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J. H. HOLLOWAY

GASEOUS FUEL MIXING MANIFOLD

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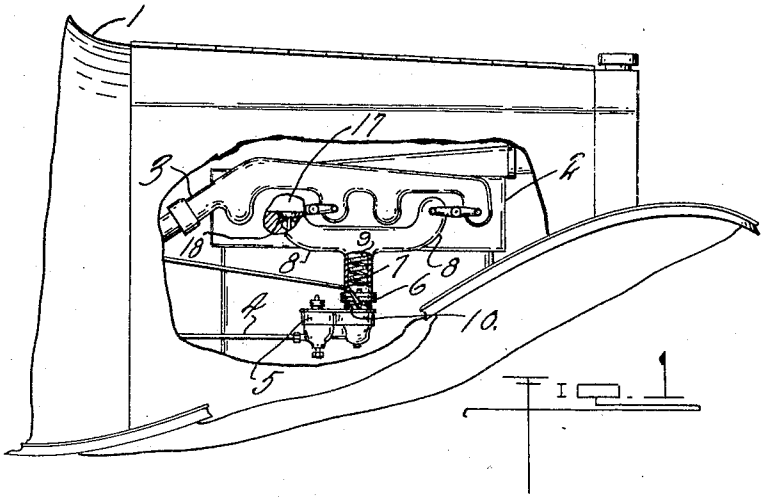


FIG. 1

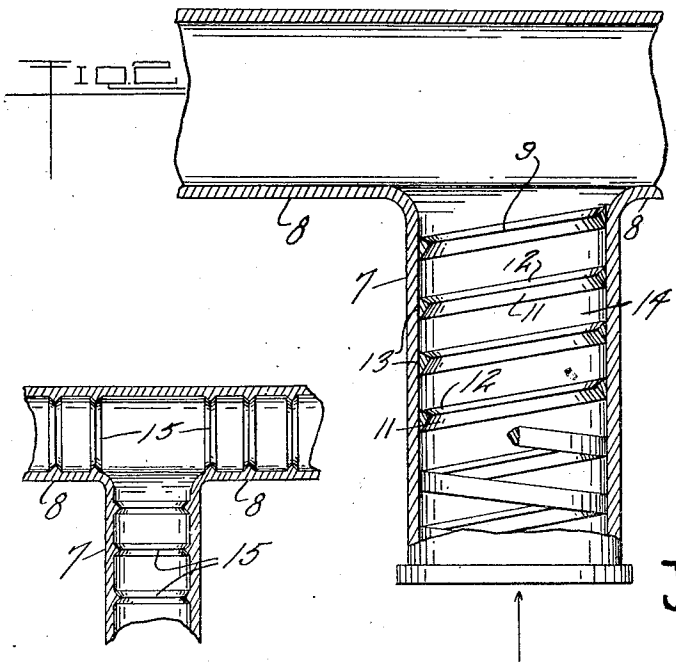


FIG. 2

FIG. 3

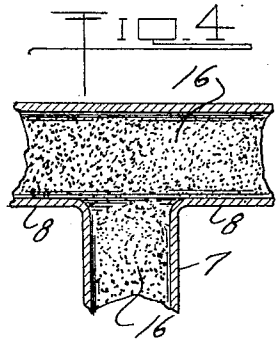


FIG. 4

John H. Holloway
INVENTOR
BY
Geo. E. Kirk
ATTORNEY

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UNITED STATES PATENT OFFICE.

JOHN H. HOLLOWAY, OF LA FAYETTE, INDIANA.

GASEOUS-FUEL-MIXING MANIFOLD.

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This invention relates to fuel feeding for approximating a homogeneous mixture of the fuel and combustion supporting gas.

This invention has utility when incorporated for the delivery of fuel to internal combustion motors, especially of the multi-cylinder type.

Referring to the drawings:

Fig. 1 is a fragmentary view of a motor vehicle having an embodiment of the invention incorporated therein;

Fig. 2 is an enlarged view of a portion of the intake manifold of Fig. 1, showing the fuel commingling feature therein;

Fig. 3 is a view of an intake manifold, with parts broken away, showing as carrying therein an embodiment of the fuel commingling device; and

Fig. 4 is a view similar to Fig. 3, with the commingling device as a region of internal projections.

The motor vehicle 1 is shown as propelled by multi-cylinder internal combustion motor 2 having exhaust manifold 3. Liquid fuel supply line 4 extends to carburetor 5 having connection 6 assembling with riser portion 7 of intake manifold having branches 8 to the motor 2.

For equipment as now in use, the invention is conveniently adapted by inserting to an extent desired in the intake manifold helix 9. Throttle 10 of the usual butterfly type, at any fractions of fully open, tends to deflect the mixture of liquid fuel as more or less thoroughly subdivided in the combustion supporting gas or air, toward the side wall of the riser 7 toward which the delivery side of the throttle disk as a valve is directed. This tends to throw the heavier portions of the mixture more against such side wall of the riser 7 of the intake manifold for precipitation or condensing of the fuel out of the gas and to cling to such wall. This precipitation or condensation leaves a portion of the main current leaned as passing from the intake.

This throwing of the fuel out of the mixture is variable. The character of the atmosphere, especially as to humidity, is a factor in the fuel take up at the vaporization in the carburetor. Temperature of both the fuel and the air are other factors, while the character of the gasolene or liquid fuel, as well as the speed and motor load also react to affect the efficiency of the fuel consumption. As such heavier matter in the fuel-gas mixture flows into the intake, its mass or gravity, may tend to lag behind, instead of keep up with the speed of the vehicle, thus tending to cause undue deposit upon the after wall of the intake.

The helix 9 is herein shown as an additional element of right triangular cross-section, having longer side 11, from the inwardly projecting right angle portion, as the side for deflecting the incoming mixture as cross currents into the central flow. This marginal disturbance is peripherally of the flow incited from the annular regions of this helix 9. Side 12 extending outwardly from the right angle is more abrupt from the line of the flow. Hypotenuse 13 of this helix 9 approximates outer cylindrical contour, in practice somewhat larger than the interior of such riser or branch portions of the intake in which to be inserted, so that as contracted for insertion, the wire of this helix 9 expands for snugly anchoring such helix in the mounted position in the intake interior.

The flow of the fuel mixture is axial of the intake passages. Helix sides 11 inwardly direct the peripheral portion of such current flow, and, as to deposited fuel particles, slightly swirls and urges such together as collections which move up to the right angle edge of reduced adherence, and are thence blown off such edge and inward toward the central region of the flow for re-commingling or reatomization therein. Furthermore, this restricted and higher velocity region at the edge of the helix 9 as inwardly projecting, induces draft pull into the current flow up along the side 12 into the mixture. A region 14 of slightly lower pressure is thus created between the wraps of the helix into which the flow after passing the inwardly extending edge is thus urged to expand for collection of the condensation and moving of such along the incline 11 to the next edge for a repetition of this commingling operation. The feeding off of the condensation from the inwardly projecting edge of the helix 9 has the flow of such heavier matter directed into the central portion of the current flow, while the lower pressure region as beyond such edge and of larger diameter tends to suck thereinto the non-fuel carrying or lighter portions of the gases. It will thus be seen that this action is automatic and selective for causing those gas portions which are furthest from satura-

tion to be active in the condensation pick-up. Again this peripheral restriction and expansion along the direction of flow, inasmuch as the received flow is more or less central, has but slight tendency for swirling, but with a markedly perceptible and really effective turbulency promotion throughout the cross-section of the current flow. Accordingly these major and minor flow actions are jointly cumulative for insuring uniformity in the quality of the fuel mixture. In multiple delivery from such intake, as to different motor cylinders, there is thus insured such uniformity in fuel mixture quality as metered by the carburetor, a condition for smooth running, with efficient uniform impulses delivered to the crank shaft.

Turbulency or straight flow disturbance means may be incorporated as a structural feature integral with the manifold of the intake in the form of the accessory of Figs. 1, 2, or as a different type, as integral rings 15 (Fig. 3), or as a lining of projections 16 (Fig. 4), and throughout or to the extent desired.

Combustion chamber 17 as enlarged by the descent of the piston of the motor 2 in the cylinder from such chamber, induces suction past poppet valve 18 as controllably opened, to bring about the mixed fuel and air rapid flow in the intake manifold past the controllable throttle from the adjusted carburetor. This turbulency depends for its velocity upon the motor suction, and brings about improved conditions of motor operation and control.

There is the insured uniformity in quality of mixture of fuel to the several motor cylinders. This fuel uniformity means such identity of mixture for the different cylinders upon starting from a cold motor that the firing is regular. The motor will idle at very much lower speeds with the device of this invention, or under the method of turbulency herein disclosed, than when such is omitted. The motor running is smooth at all speeds and loads, and it is probably resultant from this latter condition that hill climbing power and low speed heavy loads do not cause mis-firing or untoward motor operation. While there may be construed as reduction in the cross-sectional effective area of the intake manifold as hereunder, such does not seem to throttle or check the fuel flow general uniform velocity in any detrimental manner as approximately constant or uniform throughout the lineal extent as between the carbureter and throttle, for such is not detectable in fuel adjustment to detract from the speed. However, there is added mileage economy in the quantity of fuel required. It is to be noted there is such current flow control that lateral collections or tendency for such collections are brought back or precluded from leaving the main stream or current flow. This is a feature of especial value before branching of the manifold.

What is claimed and it is desired to secure by Letters Patent is:

1. A mixing device comprising an intake manifold adapted to be inserted between the carburetor and the cylinder of a multi-cylinder internal combustion engine of a motor vehicle, said manifold having a riser from the butterfly discharge valve of the carburetor, said manifold riser further having a central axial clearway throughout upward from said valve in the vertical extent thereof, said manifold riser being provided with inwardly extending means peripherally arranged within the riser vertical extent to impart such turbulency to the fuel mixture as to neutralize unbalancing of the fuel richness from butterfly valve action and from vehicle travel action.

2. A mixing device comprising an intake manifold adapted to be inserted between the carburetor and the cylinder of a multi-cylinder internal combustion engine of a motor vehicle, said manifold having a riser from the butterfly discharge valve of the carburetor, said manifold riser further having a central axial clearway throughout upward from said valve for maintaining uniform pressure with continuous upward flow, said manifold riser being provided with helical rib forming means peripherally arranged within the riser with the opposite walls tapering from said ribs to provide a sharp, inwardly extending, continuous deflector, and imparting such turbulency to the fuel mixture as to neutralize unbalancing of the fuel richness from butterfly valve action and from vehicle travel action.

3. A mixing device comprising an intake manifold adapted to be inserted in the gas and fuel conduit of the intake manifold for a multi-cylinder internal combustion motor, and a helix of right triangular form in cross-section peripherally expanded into said manifold with the hypotenuse of the helix engaging the wall of the manifold and the longer leg of the helix inwardly extending in the direction of the gas flow thereover in the manifold.

In witness whereof I affix my signature.

JOHN H. HOLLOWAY.