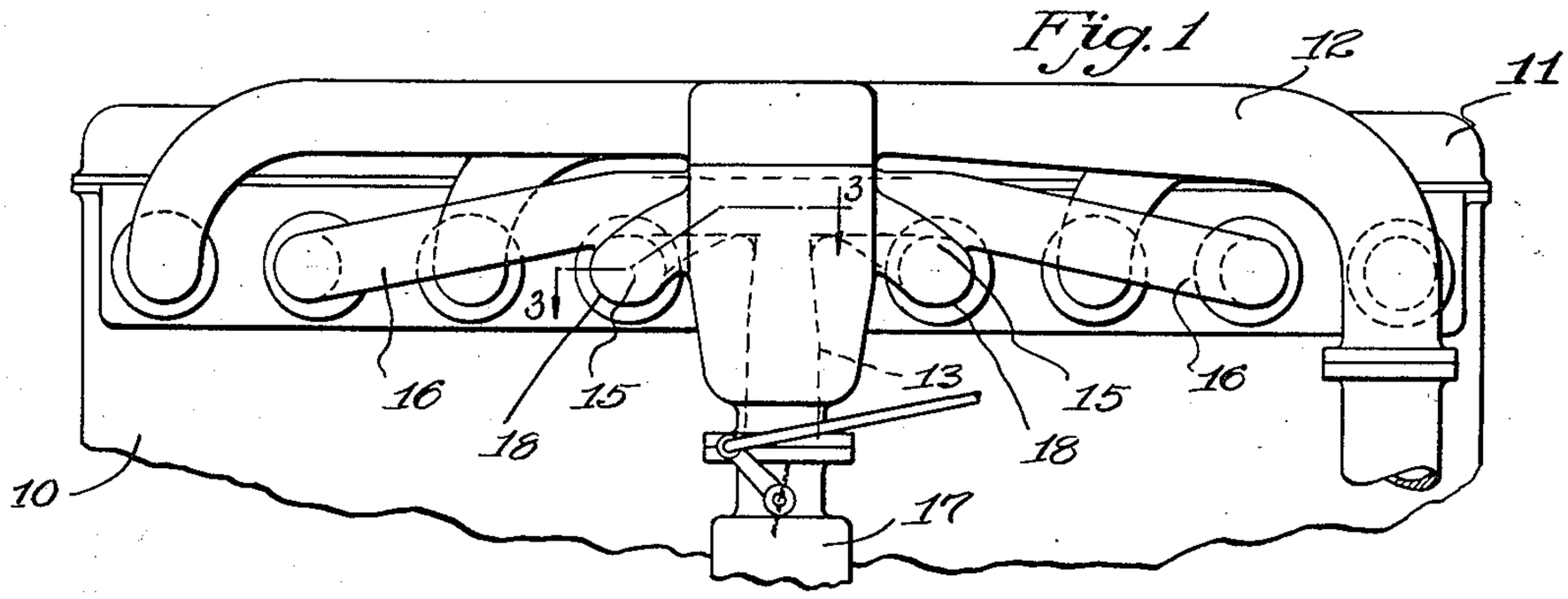
Aug. 20, 1935. H. H. TIMIAN 2,011,784

ENGINE

Filed June 24, 1932

Fig. 1



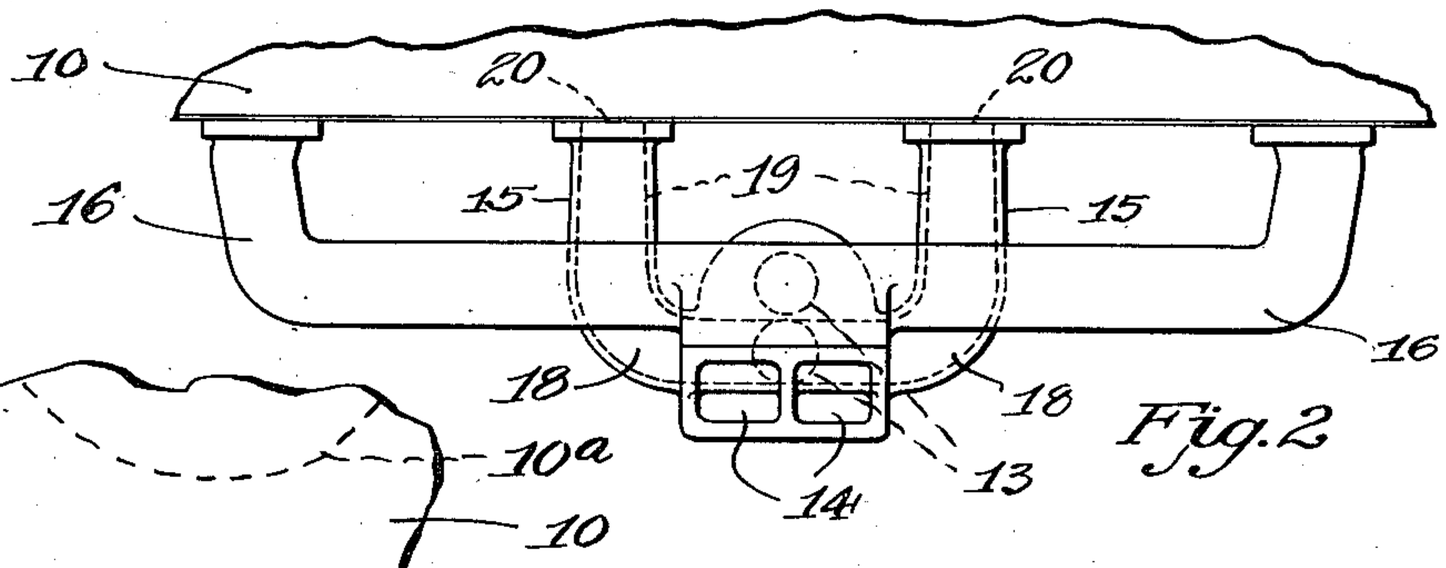


Fig. 2

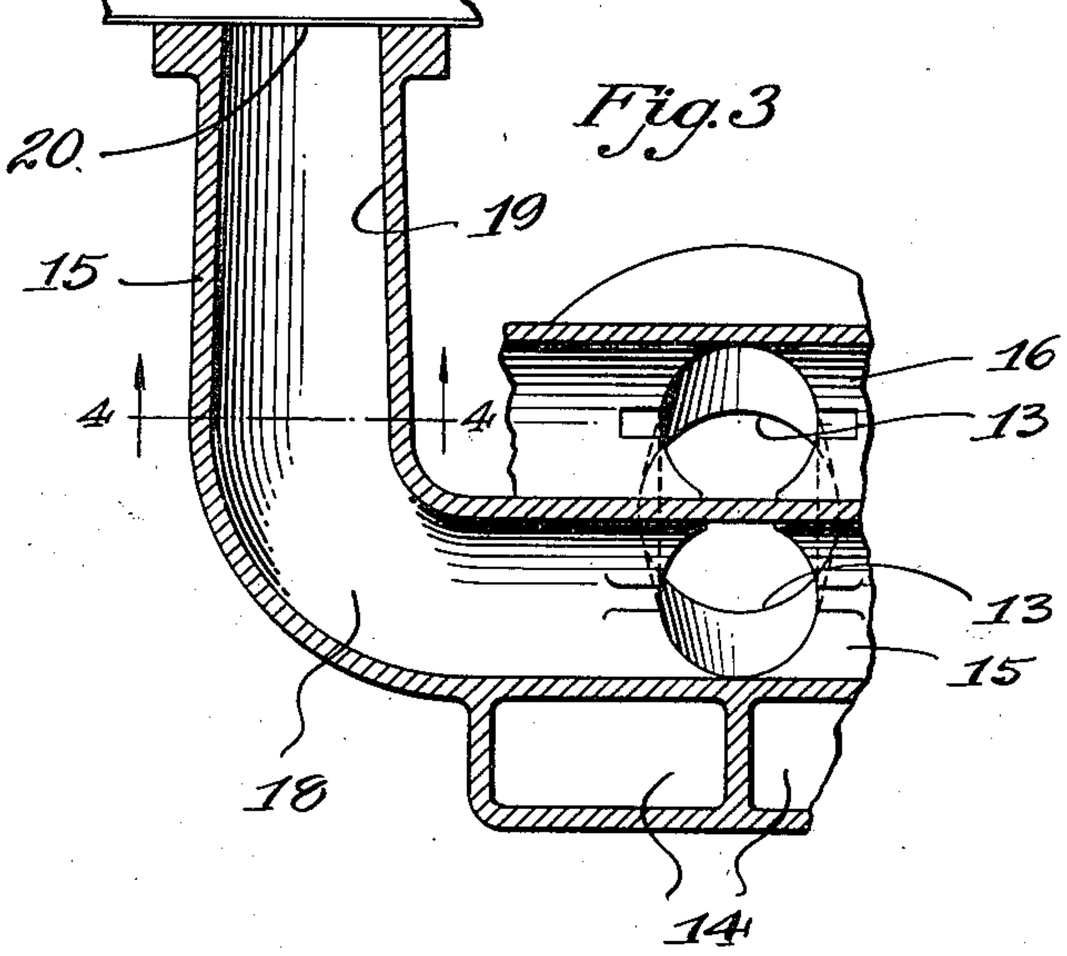


Fig. 3

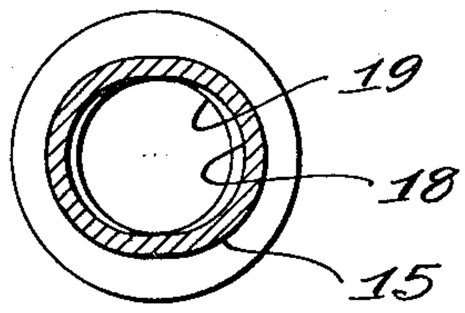


Fig. 4

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9 Claims. (Cl. 123—52)

This invention relates to multi-cylinder internal combustion engines and more particularly pertains to the fuel mixture intake manifold structure therefor. In this type of engine it is customary to construct the intake manifold with a number of branches, each branch being adapted for distributing a fuel mixture to one or more engine cylinders.

Heretofore, intake manifolds of the aforesaid type have been constructed with branches having substantially uniform cross section area. This construction is found to be unsatisfactory in that some of the branches are subject to a relatively slower pressure recovery than others during the operation of the engine, thereby producing uneven engine operation. I have particularly noted that the shorter branches have a slower pressure recovery than the longer branches of a standard manifold.

An object of my invention is to eliminate the aforesaid difficulties by providing a manifold structure having branches proportioned to equalize the pressure in said manifold during the engine operation.

Another object of my invention is to provide for a smoother engine operation by providing a manifold structure therefor in which the shorter branches are enlarged in cross sectional area preferably at the bend whereby to speed up the pressure recovery in said shorter branches to thereby substantially equalize the pressures in the manifold during the engine operation.

A further object of my invention is to improve fuel flow in the relatively shorter branches of an intake manifold structure by providing a structure in which the shorter branches are enlarged in cross sectional area at the bend.

For a more detailed understanding of my invention, reference may be had to the accompanying drawing which illustrates one form which my invention may assume, and in which:

Fig. 1 is a fragmental side elevational view of an engine equipped with a manifold structure constructed in accordance with my invention.

Fig. 2 is a plan view of the intake manifold,

Fig. 3 is a detail sectional view taken substantially on the line 3—3 of Fig. 1, and

Fig. 4 is a detail transverse sectional view of the enlarged porton of the short branches taken substantially on the line 4—4 of Fig. 3.

I have chosen for the purpose of illustration to show an engine having in general a cylinder block 10, cylinder 10a, a cylinder head 11 secured to the block and an exhaust manifold 12 adapted to conduct the burnt gases from the cylinders and for preheating the primary intake passage 13 by conducting at least some of the exhaust gases through the jackets or passages 14. An intake manifold having a plurality of short and long branches 15 and 16 respectively is cooperatively associated with the engine and is adapted for conducting a fuel mixture to one or more engine cylinders, the primary passage 13 connecting said branches with the fuel mixing forming device or carburetor 17.

The long branches 16 forming a portion of the intake manifold structure are preferably constructed with a uniform cross section over the entire length, and the relatively shorter branches 15 are preferably constructed with a variable cross section. Preferably, the shorter branches 15 are enlarged at the bend 18 with respect to the remaining portion of the branches. It may be noted that the enlarged portion of each of said branches 15 taper off into a smaller cross sectional area as at 19 terminating in outlets 20 connected with the engine cylinders, said outlets having a cross-sectional area substantially equal to the cross-sectional area of the branches ahead of the bend (see Figs. 3 and 4).

The enlargement of the relatively shorter branches at the bend provides an intake manifold structure having improved pressure recoving qualities over the entire manifold and in this way the uneven working pressures are eliminated resulting in a uniform engine performance. Further, my improved structure affords an improved fuel mixture flow in the aforesaid short branches thereby giving an improved engine performance.

The principles of my invention will be further apparent from the following. The ramming effect of the fuel mixture or the so-called "velocity head", in a straight section of manifold section, is proportional to the length of the section. The inertia of the gas column mass, which produces this ramming effect, drives the fuel mixture around the manifold bends and the longer the length of the straight section approaching the bend, the greater is this ramming effect. In a relatively short length of straight section, as provided by branches 15 in contrast with branches 16, there is much less of this ramming effect and therefore there is relatively more difficulty in getting the fuel mixture around the bends 18 of branches 15. By reason of my invention, I have "opened up" the bends or branches 15 to permit the fuel mixture to flow around the bend with less restriction than would be experienced with a uniform cross-sectional area.

The pressure recovering qualities provided by my manifold reside in the ability of the manifold branches to respond more readily and uniformly to varying pressures caused by the engine performance.

As a further explanation of the pressure flow at the manifold bends, I have discovered that, for short branches where the ramming effect is small as in the case of branches 15, the pressure falls off very materially between points just before and after a conventional bend having uniform cross-sectional area. Where this bend has its cross-sectional area increased, as provided by my invention, the pressure drop between the aforesaid points is exceedingly low so as to substantially balance the pressure drop between corresponding points for the bends of branches 16.

It is undesirable to form the bends of branches 16 with the enlarged cross-sectional area as shown at 18 for the branches 15, since to do so would materially increase the pressure beyond the bends of branches 16 with respect to the pressure beyond the bends 18, and furthermore such a provision would undesirably increase the wall surface of branches 15 and thereby increase the fuel puddling tendencies.

Although I have illustrated in this drawing but one form of my invention and have described in detail but a single application thereof, it will be apparent to those skilled in the art to which my invention pertains, that 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. An intake manifold for a multi-cylinder engine having a fuel mixture forming device, a primary fuel mixture conducting means, a plurality of branches of unequal length communicating with said primary conducting means and adapted for conducting a fuel mixture to the engine cylinders, only said branches of a relatively shorter length having an enlarged sectional portion for equalizing the pressures within said manifold.

2. A fuel mixture conducting device for a multi-cylinder engine including a primary conducting means, a plurality of fuel mixture conducting branches communicating therewith, some of said branches being substantially shorter than others and having a bend, said shorter branches being relatively enlarged at the bend for equalizing the pressures within said conducting branches.

3. A fuel mixture conducting device for a multi-cylinder engine including a primary conducting means, a plurality of conducting branches of unequal length connecting said means with the engine, means for equalizing the working pressure within said branches and including an enlarged bend in a portion of one of said relatively shorter branches.

4. A fuel conducting structure for a multi-cylinder engine, fuel mixture conducting means including a primary conducting portion and a plurality of fuel mixture conducting branch portions for conducting a fuel mixture to the engine cylinders, said branches arranged in pairs, one pair of said branches being shorter than the other pair and provided with an enlarged bend portion whereby to equalize the pressures in said conducting means and to facilitate fuel mixture flow in said fuel mixture conducting branches.

5. A fuel conducting structure for an engine including a plurality of fuel conducting branches whereby to conduct a fuel mixture to said engine and each having a bend, a primary conducting means adapted to cooperate with said branches, a fuel mixing device cooperating with said primary conducting means, a pair of said branches being relatively short and positioned adjacent the primary conducting means, said short branches provided with an enlarged portion at the bend thereto to facilitate the fuel mixture flow therein.

6. A manifold structure for a multi-cylinder engine and including a plurality of branches for conducting fuel mixture to the engine cylinders, said branches being a different length and each having a bend, the shorter of said branches having a cross-sectional area at the bend greater than those branch portions adjacent to said bend and greater than the longer of said branches at the bend.

7. A manifold structure for a multi-cylinder engine and including a plurality of branches for conducting fuel mixture to the engine cylinders, said branches being a different length and each having a bend, the shorter of said branches having a cross-sectional area at the bend greater than the area of the branch outlet and greater than the cross-sectional area of said longer branch at the bend.

8. A manifold structure for a multi-cylinder engine and including a plurality of branches for conducting fuel mixture to the engine cylinders, said branches being a different length, the shorter of said branches provided with a bend and having a cross-sectional area at the bend greater than the area of the branch outlet, the branch portion intermediate the bend and branch outlet being tapered to merge the enlarged cross-sectional area at the bend to the relatively smaller area of the branch outlet.

9. A manifold structure for a multi-cylinder engine and including a plurality of branches for conducting fuel mixture to the engine cylinders, said branches being a different length, the shorter of said branches provided with a bend and having a cross-sectional area at the bend greater than those branch portions adjacent to said bend, said branch portions adjacent the bend being inwardly tapered.

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