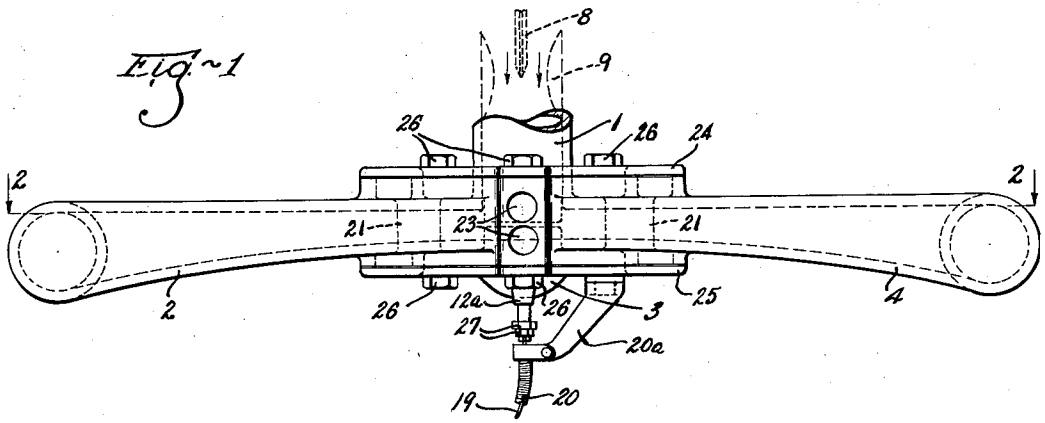
Aug. 18, 1936. F. R. HIGLEY 2,051,556

MANIFOLD

Filed Aug. 18, 1933

Fig. 1.



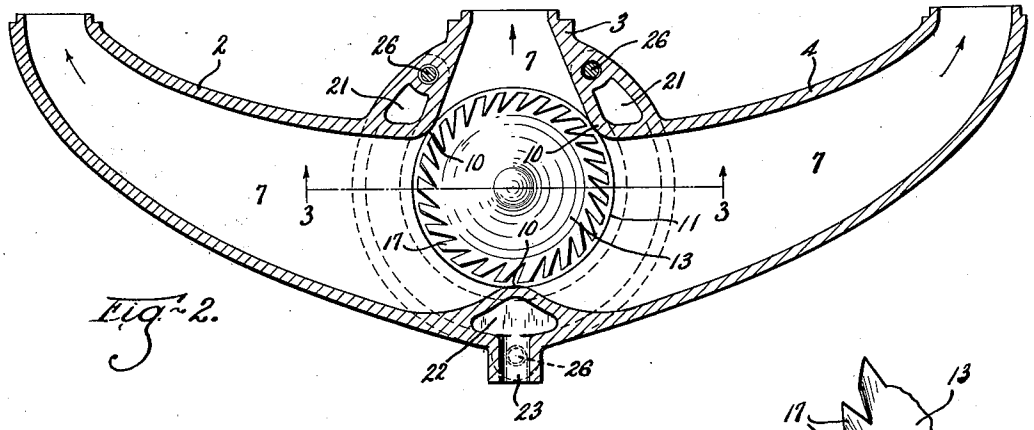


Fig. 2.



Fig. 4.

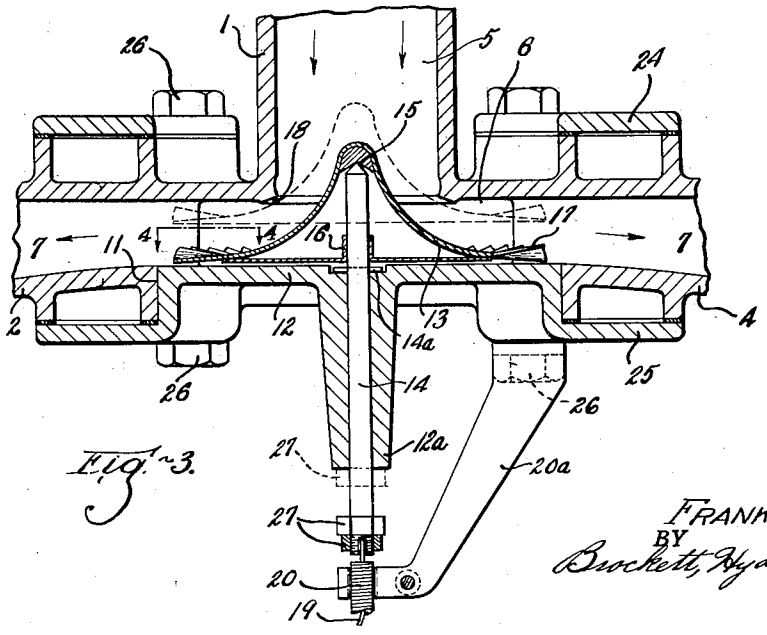


Fig. 3.

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MANIFOLD

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14 Claims. (Cl. 123—141)

This invention relates to fuel intake manifolds for multiple cylinder internal combustion engines.

The function of such a manifold is to receive a mixture formed from liquid fuel and air from a carburetor, and deliver this mixture to a number of inlet ports in the engine cylinder block, each port usually serving a pair of cylinders. The manifold thus has a master passage leading from the carburetor, usually vertically downward, and a plurality of distributing passages, one for each cylinder port, leading generally radially from a base part of the master passage; so that the path of flow from the master passage into each distributing passage includes a substantially right angle bend at the base part of the manifold. It is the general object of this invention to improve conditions of flow in this base part of the manifold.

The mixture handled by the manifold is as nearly as possible wholly gaseous, but in practice as is well known in the art, the mixture delivered by the carburetor is usually only partly gaseous including a substantial amount of liquid, although the latter may be in more or less finely divided entrained particles. These liquid particles because of their inertia, are precipitated out of the stream, at the base part of the manifold, against the wall of the latter opposite the master passage. It is a further object of this invention to effectively avoid such precipitation and instead provide a distribution of the liquid part of the mixture away from the base part of the manifold and into its distributing passages.

Under conditions of desired acceleration, a usual difficulty is that the gaseous part of the mixture, owing to its lower specific gravity, will accelerate much more rapidly than the liquid part of the mixture which, owing to its relatively high specific gravity, will relatively lag behind; so that at the commencement of acceleration the mixture actually delivered by the manifold will be unduly lean and acceleration will be retarded. It is another object of this invention to improve such conditions by increasing the velocity of liquid travel through the manifold, at the expense of slightly impeding the gaseous flow therethrough so that an improved uniformity of mixture is had.

Another problem is to obtain equal distribution of fuel from the master passage to the distributing passages. Another object of the invention is to provide that such distribution shall be improved as to the gaseous flow and substantially positively maintained as to the liquid flow.

These objects are accomplished, briefly, by the arrangement of a rotor at the base part of the manifold opposite the master passage, against which the liquid particles may impinge and from which they will be thrown into the distributing passages by centrifugal force, the rotor being arranged to be actuated by the gaseous flow through the manifold.

A final object of the invention is to provide for adjustment of such rotor, relative to the mouth of the master passage, that the rotor may perform the additional function of a valve for controlling flow through the manifold and thus serve the purpose of the usual throttle valve of the engine served by the manifold.

The exact nature of this invention together with further objects and advantages thereof will be apparent from the following description taken in connection with the accompanying drawing, in which Fig. 1 is an elevation view taken as from the port side of an internal combustion engine, showing an inlet manifold embodying the invention, and, in dot-dash lines, indicating associated carburetor elements; Fig. 2 is a horizontal section through the same as in the plane of line 2—2, Fig. 1; Fig. 3 is an enlarged sectional elevation through parts appearing Figs. 1 and 2, taken as in the plane of line 3—3, Fig. 2; and Fig. 4 is a detail plan view as in the plane of line 4—4, Fig. 3.

With reference now to the drawing, the manifold proper illustrated, is one for a six-cylinder engine, having three inlet ports in its cylinder block, each leading to two of its cylinders. The principal elements of the manifold are as usual a stem 1 and three branches, 2, 3 and 4, providing respectively a master passage 5 leading downwardly into a base part 6 of the manifold, and three distributing passages 7, leading from the base part 6. The stem part 1 of the manifold has connection with a carburetor here indicated conventionally as including as its essential elements, a needle valve 8 and associated Venturi restriction 9.

The general arrangement as thus far described will be recognized as old and well-known, to one familiar with the art, the general purpose of the manifold being to receive the fuel mixture delivered by the carburetor and in turn deliver this mixture as needed, to the several engine ports served by the branches 2, 3 and 4 of the manifold, flow through the manifold being as indicated by the arrows, Figs. 1, 2 and 3.

According to my invention, the manifold is so proportioned that its base part 6 is enlarged radially of the axis of its master passage, and correspondingly flattened longitudinally of the axis,

so that the mouths of the distributing passages 7, connecting with the base part, are widened to collectively include substantially the entire periphery of the base part, leaving in effect partitions 10 therebetween. Also, the mouths of the partition passages are of equal width where they join the base part of the manifold.

The base part of the manifold has an opening 11 in its wall opposite the master passage 5, but substantially of greater diameter than the master passage, and for which a removable closure 12 is provided.

A purpose of this opening 11 is to permit the disposition of a rotor 13 in the base part 6 of the manifold. This rotor is coaxial with the master passage 5 and carried by the closure 12. More specifically, it is rotatably mounted upon a post 14, which is slidably mounted in the closure, having a cotter pin or the like 14a to retain it in the closure.

The rotor is preferably generally conical having an anti-clastic surface presented to the mouth of the master passage, so as to act as a hydro-cone as will appear. It has a thrust bearing on the end of the post 14 as conventionally indicated at 15, and spaced therefrom a steady bearing upon the post as conventionally indicated at 16; the arrangement being one whereby the rotor is freely rotatable upon the post. The rotor may preferably be of sheet metal as indicated so that its weight is slight and its inertia will be a minimum.

The central part of the rotor preferably extends somewhat into the mouth of the master passage 5. Radially the rotor preferably has as great extent as possible yet permitting a running clearance from the manifold partition projections 10. The rotor is provided with vane means adapted to cause its actuation by a stream flowing through the manifold. Thus the peripheral part of the rotor may be deformed as by the cutting and bending indicated in the drawing, to provide blades 17 adapted for its actuation upon its bearings dependent upon flow through the manifold.

The stem 1 of the manifold, which is preferably cylindrical as indicated, is arranged to lead into the base part 6 thereof in such a manner as to provide an annulus 18 which may be preferably finished as indicated Fig. 3, concentric with the rotor. That the rotor may be cooperative with this annulus to serve as a valve for controlling outlet from the master passage 5, the post 14 is made longitudinally adjustable in its bearing in the closure 12. Means for the purpose are here conventionally indicated as by a Bowden wire 19 secured with the outer end of the post 14 and cooperative wire sleeve 20 rigidly secured as by the bracket 20a.

The motion permitted the post 14 is such that it may be moved between a full open position, that shown in Fig. 3, and an elevated closed position indicated by the broken lines Fig. 3, wherein the rotor 13 has just running clearance from the annulus boss 18, the sectional contour of the rotor, including its blades 17, being such as to permit clearance for the blades in this rotor position. That a fine limiting adjustment may be had for the closed position, nuts 21 may be threaded onto the post 14, engageable with the stem part 12a of the closure member.

It is preferable that heat be applied to the base part of the master passage and particularly to the projecting parts 10 thereof. For this purpose the manifold casting is arranged to provide a pair of vertical hollows 21 adjacent the symmetrically disposed projections 10, and a pair of hollows 22 adjacent the remaining projection 10, the hollows 22 being separated from each other merely by a transverse web and each having an opening 23 leading outwardly. The hollows 21 are open both top and bottom and each of the hollows 22 is open opposite the dividing web therebetween, top or bottom as the case may be. The walls forming the openings 21 and 22 are extended as indicated Figs. 1 and 3, above and below the manifold distributing passages 7. Also, these walls are extended so as to connect both of the hollows 21 with the hollows 22 as indicated Figs. 2 and 3. A cover plate 24 generally of horseshoe form, is disposed above to close the upper connecting passages between the hollows 21 and the upper hollow 22. Similarly, the closure 12 as at 25, is extended below the cover plate 24. The arrangement is such that a passageway for a heating medium is provided from one of the openings 23 by way of the corresponding hollow 22, both of the hollows 21 in parallel relation, the other hollow 22 and its opening 23. The cover plate 24 as well as the closure 12 is removably secured in the positions described and illustrated as by bolts or screws 26.

Operation will be as follows. Assuming the manifold properly mounted on an engine and having its master passage connected to a carburetor as above described, vertical adjustment of the post 14 will cause the rotor 13 to act as a valve in the mouth of the master passage 5, closing the master passage as the rotor is raised, Figs. 1 and 3.

All flow of the gaseous mixture from the master passage 5 will be generally downward and outward over the upper face of the rotor, which acts as a hydro-cone, and particularly past the blades 17 thereof, imparting to the rotor a high speed of rotation. Particles of liquid fuel entrained in the mixture, will impinge upon the rotor, which, by centrifugal force, will throw these particles radially outwardly and generally into and along the distributing passages 7. These passages preferably have a slight downward slope as they lead from the base part of the manifold, as indicated Fig. 1, so that the throw of the liquid particles from the rotor will move them as far as possible along the passages 7. Those liquid particles thrown from the rotor against the parts 10 of the manifold will be volatilized by the heat localized at these points.

It will be noted that by the arrangement described the rotor will be maintained in operation at all times even though as a valve it be in substantially closed position. In such elevated position assuming an equal rotor speed, the periphery of the rotor being higher relative to the distributing passages 7, the liquid particles of the mixture will be thrown the farther along these passages. As the rotor is lowered with opening effect as a valve, the spray of liquid therefrom will have distribution along the distributing passages generally radially inwards toward the rotor.

Generally, at all times, the effect of the rotor will be to slightly impede the gaseous flow through the manifold owing to the obstructive effect of its blades 17, while its effect upon the liquid particles of the mixture will always be to accelerate their travel from the master passage 5 into and along the distributing passages 7. These combined results are of particular advantage during conditions of accelerating of the engine as

will be appreciated by one familiar with the art.

Particularly it is to be observed that all of the distributing passages subtend equal peripheral parts of the rotor, where they join the base part of the manifold. Since the rotor will throw approximately uniformly throughout its periphery, the more so with the more rotative speed, the arrangement described provides a positive distribution, equally to all distributing passages, of any and all liquid particles in the mixture.

While I specifically illustrated and described an adaptation of the invention to a manifold having three distributing passages and thus suitable for a six-cylinder motor, it will be apparent that the invention is equally applicable to the manifold for any number of cylinders arranged either in line or in a V, all as will be apparent to one familiar with the art.

What I claim is:

1. In a manifold for the purpose described and having a master passage and distributing passage means leading from a base part thereof, a rotor arranged in said base part coaxial with said master passage, imperforate opposite said master passage and having vane means for its actuation by gaseous flow from the master passage to the distributing passage means, and means for adjusting the effective distance between said master passage and the rotor, for controlling said flow.

2. In a manifold for the purpose described and having a master passage with distributing passage means leading from a base part thereof, a rotor having a part arranged in the path of entrained liquid particles of a generally gaseous mixture fed through said master passage, means for actuating said rotor to cause said particles to be thrown thereby into said distributing passage means, and means for axially adjusting said rotor, to control flow from said master passage, the corresponding rotor and manifold parts being arranged to provide suitable clearance for the purpose of said adjustment.

3. In a manifold for the purpose described and having a master passage with a plurality of distributing passages leading divergently from a base part thereof, a rotor arranged in the hollow of said base part, in the path of flow from said master passage, to receive, and throw outwardly, by centrifugal force, nongaseous particles of a generally gaseous mixture fed through said manifold, and means for heating the walls of said manifold about said base part and including means forming passages for a heating medium adjacent said base part between said distributing passages.

4. In a manifold for the purpose described and having a master inlet passage and distributing passage means leading divergently from a base part thereof, a rotor arranged in said base part with a face opposite said master passage and having associated actuating means, and means for adjusting said rotor lengthwise of said master passage axis for controlling flow through said manifold.

5. In a manifold for the purpose described and having a master inlet passage with a plurality of distributing passages leading divergently from a base part thereof, a rotor mounted for free rotation within said manifold and without driving connection external of the latter, having a face located opposite said master passage and proportioned and arranged to receive substantially all liquid particles separated at said base part from a stream of generally gaseous mixture flowing through said manifold, and having vane means adapted to cause said stream to actuate said rotor, said rotor being disposed to discharge said particles centrifugally toward said distributing passages.

6. In a manifold for the purpose described and having a base part, a master passage leading thereto and a plurality of distributing passages leading divergently therefrom, a rotor mounted for free rotation within said manifold base part, about an axis aligned with the mouth of said master passage at said base part, said rotor having a face part located opposite said master passage to receive liquid particles separated from a stream of generally gaseous mixture flowing through said manifold, and having vane means adapted to cause said stream to actuate said rotor, and means for adjusting said rotor lengthwise of said axis whereby said rotor face part will be cooperative with said master passage mouth, to control flow of said stream.

7. In a manifold for the purpose described and having a master inlet passage with a plurality of distributing passages leading divergently from a base part thereof, a rotor mounted for free rotation within said manifold, having a face located opposite said master passage to receive liquid particles separated from a stream of generally gaseous mixture flowing through said manifold, and having vane means adapted to cause said stream to actuate said rotor, said rotor being disposed to discharge said particles centrifugally toward said distributing passages, said distributing passages having relatively wide mouth parts collectively communicating with said base part substantially entirely about said rotor.

8. In a manifold for the purpose described and having a base part, a master passage leading thereto and a plurality of distributing passages leading divergently therefrom, a rotor mounted for free rotation within said manifold base part, about an axis aligned with the mouth of said master passage at said base part, said rotor having a face part located opposite said master passage to receive liquid particles separated from a stream of generally gaseous mixture flowing through said manifold, and having vane means adapted to cause said stream to actuate said rotor, and means for adjusting said rotor lengthwise of said axis whereby said rotor face part will be cooperative with said master passage mouth, to control flow of said stream, said distributing passages being arranged to collectively communicate with said base part substantially entirely about said axis.

9. In a manifold for the purpose described and having a master inlet passage with a plurality of distributing passages leading divergently from a base part thereof, rotor means having a face part proportioned and arranged within said manifold base part opposite said master passage to receive substantially all liquid particles separated at said base part by their inertia from a stream of generally gaseous mixture emerging from said master passage during flow through said manifold, said rotor means having vane means arranged to provide for its actuation by the gaseous part of said stream, thereby taking kinetic energy from said gaseous part, and said rotor means having a peripheral part disposed to discharge said particles centrifugally, divergently from said master passage base part and into the mouths of said distributing passages, thereby imparting a substantial part of said energy to said particles, whereby during acceleration of said stream in the operation of said manifold, flow of the liquid part of said mixture is increased and flow of the gase-

ous part of the mixture is correspondingly retarded, with consequent equalizing effect upon said mixture parts, the liquid particles of which would otherwise lag relative to the gaseous part.

10. In a manifold for the purpose described and having a master inlet passage with a plurality of distributing passages leading divergently from a base part thereof, rotor means having a face part proportioned and arranged within said manifold base part opposite said master passage to receive substantially all liquid particles separated at said base part by their inertia from a stream of generally gaseous mixture emerging from said master passage during flow through said manifold, said rotor means having vane means arranged to provide for its actuation by the gaseous part of said stream, thereby taking kinetic energy from said gaseous part, and said rotor means having a peripheral part disposed to discharge said particles centrifugally, divergently from said master passage base part and into the mouths of said distributing passages, thereby imparting a substantial part of said energy to said particles, said rotor means being light and said vane means so constructed and arranged that the speed of said rotor means will be high relative to the velocity of gaseous flow through said manifold, and will be quickly responsive to the latter.

11. In a manifold for the purpose described and having a master inlet passage with a plurality of distributing passages leading divergently from a base part thereof, a rotor mounted in said base part, having a face located opposite said master passage to receive substantially all liquid particles separated at said base part from a stream of generally gaseous mixture flowing through said manifold, said rotor being disposed for actuation to discharge said particles centrifugally toward said distributing passages, and means for actuating said rotor, said distributing passages having slope in the direction of the falling path of particles discharged by said rotor.

12. In a manifold for the purpose described and having a master inlet passage with a plurality of distributing passages leading divergently from a base part thereof, a rotor mounted for rotation within said manifold concentric with said master passage, having a face located opposite said master passage and of effectively imperforate area greater than the sectional area of said master passage, to receive substantially all liquid particles separated at said base part from a stream of generally gaseous mixture flowing through said manifold, said rotor having vane means peripherally located without the projected area of said master passage and adapted to cause said stream to actuate said rotor.

13. In a manifold for the purpose described and having a master inlet passage with a plurality of distributing passages leading divergently from a base part thereof, a rotor mounted for rotation within said manifold concentric with said master passage, having a face located opposite said master passage and of effectively imperforate area greater than the sectional area of said master passage, to receive substantially all liquid particles separated at said base part from a stream of generally gaseous mixture flowing through said manifold, said face being of anticlastic form to provide hydroconical characteristics to gaseous flow through said base part, said rotor having vane means peripherally located without the projected area of said master passage and adapted to cause said stream to actuate said rotor.

14. In a manifold for the purpose described and having a master inlet passage with a plurality of distributing passages leading divergently from a base part thereof, a rotor mounted for rotation within said manifold, concentric with said master passage, having a face located opposite said master passage and of effectively imperforate area greater than the sectional area of said master passage, to receive substantially all liquid particles separated at said base part from a stream of generally gaseous mixture flowing through said manifold, said face being of anticlastic form to provide hydroconical characteristics to gaseous flow through said base part, said rotor having vane means peripherally located without the projected area of said master passage and adapted to cause said stream to actuate said rotor, and means for adjusting the effective distance between said master passage and said rotor, for controlling said stream.

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