June 6, 1939. D. A. SULLIVAN 2,160,922

INTAKE MANIFOLD

Filed Aug. 14, 1936 2 Sheets-Sheet 1

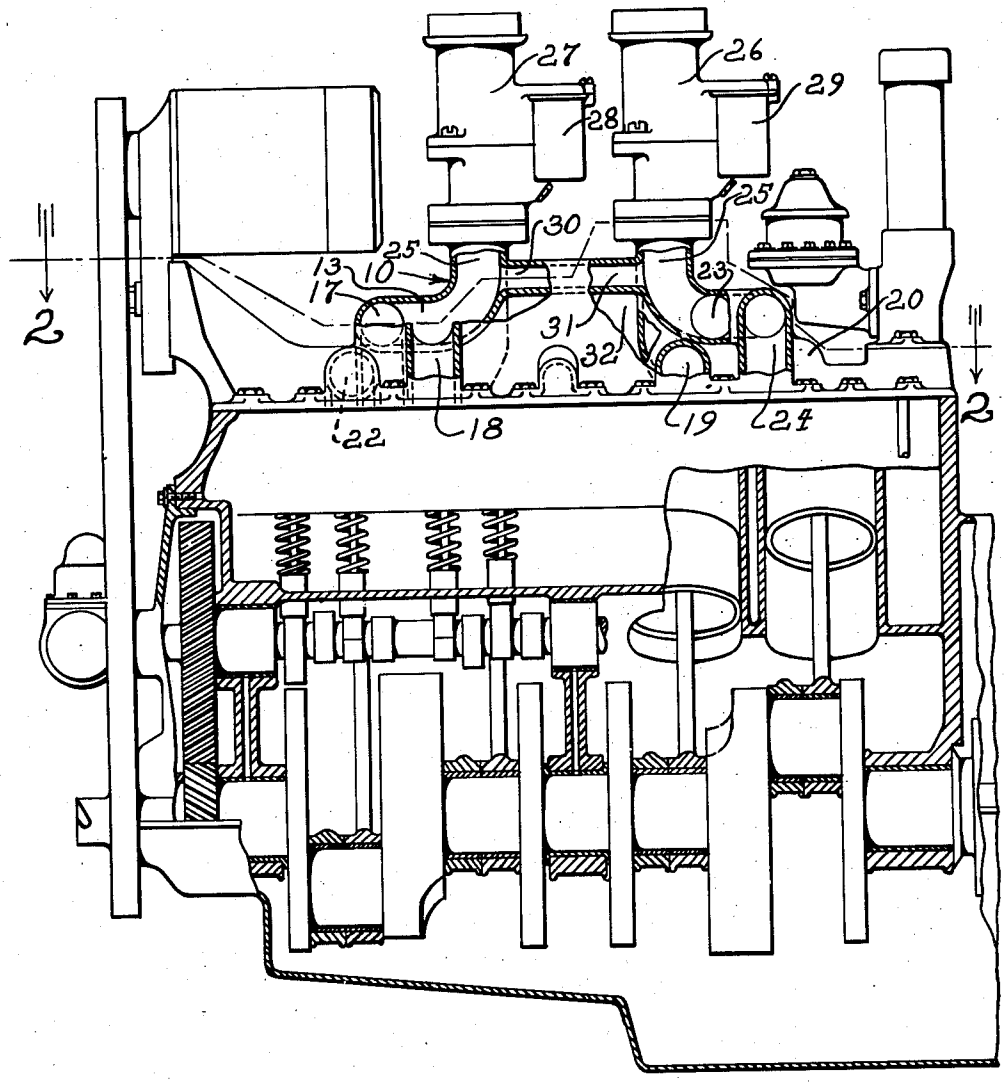


Fig. 1.

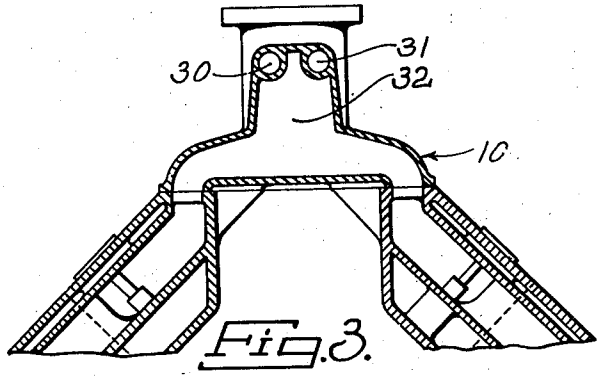


Fig. 3.

INVENTOR
DONNELL A. SULLIVAN.
BY
Harness, Dickey & Pierce
ATTORNEYS.

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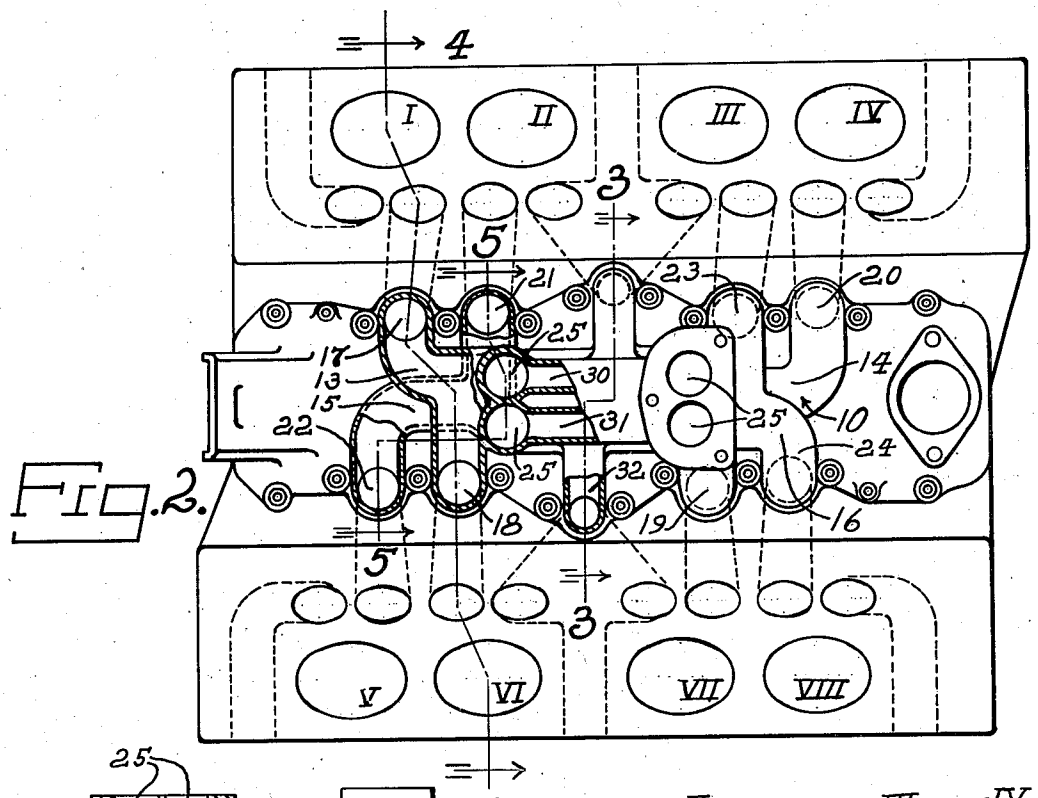


Fig. 2.

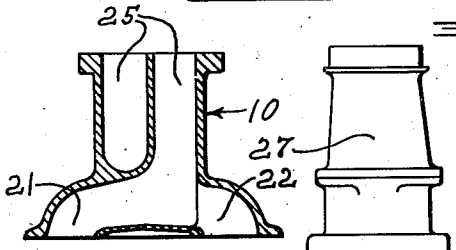


Fig. 5.

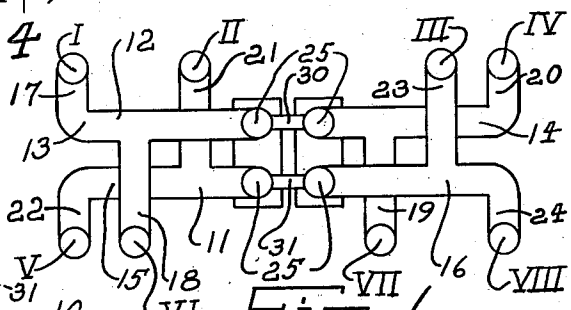


Fig. 6.

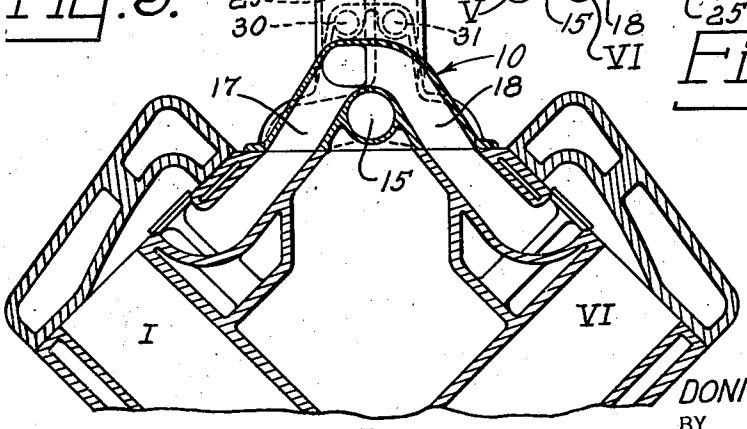


Fig. 4.

INVENTOR
DONNELL A. SULLIVAN.
BY
Harness, Dickey, Pierce & Harris
ATTORNEYS.

Patented June 6, 1939 2,160,922

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2,160,922

INTAKE MANIFOLD

Donnell A. Sullivan, Dearborn, Mich.

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3 Claims. (Cl. 123—52)

This invention relates to an improved intake manifold for and method of supplying fuel mixture to internal combustion engines.

More particularly, the invention pertains to improvements in manifolding of V-8 twin, dual or equivalently carburetted engines.

One of the main objects of the invention is to provide relatively short branch passages which present unobstructed passage for the flow of fuel mixture to all of the cylinders of an engine of this character and which, therefore, affords free breathing action.

Another object of the invention is to provide a manifold of this kind in which the air fuel ratio produced by the carburetting means is maintained throughout the manifolding system to the point of entry thereof to the cylinders.

A further object of the invention is to provide a manifold having branch passages so constructed and arranged as to establish improved distribution by presenting passages for the flow of fuel mixture of substantially the same general contour.

Another object of the invention is to provide in a V-8 internal combustion engine, a plurality of individual manifold branch sections, each of which is served by a separate carburetting means and which are so arranged that advantageous firing orders can be employed without having two cylinders that are served by a single branch fire or be charged successively, so as to thereby prevent one cylinder from robbing another cylinder of a portion of its charge.

An additional object of the invention is to provide communication between the branches of each section of the manifold which, though restricted enough to cause each branch to draw fuel mixture mainly from its respective carburetting means, is large enough to induce the back surge of fuel mixture occurring in one branch, into the other branch of the same section so as to prevent back flow of the mixture through the carbureter, thus reducing the waste of fuel and the fire hazard.

Another object of the invention is to provide sections in a manifold of this kind which have certain identical end portions, though reversed in position, so as to enable cores of identical construction to be used during molding.

A further object of the invention is to provide means for heating the lower end portions of the inlet passages of the manifold and which also surround the restricted connecting means between the branches of each section, respectively, for promoting vaporization of any fuel tending to collect therein.

An illustrative embodiment of the invention is shown in the drawings in which:

Fig. 1 is a longitudinal sectional view of an internal combustion engine equipped with an intake manifold embodying the invention and showing portion of the manifold structure in section and portions removed to disclose the underlying structure.

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a transverse fragmentary sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a fragmentary transverse sectional view taken on the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary transverse sectional view taken on the line 5—5 of Fig. 2.

Fig. 6 is a diagrammatic illustrational view of the arrangement of the manifold sections and branches and passageways thereof.

The intake manifold 10 is disposed between the two banks of cylinders of the engine and it includes two manifold sections, generally designated by the numerals 11 and 12 in Fig. 6. The manifold section 12 comprises a pair of branches 13 and 14 and the manifold section 11 comprises a pair of branches 15 and 16 of which branches 13 and 16 are identical and branches 15 and 14 are identical in structure, though reversed in position. The branch 13 is provided with oppositely extending passageways 17 and 18 which serve cylinders I and VI, respectively. The branch 15 of the manifold section 11 has a pair of passageways 21 and 22 which serve cylinders II and V, respectively. The branch 14 has passageways 19 and 20 which serve cylinders VII and IV, respectively, and the branch 16 has passageways 23 and 24 which serve cylinders III and VIII, respectively.

The branches 13, 14, 15 and 16 are arranged with their inner corresponding ends adjacent each other as illustrated in Fig. 6, and each branch is provided with a riser 25 to each of which is connected a substantially independent source of fuel mixture. The sources of fuel mixture may comprise four wholly separate and independent carbureters or a pair of dual carbureters may be employed for this purpose. If desired, a four throat carbureter having apparatus for independently determining the fuel mixture characteristics of the fuel supplied to each respective throat may be used. In the form illustrated in the drawings, a pair of dual carbureters 26 and 27, are shown, each of which is

provided with two fuel mixture throats to which fuel mixture is supplied. Naturally, each carbureter may comprise only one fuel reservoir 28 and 29, respectively, but the fuel mixture throats of the carbureters shown preferably have individual jets for predetermining the fuel mixture ratio therein.

The risers 25 of the branches 13 and 14 of the manifold section 12 are connected together by a conduit 30 and the risers 25 of the branches 15 and 16 of the manifold section 11 are similarly connected together by a conduit 31. The conduits 30 and 31 are made smaller in cross section than the cross sections of the various branches and passages of the manifold in order to produce relatively restricted communication between the manifold branches at these locations.

An engine equipped with an intake manifold of the foregoing construction can be operated on a plurality of different firing orders while obtaining the advantages heretofore set forth. Any of the following firing orders may be used for clockwise rotation of a ninety degree crank shaft in which number two crank pin follows number one crank pin by ninety degrees.

1–5–6–8–7–2–4–3	1–2–6–8–7–5–4–3
1–5–6–3–7–2–4–8	1–2–6–3–7–5–4–8
1–5–4–8–7–2–6–3	1–2–4–8–7–5–6–3
1–5–4–3–7–2–6–8	1–2–4–3–7–5–6–8

For clockwise rotation of a ninety degree crank shaft in which number two crank pin follows number one crank pin by 270°, the following firing orders may be employed:

1–5–7–8–6–3–4–2	1–3–7–8–6–5–4–2
1–5–7–2–6–3–4–8	1–3–7–2–6–5–4–8
1–5–4–8–6–3–7–2	1–3–4–8–6–5–7–2
1–5–4–2–6–3–7–8	1–3–4–2–6–5–7–8

For counter-clockwise operation of a ninety degree crank shaft in which number two crank pin follows number one crank pin by ninety degrees the following fire orders may be used:

1–2–4–3–6–8–7–5	1–2–4–5–6–8–7–3
1–8–4–3–6–2–7–5	1–8–4–5–6–2–7–3
1–2–7–3–6–8–4–5	1–2–7–5–6–8–4–3
1–8–7–3–6–2–4–5	1–8–7–5–6–2–4–3

For counter-clockwise rotation of a ninety degree crank shaft in which number two crank pin follows number one crank pin by 270 degrees, the following firing orders may be used:

1–3–4–2–7–8–6–5	1–3–4–5–7–8–6–2
1–8–4–2–7–3–6–5	1–8–4–5–7–3–6–2
1–3–6–2–7–8–4–5	1–3–6–5–7–8–4–2
1–8–6–2–7–3–4–5	1–8–6–5–7–3–4–2

In the operation of an engine equipped with a manifold embodying the invention, the distances of travel from the riser to the respective cylinders are relatively short and the passages are substantially unobstructed. These characteristics afford free breathing action of the engine and enable the fuel and air ratio of the fuel mixture produced by the carburetting means to be maintained throughout the entire manifolding system and to the points of entry of fuel mixture to the engine.

During operation of a V–8 engine on any of the foregoing firing orders and having banks of cylinders disposed at ninety degrees to each other and provided with a ninety degree crank shaft of the specified types, successive fuel charges will be supplied to the respective cylinders by different manifold branches. This characteristic of the improved manifolding system prevents one cylinder from robbing another cylinder of a portion of its charge, thereby providing a supply of uniform quantities of fuel mixture to all the cylinders.

The conduits 30 and 31 connecting the risers of the branches of the respective manifold sections serve to prevent the back flow of fuel mixture through the carburetting means. This is accomplished without interfering with distribution of fuel mixture by employing conduits which are sufficiently restricted to prevent excessive flow of fuel mixture from the carburetting means of one branch to the other branch, but of large enough size to accommodate the back flow of fuel mixture from one branch to another branch under the suction existing in the last mentioned branch when one of the cylinders which it serves is being charged. In other words, after the cylinder I is charged and the intake valve of that cylinder is closed, the fuel mixture in the branch 13 tends to flow back toward the riser of this branch. Before this back flow can pass through the carburetting means associated with the branch 13, one of the cylinders served by the branch 14 begins to receive its charge and thereby causes enough suction to induce the back flow through the conduit 30, thereby discouraging the back flow of fuel mixture through the carbureter. This same operation occurs throughout the entire manifolding system and during its entire induction cycle.

In Fig. 3 of the drawings, there is illustrated apparatus for applying heat to the lower end portions of the risers 25 and to the conduits 30 and 31 by which these risers are connected together. This structure includes a heating chamber 32 to which a heating medium, preferably exhaust gas from the engine, is supplied by an exhaust gas conduit (not shown). The portions of the walls of the conduits 30 and 31 are disposed in the chamber 32 and these passages are, therefor, effectively heated by the exhaust gases or other heating medium for the purpose of vaporizing any liquid fuel tending to collect in the conduits 30 and 31.

Although but one specific embodiment of the invention is herein shown and described, it is understood that various changes may be made without departing from the spirit of my invention.

I claim:

1. An intake manifold for a V–8 internal combustion engine having substantially independent carburetting means for each pair of related cylinders thereof including a pair of manifold sections, each comprising two branches, each branch communicating with one of said carburetting means, respectively, and means providing restricted communication between the inlet end portions of the two branches of each manifold section, respectively, for preventing blow-back of fuel mixture through said carburetting means, said branches being so constructed and arranged that suction exists in one branch when back flow tends to occur in the other.

2. An intake manifold for a V–8 internal combustion engine having substantially independent carburetting means for each pair of related cylinders thereof including a pair of manifold sections, each comprising two branches, each branch communicating with one of said carburetting means, respectively, means providing restricted communication between the inlet end portions of the two branches of each manifold section, respectively, for preventing blow-back of fuel mix-

ture through said carburetting means, and means for heating portions of said branches comprising an exhaust gas chamber surrounding said communication establishing means for vaporizing liquid fuel tending to collect therein.

3. In a V–8 internal combustion engine having cylinders numbers I, II, III and IV on one side of the central longitudinal axis and cylinders numbers V, VI, VII and VIII on the opposite side of said axis, an intake manifold having substantially independent carburetting means for each pair of related cylinders including a pair of manifold sections, each comprising two branches, the branches of one section, having outlet tubes at their outer ends serving cylinders I and IV respectively and having outlet tubes intermediate their ends serving cylinders VI and VII respectively and the branches of the other section having outlet tubes at their outer ends serving cylinders V and VIII respectively and having outlet tubes intermediate their ends serving cylinders II and III respectively, and means providing restricted communication between the end portions of the two branches of each manifold section, respectively, for preventing back flow of fuel mixture through said carburetting means, the construction and arrangement of said branches and the firing order of said engine being such that suction occurs in one branch while blow-back tends to occur in the other branch of said section.

DONNELL A. SULLIVAN.