Sept. 10, 1935. J. W. SWAN 2,013,737

INTAKE MANIFOLD

Original Filed Sept. 8, 1928 2 Sheets-Sheet 1

Fig. 1.

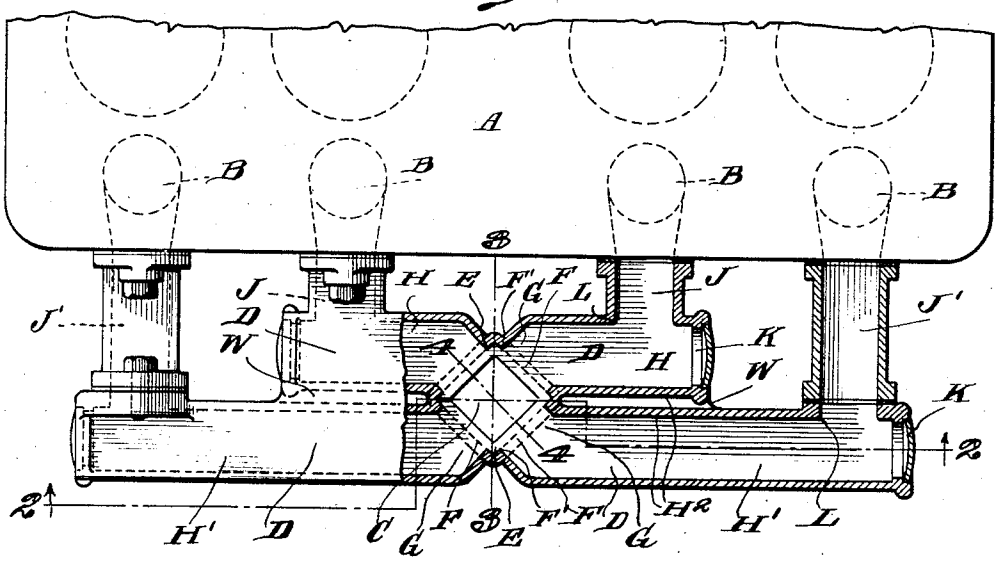


Fig. 2.

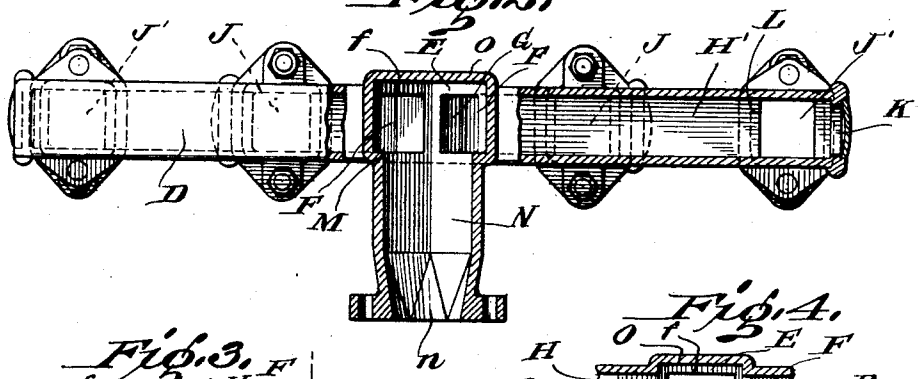


Fig. 3.

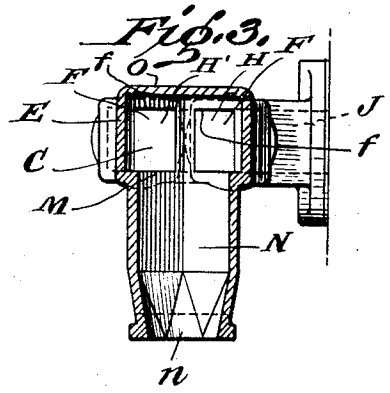
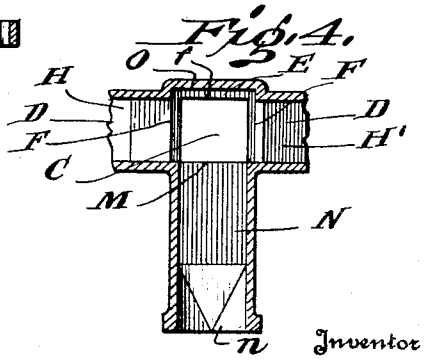


Fig. 4.



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Sept. 10, 1935. J. W. SWAN 2,013,737

INTAKE MANIFOLD

Original Filed Sept. 8, 1928 2 Sheets-Sheet 2

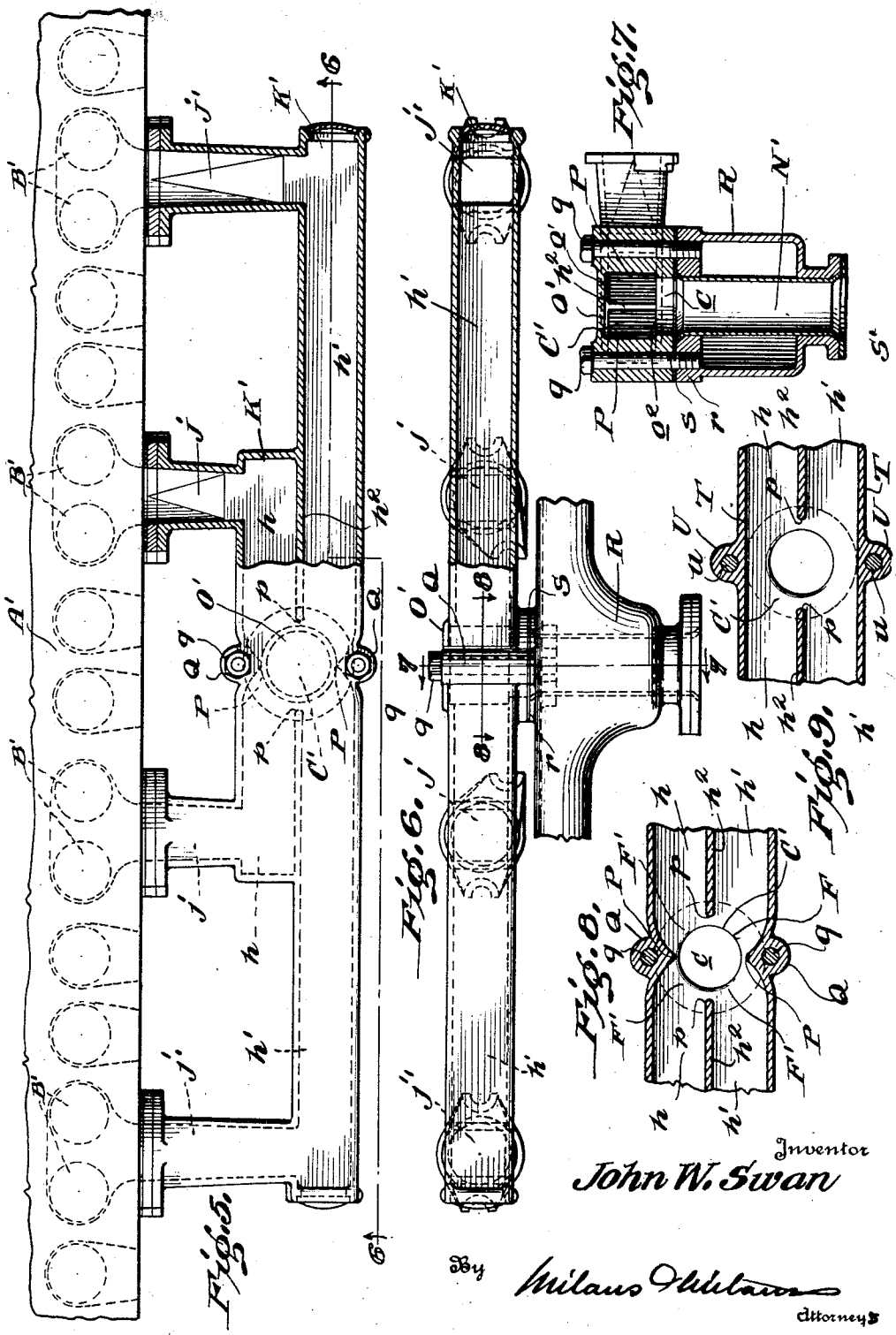


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

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UNITED STATES PATENT OFFICE

2,013,737

INTAKE MANIFOLD

John W. Swan, Sarasota, Fla., assignor to The Swan Carburetor Company, Cleveland, Ohio, a corporation of Ohio

Application September 8, 1928, Serial No. 304,729
Renewed July 20, 1934

9 Claims. (Cl. 123—52)

This invention relates to improvements in intake manifolds of the general type well defined in my Patents Nos. 1,536,044, granted April 28, 1925, and 1,636,721, granted July 26, 1927. The present improvements relate to the provision of a four-branch manifold as distinguished from the three-branch type specially disclosed in the patents referred to.

In the prior three-branch type of intake manifolds, it has been the practice, in instances, to utilize the branches, leading from the common distributing zone, to supply the fuel to either one of a pair of cylinders. At times each branch would feed to a pair of cylinders, as in a six cylinder engine, while at other times resort was had to the manifold in supplying fuel to a four cylinder engine in which case of course one of the branches fed to a pair of the cylinders while the other two branches each fed to a single cylinder.

Now, where a branch fed to a pair of cylinders as distinguished from a single cylinder, formations or means have been employed to insure uniform distribution of the fuel through a single branch to a pair of cylinders. These considerations have been practically and well cared for, but it will be understood that where the branches of a manifold lead to different ultimate points of discharge, as where one branch leads to a single port and another branch leads to a pair of ports, there is the possibility, under some conditions, of interfering somewhat with the uniform distribution of fuel, particularly where care is not exercised in the formation or shape of the branch to prevent the enriching of the fuel fed to one of the pair of ports as compared to the fuel fed to the other cylinder of said pair.

It is obvious that if every cylinder could have its individual supply of fuel delivered from a common source and through a branch of the manifold devoted exclusively to said cylinder, and the various branches being of substantially the same form and subject to the same conditions, practically all danger of irregularity or lack of uniformity in the fuel as fed to all of the cylinders is eliminated.

With the foregoing in mind, the present invention has for its fundamental or supporting principle the distribution of fuel from a common or distributing zone to each of the cylinders to be supplied through an individual branch of the manifold devoted to that cylinder, with each of the branches leading to each of the cylinders receiving its fuel from the distributing zone in exactly the same manner and under exactly the same conditions so that fuel passing to one cylinder will be exactly the same as that passing to another cylinder. By referring to exactness it is of course meant that the conducting of the fuel from the carburetor to the distributing zone and out of the distributing zone into the individual branches and through them to the individual cylinders, is in a manner and subject to structural formations substantially the same throughout the cycle of operation, so that the fuel from the carburetor passing to one cylinder may not become materially impaired or enriched as compared to the fuel passing from the carburetor to another cylinder in the succeeding operations in feeding all of the cylinders.

The manifold of the present improved type will be peculiarly useful in connection with four cylinder engines where each of the four branches will be operatively associated with one of the cylinders. However, if the formation of the branch outlets is such, for example, as taught in my above mentioned patents, that a single branch may satisfactorily feed to a pair of cylinder inlets, the improved manifold is well adapted for and also especially useful in connection with eight cylinder engines.

With the foregoing principles understood, the details in construction and operation of parts may be readily followed. To that end I have illustrated in the accompanying drawings forming part hereof two embodiments of the invention, one where the manifold is combined with a four cylinder engine and the other where a manifold of slightly different design (it could of course be the same design in detail) is combined with an eight cylinder type of engine, the latter, as will be apparent, being illustrated in both instances in purely a fragmentary way.

In the drawings:—

Figure 1 is a top plan view of a four cylinder engine with the manifold applied thereto, a part of the latter being shown in horizontal section to better disclose the interior formation;

Figure 2 is an elevational and part sectional view on the line 2—2 of Figure 1;

Figure 3 is a transverse vertical sectional view on the line 3—3 of Figure 1; and

Figure 4 is a vertical sectional view on the diagonal line illustrated at 4—4, Figure 1;

Figure 5 is a top plan view, a part of the top wall being broken away, showing a type of the improved manifold in operative association with an eight cylinder engine;

Figure 6 is in part a side elevation and vertical section of the same device taken on the line 6—6 of Figure 5;

Figure 7 is a transverse sectional view taken on the line 7—7 of Figure 6; and

Figure 8 is a detail horizontal sectional view taken through the distributing zone and correlated branches, looking downwardly from the uptake to the carburetor, on the line 8—8 of Figure 6;

Figure 9 is a sectional view similar to that of Fig. 8 illustrating a somewhat modified contouring of the distributing zone and associated wall structure.

Referring more specifically to the drawings wherein like reference characters designate the same parts in the several series of views,—A designates, generally, a four cylinder engine, and B the inlet ports thereof through which the fuel as supplied by the carburetor or other equivalent device is fed for the cylinders.

The intake manifold cooperatively associates with the cylinder inlet ports B comprises essentially a distributing zone or chamber C of substantially square formation, horizontally (Fig. 1) and with its vertical walls of similarly square formation, as shown in Fig. 2. The distributing zone is disposed angularly with reference to the cylinder block, that is, with an axis intersecting two of the vertical corners of the distributing zone at right angles to the face of the cylinder block (as instance the line 3—3 of Fig. 1), instead of having a wall of the distributing zone parallel to the face of the cylinder block as in my earlier patented devices. This disposition of the distributing zone is peculiarly advantageous in the present case. It enables the employment of four branches of the manifold, respectively indicated at D, one for each cylinder intake B, taking charges from the distributing zone in exactly the same manner and subject to exactly the same formations and conditions. Each wall of the distributing zone, represented at E, is provided with an opening F, the same size in each instance communicating with right angularly disposed offset ends G of the branches D merging into elongated or horizontal extensions H H′ of said branches, the outermost extensions H′ being longer than the inner extensions H so that they may reach to the outermost cylinders as will be readily appreciated.

J J′ represent the offsets or leads from the ends of the manifold branch extensions H H′ to the cylinders, the leads J J′ being at right angles to the extensions as in my earlier devices, and the extensions having offset ends or recesses K and sharp inner angles or corners L, cooperating as now understood in the art to secure a more even distribution of the fuel in instances where a manifold branch may feed to the inlets of two cylinders as distinguished from a single inlet. This is explained in my issued patents.

The bottom of the distributing chamber shown at M is flat and horizontal, coincident with the plane of the bottom of the branch extensions H H′, the corners or angles between the distributing chamber and the uptake N from the carburetor being sharp,—a highly desirable characteristic as taught the art in connection with the devices of my issued patents.

The top O of the distributing zone is raised to form a recess or dome common to all of the outlet openings F from the zone and the upper edges *f* of the openings F, in the plane of the top wall of the extensions H H′ of the manifold branches are sharp angles. The vertical corners of the walls and marginal vertical edges adjoining the openings F, as shown at F′, are also sharp. I have found that such a construction lends itself to the best possible results in obtaining uniform distribution. The wet particles of fuel reaching the dome, by way of the riser, cannot pass along the top wall to any branch to thereby enrich the mixture going to that branch, but drop back into the mixture stream off the sharp corners between the branches and the dome.

The cross section of the various branches and also of the offset portions of the manifold is rectangular throughout and the cross section of the uptake N from the carburetor is similarly rectangular, the lower end adjacent the carburetor being shown as contracted or rounded to fit a rounded portion of the carburetor. As in the case of my earlier devices the ends of the offset portions J J′ may be similarly rounded if found desirable to meet conditions confronting the use of the manifold on a particular engine.

From the foregoing description, it will be apparent that fuel as discharged from a carburetor is bound to be distributed from the distributing zone C and delivered to a cylinder intake port B without change, as to impairment or enriching the mixture, in any manner whatsoever save as the succeeding charges are similarly affected in the other branches of the manifold during the cycle of operation so that uniformity throughout is assured,—in fact the charge as delivered by the carburetor is finally delivered to the intake of the particular cylinder for which it is intended.

It will be appreciated that owing to the diagonal disposition of the distributing chamber, the parallel relation of the distributing branches taking off mixture from the distributing chamber, and the greater length of the offsets J′ of the extensions H′, the simplest possible four branch manifold is created, and practically no consequential additional space or expense required in its production.

It will be perfectly clear that instead of having the cross sections of the manifold branches and offsets, and also the uptake, of rectangular form, they may be round or of other contours, some perhaps better than others in functional characteristics, but all embodying the underlying spirit of the present combination or arrangement; and further that in lieu of having the manifold used in a four cylinder as illustrated in Figure 1, the same may with great advantage be used in connection with an eight cylinder engine at which time each of the offsets J J′ will feed to a pair of cylinder inlet ports instead of to a single inlet port. In the embodiment of my invention illustrated in Figure 5, I have suggested the eight cylinder type of engine at A′, the respective pairs of cylinder inlet ports designated B′, and the offsets of the inlet manifolds each delivering to a pair of cylinder inlets B′ being shown at *j* and *j*′. In this instance the square cross section of the offsets J J′ are merged into circular outlet ends as can be seen. Preferably the extensions or outlet branches *h h*′ in this instance are square or rectangular in cross section, as heretofore, although they may be round, but instead of having the extensions H H′ spaced or formed with separate adjacent parallel walls H^2, Figure 1, they are formed integrally with a single intervening wall h^2, Figure 5.

In the form of Figure 1, the top and bottom walls of the otherwise spaced extensions or branches H H′ may be integrally connected and continuous as shown at W.

The distributing zone C′ in the present embodiment of the invention opens downwardly through

5-2 ENGINES.

a circular opening *c* to the uptake N adapted to receive the mixture from a carburetor or from a pipe leading thereto from the carburetor. The top wall O' of the distibuting chamber or zone C' forms an upper recess or dome, as previously mentioned, adjoining the outlet branches by sharp corners o', the base or bottom wall of the chamber adjoining the opening *c* being on the plane of the bottom of the branches and joining the uptake orifice at a true right angle or sharp edge (Fig. 7).

The outer walls of the distributing chamber, midway the branches *h h'* are converged inwardly to substantially a vertical line as at P to provide, in conjunction with the similar vertical end walls *p* of the identical partitions h^2, the like diagonally disposed openings F' constituting the communication between the distributing zone and the manifold branches. The directing of the wall portions P inwardly leaves room for the use of apertured fillets Q through which fastening screws or bolts *q* may be passed to secure the manifold proper to the top *r* of a hollow casting R receiving the uptake N', the purpose of the casting being to provide a heat jacket through which exhaust gases or the like can be passed when desired as indicated by the arrow in Figure 6, and as will be readily understood by persons skilled in this art. The uptake N' is shown as flared at its upper and lower ends into binding engagement with correspondingly tapered seats at the upper and lower ends of the casting, and packing interposed between the casting and the manifold and overlying and contacting with the upper end of the uptake N' firmly seals and binds the parts together. The packing is represented at S. A similar packing S' is introduced between the lower end of the casting and the discharge, said packing underlying and contacting with the lower end of the uptake N' sealing and fastening the parts at this point.

In the form of my device illustrated in Figures 5 to 8, inclusive, just described, I provide my customary offset or recessed ends K' as shown in the drawings.

In Figure 9 a still further embodiment of the invention is illustrated, the same, however, being quite similar to the formation of Figure 8. However, instead of having the oppositely inturned walls P (Fig. 8) of the distributing chamber, I provide in the modification of Figure 9 continuous straight outside parallel walls T, the inner surfaces of these walls being smooth. On the outside of said walls enlargements U, taking the place of the fillets Q, afford the fastening means for the similar screws or bolts *u*. The difference between the two structures is primarily the elimination of the inwardly converging portions *p* and the providing of the continuous smooth innner walls in lieu thereof. Of course in either instance the interior formation of the distributing zone immediately at the point of departure of the fuel mixture from the zone to the restrictive branches is identical, so that whatever influence the formation may have on the mixture at one point of escape from the distributing zone will be the same entirely around the zone and with regard to each and every one of the branches leading from the zone to the cylinders.

It will be optional to provide a dome O O' or to leave the top of the distributing chamber or zone coincident and continuous with the top wall of the branches, both of which forms are disclosed in my patents hereinabove referred to.

My manifolds are formed of metal, and so far as practical in the casting operation, they are best formed integral throughout.

My preferred embodiment of the invention, as shown, presents truly sharp edges or corners, but it will be understood that in making the casting, it is difficult to secure these extremely sharp corners. Therefore, in instances, a slight rounding may occur or be resorted to, without incurring altogether detrimental effects, particularly as the volumetric efficiency may be helped thereby.

While I have herein illustrated certain specified details in construction and arrangement of parts, it will be clear to workers in the art that the invention is not restricted to any such details, but is of much broader scope, all as more definitely pointed out in the hereto appended claims.

The method disclosed herein is claimed in my application Serial No. 462,560, filed June 20, 1930.

I claim:

1. An inlet manifold comprising a distributing chamber having a dome formation at its top, lateral openings therebelow disposed around the distributing zone, and four manifold branches one leading from each opening, in combination with an uptake, the uptake being joined to the bottom edges of the outlet openings by sharp angles or corners.

2. An inlet manifold comprising a distributing chamber having four outlet openings therearound below a closed top thereof, and a corresponding number of manifold branches, one communicating with each opening, and below the plane of the top of the distributing zone.

3. A manifold for gas engines having a suitable intake, a distributing zone in communication with said intake and four branches extending from said zone, each of said branches having an independent discharge end spaced substantially apart from the other ends, the four branches being disposed so that a pair occupies in part a substantially parallel relationship with the pairs extending in relatively opposite directions from the distributing zone, one branch being relatively short as compared to the other branch of the same pair to secure said spacing of the discharge ends, and the inside corner of each branch where it communicates with its discharge end being such as to effect an abrupt turn, the formation of each branch adjoining its discharge end being formed to constitute recessed portions beyond the discharge end presenting with the latter abrupt corners.

4. An inlet manifold comprising a distributing chamber having a dome formation at its top, lateral openings therebelow disposed around the distributing zone, and at least four manifold branches, one leading from each opening, in combination with an intake, the intake terminating within the distributing chamber in a sharp angle or corner.

5. An inlet manifold comprising a distributing chamber having at least four outlet openings therearound and below the top thereof, and a corresponding number of manifold branches, one communicating with each opening below the plane of the top of the distributing zone, and an intake pipe terminating in the distributing zone and extending substantially normal to the axes of the outlets.

6. An inlet manifold comprising a distributing chamber having at least four outlet openings, an intake pipe extending in a direction substantially normal to the axes of said outlet openings and terminating in the distributing chamber, said distributing chamber having a closed wall oppo-

site the intake pipe, and outlet branches communicating with each of said outlet openings in a zone between the plane of said closed wall and the end of the intake pipe and spaced away from the closed wall.

7. A manifold for an internal combustion engine having four intake ports, said manifold having a suitable intake, a distributing zone in communication with said intake and four branches extending from said zone, each of said branches having an independent discharge end spaced substantially apart from the discharge ends of the other branches, the four branches being disposed in pairs so that the branches in a pair occupy in part a substantially parallel relationship, the pairs extending in relatively opposite directions from the distributing zone, one branch being relatively short as compared to the other branch of the same pair to secure said spacing of the discharge ends, and the inside corner of each branch where it communicates with its discharge end being such as to effect an abrupt turn of the mixture.

8. A manifold for an internal combustion engine having four intake ports, said manifold having a suitable intake, a distributing zone in communication with said intake, four outlets from said distributing zone, the wall of said distributing zone opposite the intake being symmetrically formed and situated with reference to the outlets to uniformly influence entering mixture and cause the same to distribute in uniform character in the directions determined by the outlets, and four manifold branches extending from said outlets, each of said branches having an independent discharge end spaced substantially apart from the discharge ends of the other branches, the four branches being disposed in pairs so that the branches in a pair occupy in part a substantially parallel relationship, the pairs extending in relatively opposite directions from the distributing zone, one branch of a pair being relatively short as compared to the other branch of the same pair to secure said spacing of the discharge ends, and the inside corner of each branch where it communicates with its discharge end being such as to effect an abrupt turn of the mixture.

9. A manifold for an internal combustion engine having four intake ports, said manifold having a suitable intake, a distributing zone in communication with said intake, four outlets from said distributing zone, the wall of said distributing zone opposite the intake being symmetrically formed and situated with reference to the outlets to uniformly influence entering mixture and cause the same to distribute in uniform character in the directions determined by the outlets, and four manifold branches extending from said outlets, each of said branches having an independent discharge end communicating with an engine intake port and spaced substantially apart from the discharge ends of the other branches, the four branches being disposed in pairs so that the branches in a pair occupy in part a substantially parallel relationship, the pairs extending in relatively opposite directions from the distributing zone, one branch of a pair being relatively short as compared to the other branch of the same pair to secure said spacing of the discharge ends, each branch being angularly related to its discharge end whereby the junction therebetween is such as to effect an abrupt turn of the mixture, and each branch being angularly related to the manifold intake in substantially the same way at the distributing zone whereby each charge of mixture in its movement through the manifold intake and branches to the several engine ports traverses substantially the same kind of path of travel and substantially the same kind and number of changes in direction.

JOHN W. SWAN.