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INLET MANIFOLD FOR INTERNAL COMBUSTION MOTORS

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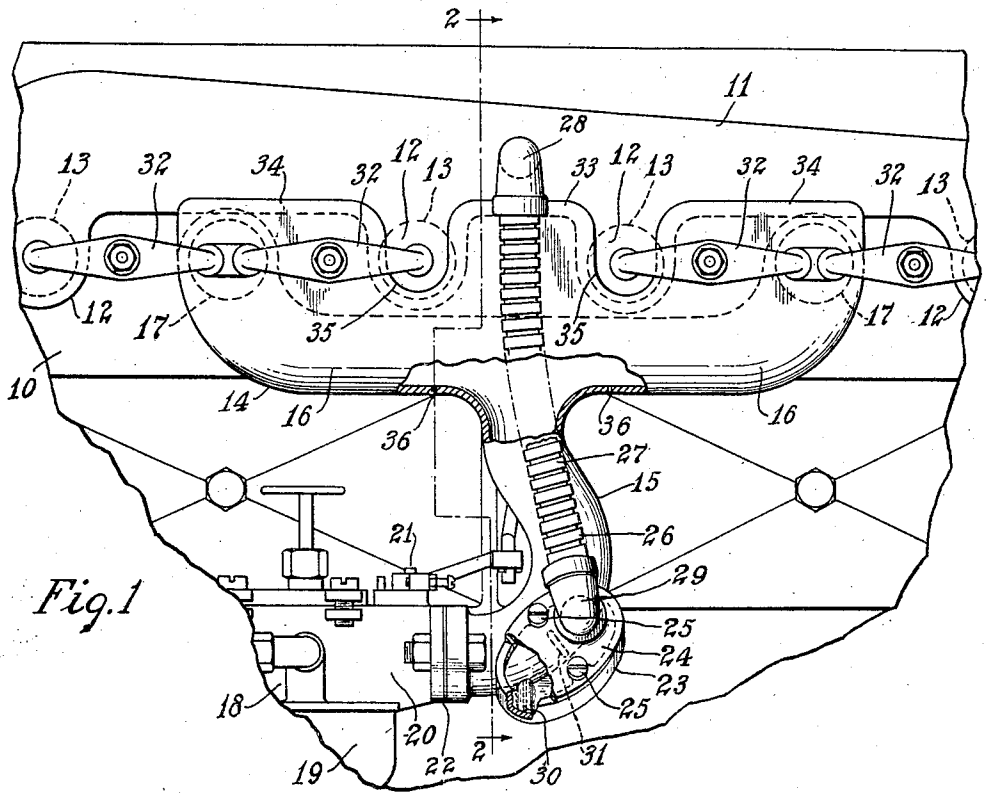


Fig. 1

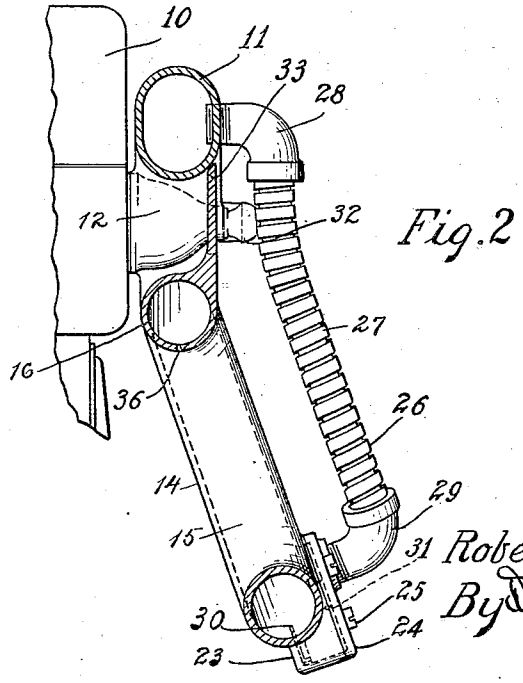


Fig. 2

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UNITED STATES PATENT OFFICE.

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INLET MANIFOLD FOR INTERNAL-COMBUSTION MOTORS.

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This invention relates to internal combustion engines and more particularly to fuel supply means therefor.

Inlet pipes for internal combustion engines generally operate to conduct a combustible mixture of air and semivolatile liquid fuel such as gasoline, drawn by suction of the pistons from a carburetor. These pipes, known in the art as manifold pipes, necessarily have one or more bends. It is known that when an engine is idling and the throttle is nearly closed, the fuel mixture in the intake pipes is traveling at or near its lowest rate of speed, and the unvaporized portion of the gasoline or similar fuel tends to separate and collect on the walls of the manifold, particularly at and in the immediate vicinity of the lower inner sides of the bends or turns in the manifold, where eddies occur, this phenomenon being commonly known as "loading". This loading often causes the motor to fire irregularly and to ultimately stop. It is also the cause of "choking" and of poor acceleration when the throttle is suddenly opened, because the excess fuel tends to unduly enrich the mixture. When the mixture is traveling at high velocity, some deposition of fuel in the form of a film on the manifold walls takes place. No simple remedy for these conditions that will adequately prevent loading has heretofore been proposed. Loading can be overcome by a sufficient degree of pre-heating but at the expense of unduly reducing the volumetric efficiency under open throttle conditions.

An object of the invention is to supply a proper mixture of fuel to the cylinders of an internal combustion engine at all speeds.

Another object is to reduce the deposition of liquid fuel upon the walls of the intake pipes of a motor vehicle.

A feature of the invention is an intake manifold for internal combustion engines which includes means for producing relatively small jets of air or other fluid at the place or places where the fuel tends to collect or to form a film. Preferably these jets are employed in combination with manifold heating means which may be of a special character constituting another feature of the invention and designed advantageously to localize the heat and so to control it as to avoid overheating.

In the accompanying drawings,—

Fig. 1 is a side elevation, partly broken away and in section, showing a motor equipped with a preferred form of my invention;

Fig. 2 is a section on the line 2—2 of Fig. 1.

In the drawings, 10 is the cylinder-block of a four-cylinder motor having an exhaust-manifold 11 provided with branches 12, 12, which connect with the four exhaust-ports 13, 13, and an inlet manifold 14 provided with an uptake trunk portion 15 and horizontal branches 16 connecting with the two inlet ports 17, 17, these manifolds being held in place by the usual T-clamps 32. 18 is an ordinary form of spray carbureter having a float-bowl 19, a mixing chamber 20 and a throttle-valve 21 at the outlet of said chamber, the carbureter in this instance being of the horizontal or side-outlet type bolted to the inlet manifold with a flanged connection at 22, and the trunk 15 of the manifold having a bend or turn at its lower end to conduct the mixture into the upright portion of said trunk.

The anterior portion with reference to the direction of flow of the combustible mixture, in this case the lower bend, of the inlet manifold being the coolest portion where the most intense evaporation is taking place, and where the unvaporized fuel in the mixture tends to be thrown out against the lower wall of the bend by gravity and inertia or centrifugal action, I furnish a substantially uncooled supply of exhaust heat to this portion by providing it with a local jacket or heating chamber 23 having body walls cast integrally with the manifold trunk 15, and a removable cover 24 held in place by a pair of screws 25, 25, this chamber being directly connected with the exhaust manifold 11 through a branch exhaust pipe 26 consisting of a piece of flexible metal tubing 27 and a pair of elbow-fittings 28, 29 telescoped with its ends and threaded into apertures in the exhaust manifold 11 and cover 24 respectively. Chamber 23 embraces principally the front and under side of the trunk 15 at the lower bend and it terminates on the back side about at the median plane of said trunk in order that its interior may be fully accessible for cleaning or removal of the cover 24.

The branch exhaust pipe 26 enters chamber 23 at or near the upper end of the latter, and the products of combustion after giving up a considerable portion of their heat to the walls of the chamber and especially to the lower wall of the bend in the intake passage, against which they directly impinge on entering, find an outlet into the combustible mixture in said passage through a small fixed orifice 30. Preferably this orifice is located at or near the lower side of the bend, so that its gaseous jet will tend to pick up any liquid fuel which is following the wall of the passage in that locality, and it is also positioned at or near the lowest point of the heating chamber 23 so as to drain said chamber of the water of condensation from the exhaust gases which would otherwise tend to collect. 31 is a baffle extending part-way across the chamber 23 for deflecting the gases therein and increasing the heat transmitting surface.

An arrangement for supplying a moderate degree of heat to the upper or posterior portion of the inlet manifold 14 is provided by casting on the upper front part of its horizontal section a web structure or shield comprising a middle member 33 and two end members 34 partly separated by a pair of recesses 35 to accommodate the adjacent ends of the two middle T-clamps 32, the members 34 being suitably perforated for the passage of the stems of said clamps. This web structure is located in the outer plane of the exhaust manifold as will be evident in Fig. 2. The upper edge of this web structure is brought close to the exhaust manifold, so that a substantial closure of the outer side of the space included between the inlet and exhaust manifold is effected. Cooling currents of air are thereby substantially excluded from said space and the transmission of heat from the exhaust manifold to the webbed inlet manifold, both by convection in the enclosed air space and by radiation, is promoted. By forming this web structure integrally with the inlet manifold, its conductive efficiency is increased as compared with a separate shield and the manifold and shield can be manufactured and handled as a unit.

Other heating expedients in place of or in addition to those described may be resorted to. The air-supply to the carbureter may, for example, be heated by the usual exhaust pipe stove (not shown), this type of heating being useful mainly in promoting vaporization in the carbureter itself, but being of little effect in avoiding deposition of liquid fuel in the intake passage unless carried to an extreme which unduly lowers the volumetric efficiency.

In the lower walls of the horizontal branches 16, 16 of the inlet manifold, at or immediately beyond and on the inner sides of the bends or turns from the trunk 15 into these branches, I provide a pair of small, fixed at permanently-open air-bleeder orifices 36, 36, whose function is to supply jets or cold air for picking up or atomizing the pools of liquid fuel which tend to collect at these points during idling or slow running of the motor, a tendency due to or promoted by the occurrence of eddies at these bends. These film-breaking orifices have been found to be very effective for the purpose, especially as the velocity of the jets is greatest when most needed, namely when the throttle is in a nearly closed position giving a strong suction while the mixture is traveling at a slow speed through the manifold. While these jet orifices may be used in the same or an analogous position in any type of inlet manifold for liquid-fuel and air mixtures, it is preferred to employ them, as shown, in combination with means such as the jet-orifice 30 for injecting a supply of cooled products of combustion into the mixture on the posterior side of the throttle, since the added air-supply through the orifices 36 is compensated by the dilution of the mixture through the orifice 30, and thus the motor may be held to a low minimum power without irregular firing, by suitable adjustment of the throttle valve. The orifices 36 being of relatively minute size, do not admit sufficient air to sensibly affect the mixture ratio through the greater part of the range of operation. It will also be evident that these auxiliary air-openings in the manifold contribute to the attainment of good suspension and vaporization of the fuel with the use of manifold wall-heating expedients affording a moderate degree of heat. The size of the holes 30 and 36 depends largely upon the size of the motor. For a Ford motor the hole 30 may be made by a No. 56 U. S. standard wire-gauge drill and the holes 36 by a No. 65 drill, but these sizes may be considerably varied.

I do not limit myself as to the exact character and arrangement of the several-described expedients nor to the use of all of these features in combination.

I claim:

1. The combination of an internal-combustion motor, a liquid-fuel carbureter, an inlet passage having a turn, and a film-breaking air-bleeder orifice at the lower side of said turn, said orifice being permanently open to the atmosphere.

2. The combination of an internal-combustion motor, a liquid-fuel carbureter, an inlet pipe having a turn connecting an uptake portion with a posterior, substantially horizontal portion thereof, and a relatively-minute, air-jet orifice at the lower side of said turn, said orifice being permanently open to the atmosphere.

3. An inlet manifold for internal-com-

bustion motors having an uptake portion, lateral branches leading from its upper end, and small air-jet orifices on the lower posterior sides of the turns from said uptake portion into the branches, said orifices being permanently open to the atmosphere.

4. The combination of an internal-combustion motor, a liquid-fuel carbureter, an intake pipe connecting said carbureter with the motor, a film-breaking air-jet inlet to said pipe, and means for admitting to said pipe a compensating jet of products of combustion.

5. The combination of an internal-combustion motor, a liquid-fuel carbureter, an intake manifold having an uptake portion connected with the carbureter and lateral branches connected with the motor, air-jet orifices on the under sides of the turns from said uptake portion into the branches, and means for admitting a supply of products of combustion into the combustible mixture in said uptake portion.

6. The combination of an internal-combustion motor having an exhaust passage, a liquid-fuel carbureter having a horizontal outlet, an inlet pipe provided with a heating chamber and having an uptake formed with a bend at its lower end connecting with the carbureter, a branch connection from the exhaust passage for supplying hot gases to said chamber, and a jet outlet from said chamber into the inlet pipe on the lower side of said bend.

7. An explosion-motor intake pipe having an uptake portion formed with a bend at its lower end, and a heating jacket localized substantially at said bend and having an inlet for hot exhaust gases at its upper end and a highly-restricted outlet leading from its lower end into said intake pipe.

8. The combination of an internal-combustion motor having an exhaust pipe, and a separate inlet pipe integrally formed with a shield covering the space between the two pipes and located in the outer plane of the exhaust pipe.

9. The combination of an internal-combustion motor having an exhaust manifold provided with downwardly-extending inlet branches, a separate inlet manifold located below said exhaust manifold and integrally formed with sections of a shield structure located in the plane of and between said branches and covering the space between the two manifolds, and clamps common to the two manifolds for holding them in place.

10. An inlet manifold for internal-combustion motors having an uptake trunk portion, a laterally-branched upper portion thereon, and an upwardly-projecting shield structure integrally formed on said upper portion and comprising a middle section and two end sections separated by recesses for accommodating the branches and clamps of an exhaust manifold.

11. The combination of an internal-combustion motor having an exhaust passage, a spray carbureter, an inlet manifold, means for imparting exhaust heat to the posterior portion of said inlet manifold, and permanently-open gaseous-jet means to assist in holding the fuel in suspension in said manifold adjacent to the heating means.

12. The combination of an internal-combustion motor, a spray carbureter, an inlet-manifold having an uptake portion provided with a lower bend and posterior lateral branches at its upper end, means for separately heating said bend and the posterior portion of said manifold, and jet inlets through the walls of said manifold at the lower side of said bend and at the lower posterior sides of the turns from the uptake portion into said branches.

13. In an internal combustion engine fuel supply system, a carburetor, an intake pipe having an uptake portion including a lower bend, connecting said carburetor to said engine, an exhaust manifold, and a conduit connecting the lower portion of said bend to said exhaust manifold, said conduit including a small duct adapted to supply a spray of gas to the interior of said intake pipe for vaporizing excess fuel.

In testimony whereof I have signed my name to this specification.

ROBERT M. PIERSON.