Oct. 8, 1935. H. H. TIMIAN 2,016,696

ENGINE

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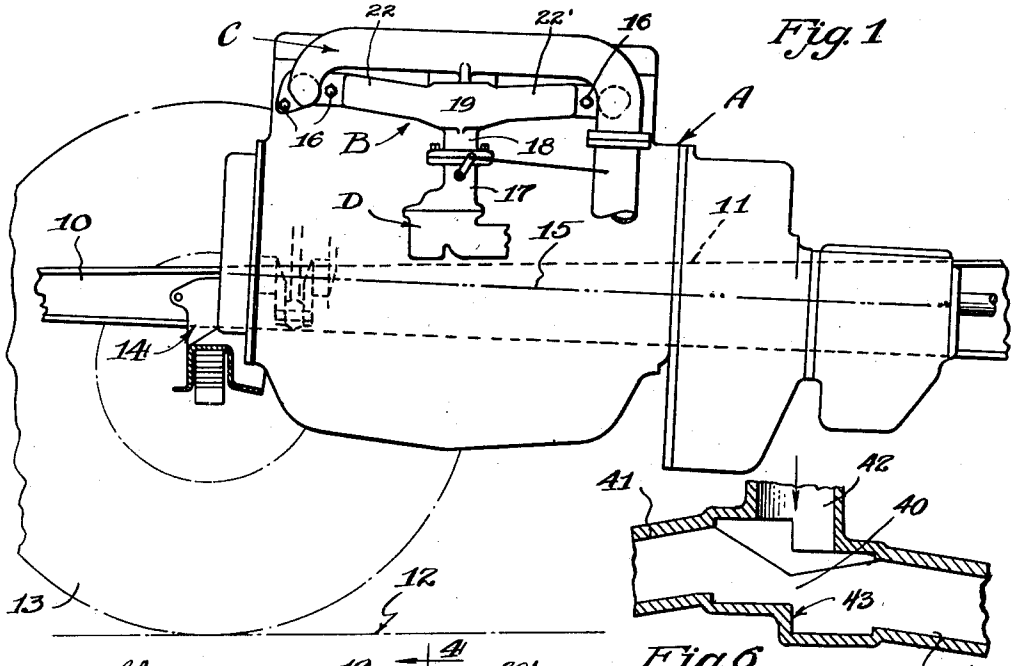


Fig. 1

Fig. 6

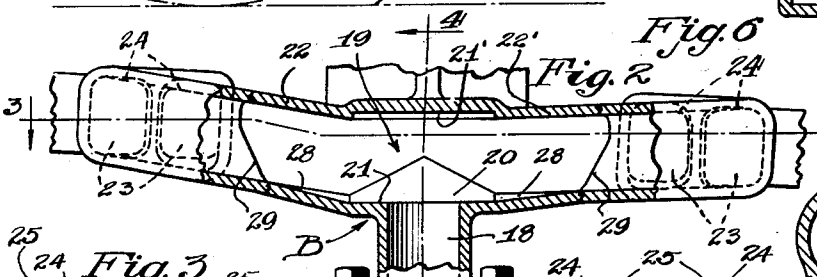


Fig. 2

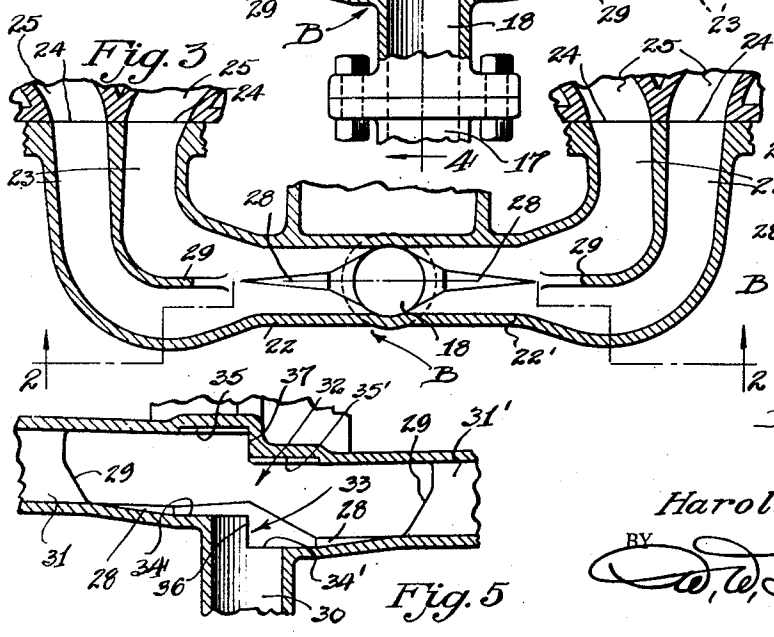


Fig. 3

Fig. 5

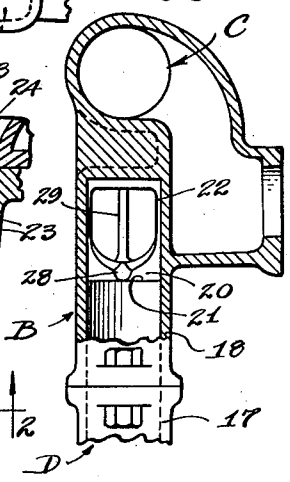


Fig. 4

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ENGINE

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14 Claims. (Cl. 123—52)

My invention relates to engines and more particularly to the fuel mixture distributing system for an internal combustion engine, my present invention in its more particular aspects relating to the construction of the intake manifold structure employed in such fuel mixture distributing systems.

Engines employed with automotive vehicles and also utilized as the power unit for marine vessels, are usually mounted on a chassis in such a way as to permit the power take-off shaft to be downwardly inclined to the traction elements. In the case of an automobile, the propeller shaft is usually inclined downwardly towards the rear axle of the vehicle, and in a boat or other marine vessel the propeller shaft is also usually inclined downwardly towards the propeller. It is usually preferable to so support the engine from the chassis that the longitudinal axis of said engine is inclined with respect to the normal horizontal plane of the chassis in order to eliminate the installation of complicated universal couplings in transmitting the drive. In the particular art for which the present invention was developed, it was noted that the usual type of intake manifold was not entirely satisfactory since uniform distribution of wet fuel could not be attained with that degree of efficiency that is desirable at the present time. This unsatisfactory engine performance was more noticeable at idling speeds of the engine and during engine acceleration due to the fact that the wet fuel precipitate tended to collect at one end of the manifold or tended to supply certain of the engine cylinders, in particular the rear cylinders of the engine, with a richer fuel mixture than others. In the conventional manifold unequal wet fuel distribution is particularly noticeable on starting.

It is an object of my present invention to facilitate the distribution of fuel precipitate to the cylinders of a multi-cylinder engine by providing an improved fuel mixture distributing system therefor, in which the inclination of the engine with respect to the normal horizontal plane of the chassis has no effect on the wet fuel precipitate distribution.

Another object of my present invention is to provide an intake manifold structure for an engine of the character described in which the fuel mixture conducting portions of the manifold are adapted to receive the fuel precipitate during engine idling, during engine acceleration and during part throttle engine operation in such a manner as to effect a uniform distribution of the wet fuel to the engine cylinders and to substantially counteract the tendency of the wet fuel to flood one end of the manifold structure. A further object of my present invention is to provide an intake manifold structure in which uniform wet fuel distribution may be had by providing a puddling chamber for collecting wet fuel precipitate, which is so constructed as to provide a surface on which the fuel is precipitated and collected that is constructed to lie in a horizontal plane and substantially parallel with the normal horizontal plane of the chassis whereby to evenly distribute the fuel precipitate over said floor and to prevent the tendency of said fuel precipitate to collect an excessive amount near one end of the puddling chamber from which the tendency of supplying some of the engine cylinders with an excessive amount of wet fuel to the detriment of the other cylinders is eliminated.

My present invention in its more particular aspects relates to a manifold structure of the updraft type in which the carburetor or fuel mixture forming and distributing device is located below the manifold structure, the fuel mixture being conducted upwardly from the carburetor to the lateral distributing runners of the manifold by means of an upwardly extending primary fuel mixture conducting means.

A still further object of my invention is to provide an improved intake manifold structure having a fuel mixture distributing chamber provided with a stepped floor forming a multi-level puddling chamber, each level portion thereof extending in a horizontal plane.

It may be further noted that the lateral runners in the present embodiment of my invention are both inclined upwardly from the distributing chamber and puddling chamber, so that the wet fuel precipitates in both of said lateral runners tend to drain toward said distributing or puddling chamber instead of toward one end of the manifold, the slope of said runners being such as to induce this desired flow of wet fuel even though the vehicle is traveling over the maximum grade customarily encountered when touring in mountainous districts.

For a further understanding of my invention reference may be had to the accompanying drawing illustrating one embodiment of my invention, and in which:

Fig. 1 is an elevational view of an internal combustion engine and associated vehicle chassis, this figure showing the relationship between the engine and chassis and further illustrating an intake manifold structure assembled to the engine and which is constructed in accordance with my present invention,

Fig. 2 is a longitudinal vertical sectional view through the manifold structure illustrated in Fig. 1, and taken on the line 2—2 of Fig. 3,

Fig. 3 is a horizontal sectional view through said manifold structure taken substantially on the line 3—3 of Fig. 2,

Fig. 4 is a vertical transverse sectional view taken substantially on the line 4—4 of Fig. 2,

Fig. 5 is a detail fragmentary vertical longi-

tudinal sectional view of a modified construction showing a stepped puddling chamber, and

Fig. 6 is a similar view showing the stepped construction as incorporated in a manifold of the downdraft type.

Certain phases of my invention as will be more apparent hereinafter have particular significance with an engine in which the crankshaft axis is inclined to the horizontal.

I have chosen for purposes of illustration to show my invention as being incorporated with an engine employed for propelling an automotive vehicle, but it will be obviously understood that the principles of my invention may be incorporated with engines other than those used with automotive vehicles such as stationary and marine engines, and the reference in the specification and claims to a chassis for supporting said engine in its broadest aspects refers to any engine support such as carried by land, water, or air vehicles. In the present embodiment of my invention I have illustrated a vehicle chassis 10 having a normal horizontal plane 11 which extends substantially parallel with the ground level 12, the chassis frame 10 being supported from the ground by the usual traction elements 13. An engine A is preferably supported from the chassis 10 by suitable supports or brackets, one of said brackets being shown as at 14. It is customary in automotive vehicles to so support the engine as to tilt the same toward the rear of the vehicle, this being clearly illustrated in Fig. 1 in which it will be noted that the longitudinal crankshaft axis 15 of the engine is inclined to the normal horizontal plane 11 of the chassis.

My present invention especially relates to the fuel mixture distributing system for such an engine and it will be noted that I have provided an intake manifold structure especially adapted for assembly with a multi-cylinder engine, this intake manifold structure B being secured to the engine A in the usual manner by means of a plurality of bolts or other fastening devices 16. Preferably an exhaust manifold structure C is also provided for assembly with the engine A in the usual manner. In the illustrated embodiment of my invention, I have provided a fuel mixture forming and distributing device D of the updraft type, this device being usually referred to as a carburetor and is provided with the upwardly extending extension 17 adapted to connect the carburetor with the primary fuel mixture conducting means of the manifold structure, said primary fuel mixture conducting means being designated by the reference character 18 and extending upwardly from the carburetor extension to the distributing chamber 19 of the manifold structure. The distributing chamber 19 includes a puddling chamber 20 having a floor portion 21 and a roof portion 21' preferably located opposite to the outlet of the primary fuel mixture conducting means 18, said floor and roof portions preferably being constructed to lie parallel with the horizontal plane of the chassis. The oppositely extending lateral runners 22 and 22' communicate respectively with the distributing chamber 19 and extend substantially longitudinally of the engine A. Suitable port runner portions 23 connect the lateral runners 22 and 22' with the engine, said engine preferably being provided with suitable intake ports 24 communicating with the engine intake passages 25 communicating to the engine cylinders (not shown). The puddling chamber 20 is preferably provided with an extension 26 forming a distributing groove for controlling the fuel flow during engine operation, this groove acting to direct the wet fuel so that the same can be acted upon by the split 29 to properly distribute the fuel to the engine cylinders. The puddling chamber or recess is preferably diamond shape in plan and is provided with apices extending towards the lateral runners for flowing the wet fuel precipitate in a prescribed path, the runners each being provided with a "split" 29 or other means for dividing the fuel stream for distribution to the engine cylinders.

It will be noted that the lateral runners 22 and 22' are both inclined upwardly away from the distributing chamber 19 and toward the ends of the engine. Due to the inclination of the engine with respect to the horizontal plane of the chassis the runners 22 and 22' are differently inclined, (see Fig. 2) that is, one of said runners is inclined to this plane at a different angle than the other of said runners. The inclination of these lateral runners is such that longitudinal tilting of the vehicle which carries the engine during normal operation of said vehicle when moving over hilly ground which is not level, the said runners are both substantially inclined upwardly with respect to the level ground and therefore uniform distribution of the wet fuel may be had during substantially all normal operation of the vehicle. It is obvious that there may be some occasions where the vehicle is climbing a steep grade that the said runners will not be both inclined upwardly away from the distributing chamber with respect to level ground, but under this condition, the engine is operating generally with wide open throttle and the tendency of the fuel mixture to precipitate and collect along the floor of the runners and in the puddling chamber is at a minimum. Usually the runner leading to the front cylinders of the engine is inclined a greater amount with respect to the horizontal plane of the chassis than the rear runner, but it is customary to design manifolds constructed in accordance with this ivention with a forward runner having an inclination with this normal horizontal plane of the chassis with a factor of safety of about two degrees, that is, the runner is inclined at an angle of about two degrees more than that normally required so as to provide a sufficient factor of safety to take care of about one degree variation resulting from a loading of the vehicle.

A manifold structure of the character described above facilitates engine operation and more particularly improves part throttle engine operation and considerable improvement in the operation is noted on starting the engine and during acceleration by reason of the uniform distribution of the wet fuel precipitate to the various cylinders of the engine. On starting the engine it is found that uniform amounts of wet fuel are swept into the engine cylinders and a tendency of more wet fuel to sweep in the rear cylinders, than into the forward cylinders of the engine as is the case with manifold structures heretofore employed in which the floor of the puddling chamber is inclined to the horizontal plane and in which fuel precipitate tends to collect at one end of the puddling chamber, is substantially eliminated for the reason that equal amounts of fuel precipitate are accumulated in both of said lateral runners, and because even though all the wet fuel is drained into the puddling chamber, it is evenly distributed over the floor of said puddling chamber. The inclination of said runners prevents the draining

of wet fuel from one runner into the other or lower runner. Greater fuel economy results from the employment of a manifold structure of the character described and the prevention of crankcase dilution will add considerable to the life of the engine as well as improve the fuel economy.

In Figs. 5 and 6 I have illustrated a modified form of construction in which the fuel mixture distributing chamber is provided with a stepped construction whereby to obviate the necessity of having runners which are differently inclined with respect to a horizontal plane, Fig. 5 showing an updraft manifold while Fig. 6 shows a downdraft manifold.

With reference to Fig. 5, 30 designates the upwardly extending primary fuel mixture conducting means or riser, 31 and 31' designate the lateral runners, and 32 designates the fuel mixture distributing chamber, which is formed with a stepped construction as at 33 whereby to form two floor surfaces or levels 34, 34' and two roof surfaces or roof levels 35, 35', said floor and roof levels being respectively joined by the vertical wall portions 36 and 37. It will be noted that the runners are constructed to lie at different levels, runner 31 being aligned substantially with the floor and roof levels 34 and 35, while runner 31' is aligned substantially with the floor and roof levels 34' and 35', and said runners are thus arranged to be both inclined an equal amount with respect to the horizontal.

In Fig. 6, I have provided a fuel mixture distributing chamber 40 and downwardly inclined runners 41 and 41', the primary fuel mixture conducting means 42 extending downwardly to the distributing chamber which is provided with a stepped puddling chamber as at 43 for accomplishing the same result as that produced by the construction shown in Fig. 5.

It will be noted that the floor portions of the distributing chamber extend horizontally and a portion of the precipitated fuel will tend to cling to this surface. Obviously fuel in excess of that which clings to the floor by capillary attraction will drain off and be subsequently returned to the carburetor in the case of an updraft carburetor as used with the construction illustrated by Fig. 5. The manifold shown in Fig. 6 may tend to collect more precipitate on the lower floor portion, but it will be remembered that for the most part there is no excess fuel precipitated to be accumulated on these floor portions, and in fact, the total fuel precipitated will most generally all adhere to said floor portions.

In its broadest aspects I do not limit my invention to the particular showing as herein described and illustrated in the accompanying drawing, as it will be apparent to those skilled in the art to which my invention pertains and various modifications and changes may be made therein without departing from the spirit of my invention or from the scope of the appended claims.

What I claim as my invention is:

1. In an intake manifold structure for a multi-cylinder internal combustion engine having a longitudinal axis inclined to the normal horizontal plane of the chassis by which said engine is supported, said manifold structure including a primary fuel mixture conducting means, a fuel mixture distributing chamber having a stepped floor portion, and oppositely extending lateral runners communicating with said chamber and extending substantially longitudinally of the engine, said lateral runners being inclined with respect to the floor portion of said chamber.

2. In an intake manifold structure for a multi-cylinder internal combustion engine having a longitudinal axis inclined to the normal horizontal plane of the chassis by which said engine is supported, said manifold structure including a primary fuel mixture conducting means, a fuel mixture distributing chamber having a stepped floor portion extending substantially parallel with respect to the said normal horizontal plane of the chassis, and oppositely extending lateral runners extending substantially of the engine and inclined relatively to the floor of said chamber.

3. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal, said manifold structure including a primary fuel mixture conducting means, a fuel mixture distributing chamber communicating with said primary conducting means and having a stepped floor portion, and oppositely extending lateral runners communicating with said chamber and extending substantially longitudinally of the engine, the mouth of one of said lateral runners lying substantially below the mouth of said other lateral runner.

4. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal, said manifold structure including a primary fuel mixture conducting means, a fuel mixture distributing chamber communicating with said primary conducting means and having a stepped floor portion, and oppositely extending lateral runners communicating with said chamber and extending substantially longitudinally of the engine, the mouth of one of said lateral runners lying substantially below the mouth of said other lateral runner, the stepped floor portion of said distributing chamber providing a multi-level puddling chamber extending substantially horizontal.

5. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal, said manifold structure including a primary fuel mixture conducting means, a fuel mixture distributing chamber communicating with said primary conducting means and having a stepped floor portion, and oppositely extending lateral runners communicating with said chamber and extending substantially longitudinally of the engine, the stepped floor portion of said distributing chamber providing a multi-level puddling chamber extending substantially horizontal, one of said lateral runners communicating with said distributing chamber substantially at one level of said multi-level puddling chamber while said other lateral runner communicates with said distributing chamber substantially at another level of said multi-level puddling chamber.

6. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal and a fuel mixture forming and distributing device, said manifold structure including a primary fuel mixture conducting means connected with said device and extending substantially upwardly therefrom, a fuel mixture distributing chamber communicating with said primary conducting means and having a stepped floor portion providing a multi-level puddling chamber, each level extending substantially horizontal, and oppositely extending lateral runners communicating with said distributing chamber, one of said lateral runners connected therewith

substantially at one level of said puddling chamber while said other lateral runner is connected with said distributing chamber substantially at the other level of said puddling chamber.

7. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal and a fuel mixture forming and distributing device, said manifold structure including a primary fuel mixture conducting means connected with said device and extending substantially downwardly therefrom, a fuel mixture distributing chamber communicating with said primary conducting means and having a stepped floor portion providing a multi-level puddling chamber, each level extending substantially horizontal, and oppositely extending lateral runners communicating with said distributing chamber, one of said lateral runners connected therewith substantially at one level of said puddling chamber while said other lateral runner is connected with said distributing chamber substantially at the other level of said puddling chamber.

8. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal and a fuel mixture forming and distributing device, said manifold structure including a primary fuel mixture conducting means extending substantially upwardly from said device, a distributing chamber having a horizontally extending floor portion on which fuel precipitate collects, said crankshaft axis being inclined to the plane of said distributing chamber floor portion, and oppositely extending lateral runners communicating with said distributing chamber and extending substantially longitudinally of the engine.

9. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal and a fuel mixture forming and distributing device, said manifold structure including a primary fuel mixture conducting means extending substantially upwardly from said device, a distributing chamber having a horizontally extending floor portion on which fuel precipitate collects, said crankshaft axis being inclined to the plane of said distributing chamber floor portion, and oppositely extending lateral runners communicating with said distributing chamber and extending substantially longitudinally of the engine, said lateral runners each being inclined upwardly from said distributing chamber, whereby to drain wet fuel accumulations towards said device.

10. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal and a fuel mixture forming and distributing device, said manifold structure including a primary fuel mixture conducting means extending substantially upwardly from said device, a distributing chamber having horizontally extending wall portions on which fuel precipitate collects, and oppositely extending lateral runners communicating with said distributing chamber and extending substantially longitudinally of the engine, each of said lateral runners being differently inclined relatively to the horizontal.

11. An intake manifold structure for an internal combustion engine having a longitudinally extending crankshaft whose axis is inclined to the horizontal and a fuel mixture forming and distributing device, said manifold structure including a primary fuel mixture conducting means extending substantially upwardly from said device, a distributing chamber having horizontally extending roof and floor portions on which fuel precipitate collects, and lateral runners communicating with said distributing chamber and extending substantially longitudinally of the engine.

12. An intake manifold structure for a multi-cylinder internal combustion engine having a longitudinal axis inclined to the normal horizontal plane of the chassis by which said engine is supported, said engine having intake ports associated with the engine cylinders and provided with a fuel mixture forming and distributing device, said manifold structure including a distributing chamber, a primary fuel mixture conducting means extending upwardly from said device and opening into said chamber, and oppositely extending lateral runners communicating with said chamber and extending substantially longitudinally of the engine for conducting the fuel mixture to the engine, said distributing chamber including a puddling chamber having a floor for collecting fuel precipitate and extending substantially parallel with the normal horizontal plane of said chassis and at an angle to the longitudinal axis of the engine.

13. An intake manifold structure for a multi-cylinder internal combustion engine having a longitudinal axis inclined to the normal horizontal plane of the chassis by which said engine is supported, said engine having intake ports associated with the engine cylinders and provided with a fuel mixture forming and distributing device, said manifold structure including a distributing chamber, a primary fuel mixture conducting means extending upwardly from said device and opening into said chamber, and oppositely extending lateral runners communicating with said chamber and extending substantially longitudinally of the engine for conducting the fuel mixture to the engine, said distributing chamber including a puddling chamber having a floor for collecting fuel precipitate and extending substantially parallel with the normal horizontal plane of said chassis, said lateral runners each having a different inclination with respect to the horizontal plane of said chassis.

14. In an intake manifold for an internal combustion engine, a primary fuel mixture conducting means, a distributing chamber communicating with said means, lateral runners communicating with said chamber and extending substantially longitudinally of the engine, said distributing chamber including a puddling portion on which a fuel precipitate collects and comprising a recess diamond shaped in plan with apices extending toward said runners for directing fuel flow in a prescribed path, and means within the runners for dividing said fuel flow for distribution to the engine cylinders.

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