June 4, 1935. H. H. TIMIAN 2,003,984

ENGINE

Filed April 16, 1931

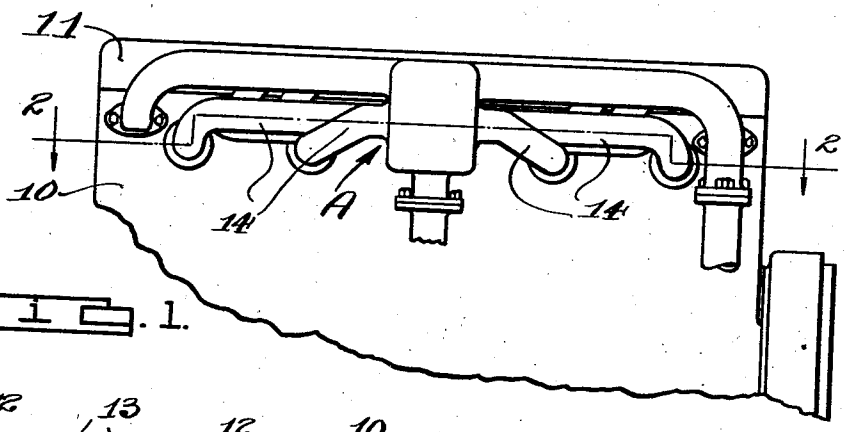


Fig. 1.

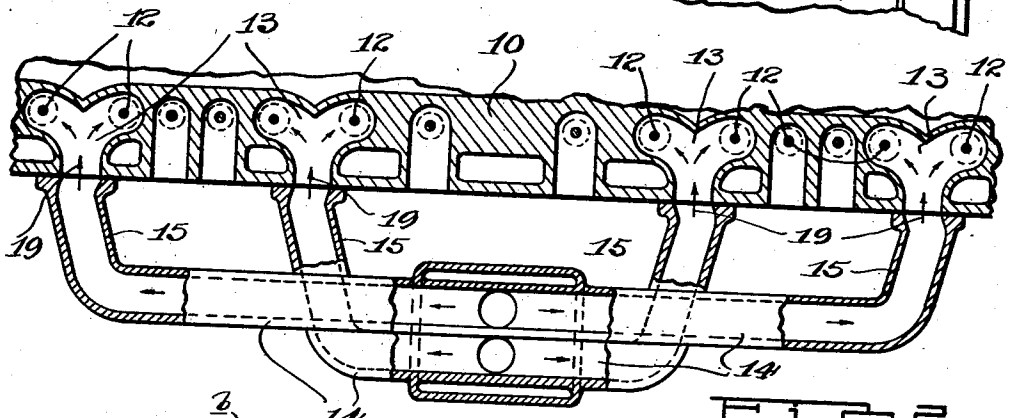


Fig. 2.

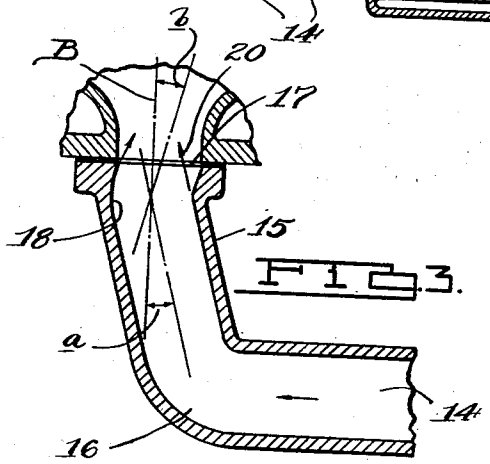


Fig. 3.

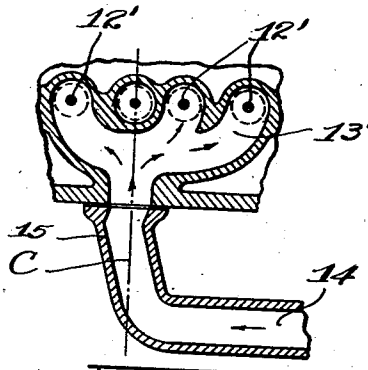


Fig. 4.

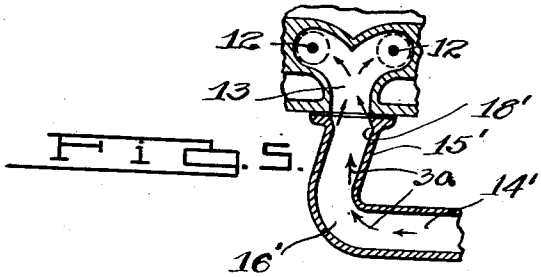


Fig. 5.

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UNITED STATES PATENT OFFICE

2,003,984

ENGINE

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21 Claims. (Cl. 123—52)

My invention relates to internal combustion engines and more particularly to a manifold structure adapted for association therewith.

In all manifold structures it has been found that a bend in the manifold which conducts the fuel mixture from the source of supply to the cylinder intake port seriously effects the fuel distribution and where said manifold outlets communicate with the cylinder intake chamber communicating with a plurality of ports, it has been difficult to uniformly distribute the fuel mixture to these ports because of the stratification within the manifold adjacent the outlet. In most cases the manifolds are assembled very closely adjacent to the side of the engine block and consequently there is insufficient length in the port runners for straightening the fuel stream and correcting the stratification thereof before the same enters the intake chamber of the cylinder block. In multiple cylinder engines and in especially those of six or eight cylinders or more, it is quite necessary to connect a plurality of cylinder intake ports with one of the manifold port runners and since the advent of the eight cylinder engine considerable difficulty has been experienced in properly distributing the fuel mixture to the cylinders.

It is the object of my present invention to more uniformly distribute the fuel mixture to the various cylinders in a multiple cylinder engine requiring the use of Siamese ports and other arrangements in which a plurality of ports are connected with a single port runner by providing means incorporated in the manifold structure for uniformly distributing the fuel in order to direct the fuel in such a manner as to conduct an adequate predetermined supply of the fuel mixture to each cylinder port.

Another object of my invention is to provide an improved manifold construction employing lateral runners and port runners communicating therewith in which means are provided for correcting stratification of the fuel mixture in the port runners adjacent the manifold outlets.

A further object of my invention is to construct a manifold having a bend which tends to induce stratification of the fuel mixture in that portion of the manifold beyond the bend by providing means beyond the bend for correcting stratification of the fuel mixture adjacent the outlet.

A more detailed understanding of my invention may be had from the accompanying drawing which illustrates preferred embodiments of my invention and in which:

Figure 1 is a fragmentary side elevational view of an internal combustion engine equipped with an intake manifold structure constructed in accordance with my invention,

Figure 2 is a horizontal sectional view taken substantially on the line 2—2 of Figure 1,

Fig. 3 is an enlarged sectional view of a portion of the manifold structure illustrating a portion of the lateral runner, the port runner communicating therewith and the means within said port runner for correcting stratification of the fuel mixture caused by flowing the same around the bend connecting said lateral and port runners.

Figure 4 is a detail sectional view illustrating my improved manifold construction associated with an engine having a fuel intake chamber of a modified construction, and

Figure 5 is a detail sectional view illustrating a modified manifold construction.

My improved intake manifold structure A is adapted for use with an internal combustion engine of the multiple cylinder type which consists of a cylinder block 10 having the cylinder head 11 secured thereto, said cylinder block including a plurality of cylinders (not shown) having suitable intake ports closed by intake valves 12, these valves being arranged and operated to admit the fuel mixture into the cylinders at the proper time from the intake chamber 13 in said engine block 10. As shown in Figure 2 the intake chambers 13 communicate with Siamese ports and since in the illustrated embodiment of my invention I have shown an engine of the eight cylinder type I have illustrated a manifold structure provided with lateral of main runners 14 and port runners 15 each port runner being arranged to communicate with one of the cylinder intake chambers 13. It is obvious that more than two cylinder ports may be placed in communication with one of the intake chambers if so desired though it is found to be most desirable to limit the number of ports to two such ports as illustrated in Figure 2.

In Figure 3 an enlarged portion of the manifold structure is illustrated and it will be noted that I have provided a bend 16 intermediate the lateral or main runner 14 and port runner 15. As the fuel mixture passes around this bend the wet fuel particles are caused to travel to one of the side walls of the port or both and thus the fuel mixture flowing through the port runner is stratified and not uniformly distributed throughout the cross-section of the port runner. Where such a port runner is connected with Siamese ports it has been found that it is difficult to

control the distribution of the fuel to said ports, since one of the ports may receive more fuel than necessary while the other port is more or less starved.

I have discovered that it is possible to control the flow of the fuel mixture in a port runner in such a way as to eliminate the stratification of the fuel as the same reaches the manifold outlet 17. I have preferably provided such means for correcting the stratification of the fuel at a point adjacent the outlet and in the illustrated embodiment of my invention this is accomplished by providing a second bend 18 in the port runner, this bend being commonly referred to as a "kick-back". I find that the angular relation between the lateral runner and the port runner preferably approximates the construction shown in Figure 3.

The port runner is arranged at an angle *a* to the axis B which extends perpendicular to the axis of the lateral runner. Preferably this angle is not more than approximately 20° and I find that this angle may vary from 5° to 20° but preferably is approximately 15°. This oblique angle between the lateral runner and port runner tends to prevent the formation of swirl or eddy currents in the port runner which necessarily produces more resistance to the flow of the fuel mixture therethrough. The second bend or kick-back 18 is preferably arranged to bend in the same direction as the bend 16 and the angle *b* between the axis of that portion of the port runner beyond the second bend and the axis B is preferably in the neighborhood of 15°. I find that this construction produces very good results and the fuel mixture is directed straight through the intake passages 13 as shown by the arrows 19 and preferably the fuel mixture is uniformly distributed and stratification of said fuel mixture has been eliminated before the same is introduced into the intake chambers 13. The elimination of this fuel stratification may be plainly seen by referring to Figure 3 in which the arrow 20 indicates how the wet fuel particles travelling along the inner wall of the port runner are kicked off adjacent the outlet into the central portion of the port runner.

The arrow 21 indicates diagrammatically the manner in which any fuel particles travelling along the outer wall of the port runner are directed inwardly into the central zone of the intake chamber 13. In this manner the fuel is evenly distributed and predetermined quantities of said fuel are thus conducted to the intake ports associated within the intake chamber 13.

It may be further noted that by varying the angle of the second bend, that the fuel may be induced to flow in any predetermined direction and when occasions arise which necessitate the supplying of more fuel to one of the ports than to the other, the correct amount of fuel may be determined and the manifold constructed to effect any predetermined distribution of the fuel.

In Figure 4 I have illustrated a port runner communicating with an intake chamber 13' which communicates with a plurality of intake ports other than the arrangement shown in Figure 2. In this construction I have preferably shown three such intake ports which are closed by intake valves 12' and preferably the fuel is distributed equally to these ports, but it will be noticed that the inlet of said intake chamber is so arranged that it would be necessary to provide more fuel flow to one side of the axis C than to the other and to obtain this distribution the angle of the second bend is such as to direct more fuel to one side of this axis than to the other.

In Figure 5 I have illustrated a port runner 15' which is constructed at an angle of less than 90° with the lateral or main runner 14'. The bend between these lateral and port runners 14' and 15' respectively is such as to cause a similar stratification of the fuel in the port runner beyond the bend and a second bend 18' is constructed in the port runner 15' adjacent the outlet for correcting the stratification of the fuel mixture, but it will be noticed that this second bend is opposite to the first bend 16'. The fuel in flowing around the bend 16' is caused to travel in a direction as indicated by the arrows 30, and thus the radius of the bend 16' can be also varied for controlling the fuel flow. The bend 16' can thus be constructed to very accurately control the fuel distribution in the port runner by varying the angle of the port runner with respect to the lateral runner or by varying the radius of the bend or by a combination of these constructions.

It will be noted that the construction herein illustrated shows one embodiment of my invention for correcting stratification of the fuel mixture in that portion of the manifold beyond the bend connecting the lateral and port runners. The illustrated embodiment shows a second bend but it must be understood other devices may be incorporated in the port runner for directing the fuel flow in a desired direction for overcoming or eliminating the stratification caused by flowing the fuel around the bend in the manifold structure. It will be noted that I have provided a novel structure for producing the desired result and the means by which this is accomplished may be economically constructed without necessitating a construction of complicated manifold structures, and furthermore, the construction herein illustrated obtains these results without producing an excessive resistance to the flow of the fuel through the manifold structure.

Preferably a construction as I have herein illustrated is adapted for use with a manifold structure in which the length of the port runner does not exceed three times the width of the outlet and in many cases where a manifold structure comprises circular lateral and port runners the length of the port runner may be determined by measuring the diameter of the manifold section and limiting the length of said runner to three times the diameter thereof. This permits the assembly of the manifold structure close to the cylinder block which condition is highly desirable in the manufacture of internal combustion engines.

If desired, the port runners may be more or less curved between the main runners 14 and intake chamber 13, as long as the general angularity of the runners is preserved within the teachings of my invention.

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 structure for an internal combustion engine and including a primary conducting portion, a manifold branch having an obtuse bend, and non-restricting means beyond the bend for correcting stratification of the fuel adjacent the manifold branch outlet.

2. An intake manifold structure for an internal combustion engine and including a primary conducting portion, a manifold branch having an obtuse bend, and non-restricting means adjacent the manifold branch outlet for correcting stratification of the fuel induced thereto by flowing the same around said bend.

3. An intake manifold structure for an internal combustion engine and including a primary conducting portion, a manifold branch having an obtuse bend, and non-restricting means beyond the bend and acting on the wet fuel for directing same to flow in the central part of said branch thereby correcting stratification of the fuel adjacent the manifold branch outlet.

4. An intake manifold structure for an internal combustion engine and including a primary fluid conducting portion, a manifold branch having a bend, and a second non-restricting bend adjacent the manifold branch outlet for producing forces acting on the fluid at said outlet whose resultant extends substantially normal to the outlet opening.

5. An intake manifold structure for an internal combustion engine and including a primary fluid conducting portion, a manifold branch having a bend, and a second non-restricting bend adjacent the manifold branch outlet and acting on the wet fuel for correcting the tendency of said wet fuel to flow along the walls of said manifold branch, said manifold being constructed and arranged to produce forces acting on the fluid at said outlet whose resultant extends substantially normal to the outlet opening.

6. An intake manifold structure for an internal combustion engine and including a primary fluid conducting portion, a manifold branch having an obtuse bend, and non-restricting means beyond the bend for directing the fuel flow in a predetermined direction to correct stratification of said fuel adjacent the manifold branch outlet.

7. An intake manifold structure for an internal combustion engine having an intake fuel passage in communication with a plurality of intake ports associated with a plurality of engine cylinders, said manifold structure including a primary fluid conducting portion, a manifold branch having an obtuse bend, and non-restricting means beyond the bend for acting on said fuel to distribute same in predetermined proportions to said plurality of intake ports.

8. An intake manifold structure for an internal combustion engine and including a manifold branch having an obtuse bend, and a second non-restricting obtuse bend beyond the first bend for correcting non-uniform fuel stratification induced by flowing said fuel around said first bend.

9. An intake manifold structure for an internal combustion engine and including a lateral runner and a port runner connected by an obtuse bend, and a second non-restricting obtuse bend in said port runner for correcting stratification of the fuel adjacent the port runner outlet.

10. An intake manifold structure for an internal combustion engine and including a lateral runner and a port runner connected by a bend, and a second non-restricting bend not exceeding an angle of approximately fifteen degrees in the port runner for correcting stratification of the fuel adjacent the port runner outlet.

11. An intake manifold structure for an internal combustion engine and including a lateral runner and a port runner connected by a bend, said port runner having an outlet and a length not exceeding three times the width of said outlet as measured in a horizontal plane extending substantially parallel with the axis of the lateral runner, and non-restricting means adjacent said port runner outlet for correcting stratification of the fuel adjacent the port runner outlet.

12. An intake manifold structure for an internal combustion engine and including a lateral runner and a port runner connected by a bend and positioned at an angle of more than ninety degrees with respect to each, and a second non-restricting bend in said port runner for correcting stratification of the fuel adjacent the port runner outlet.

13. An intake manifold structure for an internal combustion engine and including a lateral runner and a port runner connected by a bend and positioned at an obtuse angle not exceeding substantially 110 degrees with respect to each other, and a second non-restricting bend in said port runner for correcting stratification of the fuel adjacent the port runner outlet.

14. An intake manifold structure for an internal combustion engine and including a lateral runner and a port runner connected by a bend and positioned at an obtuse angle not exceeding substantially 110 degrees with respect to each other, and a second non-restricting bend in said port runner not exceeding an angle of approximately fifteen degrees in the port runner for correcting stratification of the fuel adjacent the port runner outlet.

15. An intake manifold structure for an internal combustion engine and including a primary fluid conducting portion, a lateral runner and a port runner connected by an obtuse bend, and non-restricting means within said port runner beyond the bend for acting on said fuel to redirect same to flow in a predetermined direction for correcting stratification of the fuel adjacent the port runner outlet.

16. An intake manifold structure for an internal combustion engine and including a pirmary fluid conducting portion, a lateral runner and a port runner connected by an obtuse bend for conducting a fuel to the engine, the inside portion of said bend being constructed to direct said fuel in a predetermined direction for correcting stratification of the fuel adjacent the port runner outlet without restricting the normal fuel flow.

17. In an intake manifold for an internal combustion engine, the latter having a multi-ported intake chamber, said manifold having a main runner for supplying fuel mixture to said intake chamber, a port runner extending at an obtuse angle with said main runner, said port runner having an outlet portion adjacent said intake chamber extending at an obtuse angle with the main portion of said port runner, said obtuse angles providing for substantially uniform conduction of the fuel mixture toward said intake chamber ports with substantially unrestricted flow through the port runner.

18. In an intake manifold for an internal combustion engine, the latter having a multi-ported intake chamber, said manifold having a main runner for supplying fuel mixture to said intake chamber, a port runner extending at an obtuse angle with said main runner, said port runner having an outlet portion adjacent said intake chamber extending at an obtuse angle with the main portion of said port runner, said obtuse angles providing for substantially uniform conduction of the fuel mixture toward said intake cham-

ber ports with substantially unrestricted non-turbulent flow through the port runner.

19. In an intake manifold for an internal combustion engine, the latter having a multi-ported intake chamber, said manifold having a main runner for supplying fuel mixture to said intake chamber, a port runner extending at an obtuse angle with said main runner, said port runner having an outlet opening adjacent said intake chamber extending at an angle with the main portion of said port runner, said angles providing for substantially uniform conduction of the fuel mixture toward said intake chamber ports in a direction substantially normal to the outlet opening with substantially unrestricted flow through the port runner.

20. In an intake manifold for an internal combustion engine, the latter having a multi-ported intake chamber, said manifold having a main runner for supplying fuel mixture to said intake chamber, a port runner extending at an acute angle with said main runner, said port runner having an outlet opening adjacent said intake chamber extending at an obtuse angle with the main portion of said port runner, said obtuse angle providing for substantially uniform conduction of the fuel mixture toward said intake chamber ports in a direction substantially normal to the outlet opening.

21. In an intake manifold for an internal combustion engine, the latter having a multi-ported intake chamber, said manifold having a main runner for supplying fuel mixture to said intake chamber, a port runner extending at an acute angle with said main runner, said port runner having an outlet opening adjacent said intake chamber extending at an obtuse angle with the main portion of said port runner, said angles providing for substantially uniform conduction of the fuel mixture toward said intake chamber ports with substantially unrestricted flow through the port runner, said obtuse angle being in the opposite direction from said acute angle, said obtuse angle providing forces acting on the fluid whose resultant is substantially normal to the outlet opening.

HAROLD H. TIMIAN.