed of fuel into the other channel.

The embodiment illustrated in FIG. 6 differs from that illustrated in FIGS. 1 to 4 through the fact that the jet 12 of FIGS. 1 to 4 controlled by the needle 13 is replaced by a jet 12b of an unvarying cross-section and by a jet 12a through which fuel is fed into the second channel 4. The reference numbers in FIG. 6 include a figure followed by the index *a* so as to designate elements which are similar to the elements of FIGS. 1 to 4 which carry the same reference numbers without said index *a*. In the embodiment according to FIG. 6, the bell crank 26a acts directly on the rod 30a carrying the needle 13a.

Each of said two channels 4 and 5 may also include means for adjusting the richness of the mixture. Each of the channels would then be fed by an arrangement similar to the arrangement feeding the channel 5 as illustrated in FIGS. 1 to 4.

The outlines of the needles 13 and 15 in each of said channels would then be designed in a manner such as to obtain an accurate relationship between the richnesses of the mixtures supplied by both channels for all operative conditions.

For certain applications, it may be of interest to provide inside the channel 4 an arrangement feeding fuel without any adjustment of the free cross-sectional area of the gauged ports of the fuel jet or jets. It is then possible, in the embodiment illustrated in FIG. 6, to cut out in the arrangement feeding the channel 4 the needle 13a in which case the jet 12a becomes a jet with an unvarying cross-sectional area.

The design of the arrangement provided for modifying the feed of fuel in the two channels 4 and 5 is selected in accordance with the structure of the engine to be fed.

In the embodiments described hereinabove, by way of example, the modification in the feed of fuel has been obtained by means of a needle adjusting the free cross-sectional area in the opening of a fuel-feeding jet. Said adjustment may however be obtained through any other means incorporating a jet with an opening of an adjustable cross-section.

The above-described arrangements illustrated in the drawings and adapted to provide for the simultaneous rotation of the two throttles 6 and 7 may be modified or replaced by a different mechanism such that the two throttles do not rock simultaneously by equal angles.

If the engine includes more than two separate admis-

sion channels, the carburettor may also include more than two gas channels, each of said channels being connected with one of the admission pipes of the engine, and being possibly equipped with fuel-feeding means and with means adjusting the feed of fuel of the type incorporated with the channels 4 and 5 in the above described arrangements.

I claim:

1. In combination with an internal combustion engine provided with at least two input pipes and an accelerator-controlled member, a carbureting system comprising an admission channel feeding air into each input pipe, a throttle controlled by said accelerator-controlled member in one of the channels, a fuel-fed float chamber, a fuel chamber, means of an adjustable cross-section connecting said fuel chamber with the float chamber, means connecting said fuel chamber with said one channel on the upstream side of the throttle therein and means controlled by the pressure of the downstream side of the throttle in said one channel and controlling the means of an adjustable cross-section to increase said cross-section when last-mentioned pressure decreases and reversely.

2. A carbureting system as claimed in claim 1, wherein the input pipes being two in number, the other admission channel is fed with pure air.

3. A carbureting system as claimed in claim 1, comprising a throttle in the other channel, controlled simultaneously with the first-mentioned throttle by the accelerator-controlled member, means adapted to feed fuel out of the fuel chamber into a predetermined channel and means controlling last-mentioned means and controlled by the accelerator-controlled member, when the latter has reached a predetermined point of its path in the direction of opening of the throttles, to increase the fuel richness of the mixture formed in said predetermined channel.

4. A carbureting system as claimed in claim 1, comprising a throttle in the other channel, controlled simultaneously with the first-mentioned throttle by the accelerator-controlled member, means adapted to feed fuel out of the fuel chamber into a predetermined channel and means controlling last-mentioned means and controlled by the accelerator-controlled member, when the latter has reached a position for which both throttles have reached their fully open position, to increase the fuel richness of the mixture formed in said predetermined channel.

5. A carbureting system as claimed in claim 1, comprising means operatively connecting the accelerator-controlled member with the means of an adjustable cross-section.

6. A carbureting system as claimed in claim 1, wherein the input pipes are two in number and comprising means feeding fuel into the other channel under control of the accelerator-controlled member.

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