

March 26, 1929.

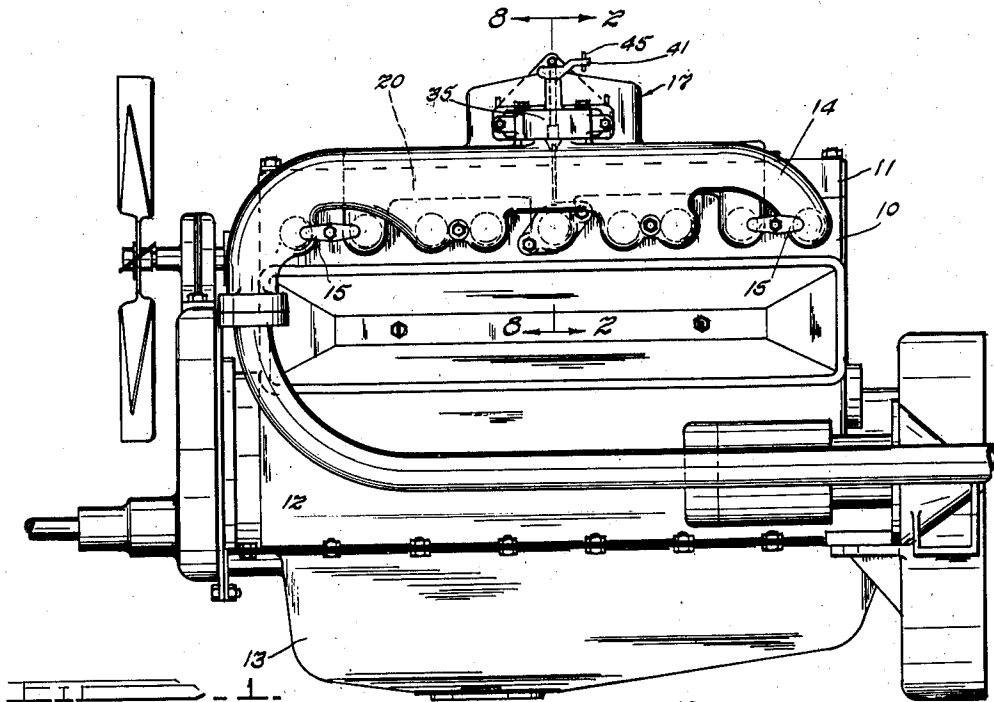
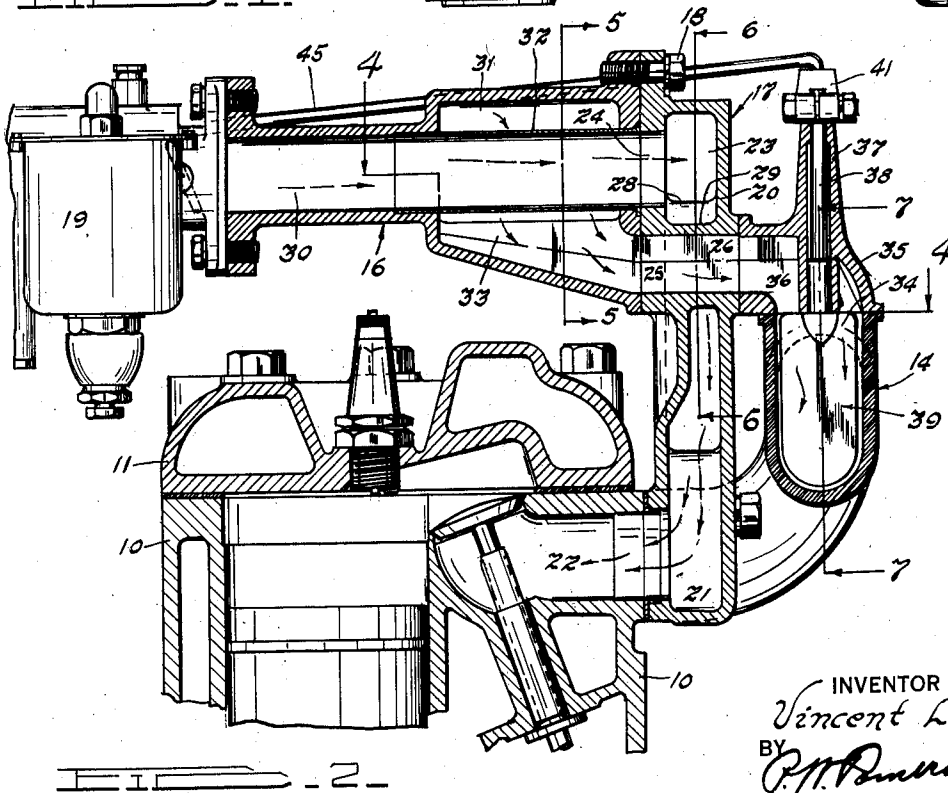
V. LINK

1,706,623

INTERNAL COMBUSTION ENGINE

Filed Jan. 10, 1927

4 Sheets-Sheet 1



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March 26, 1929.

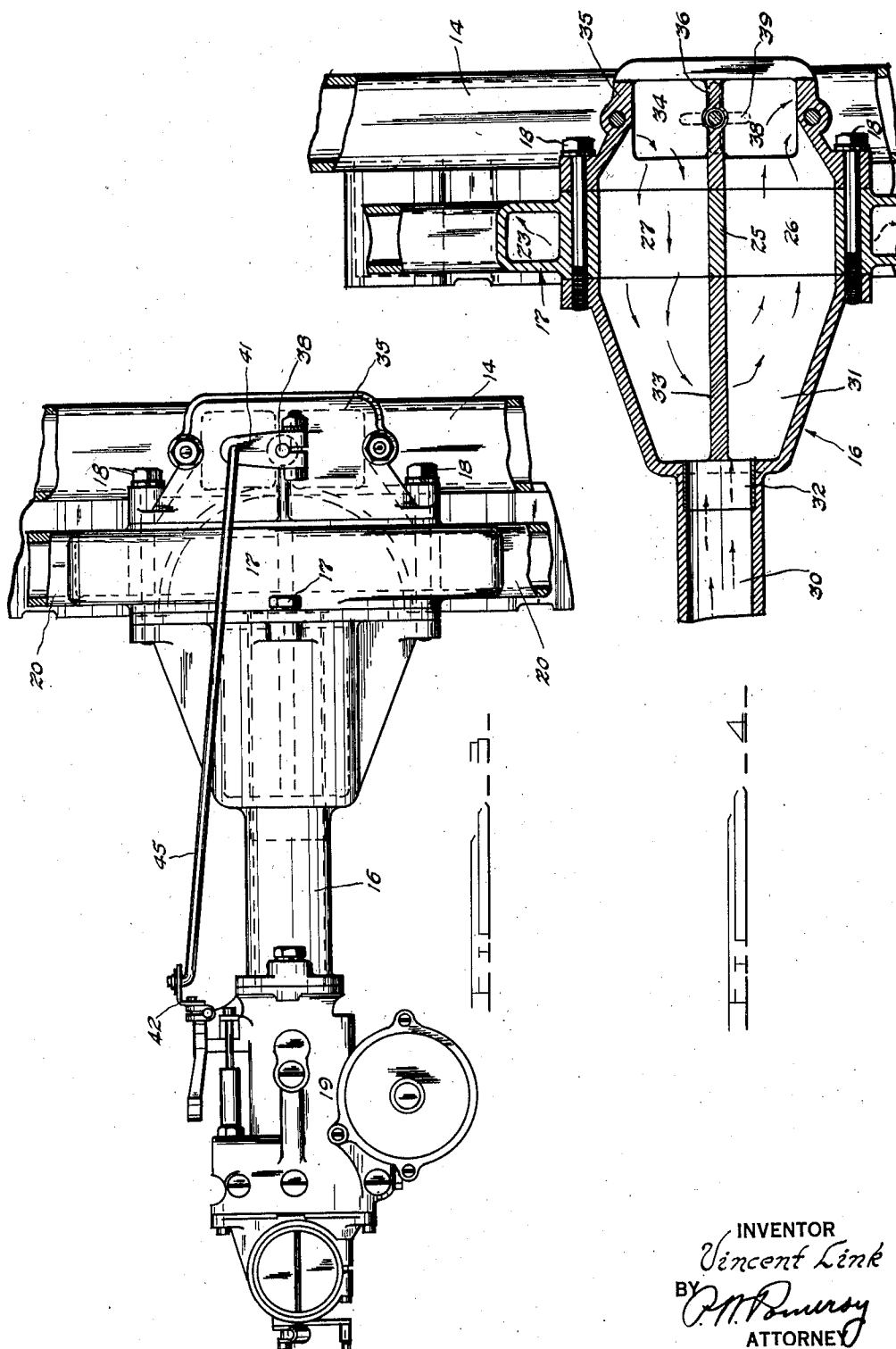
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INTERNAL COMBUSTION ENGINE

Filed Jan. 10, 1927

4 Sheets-Sheet 2



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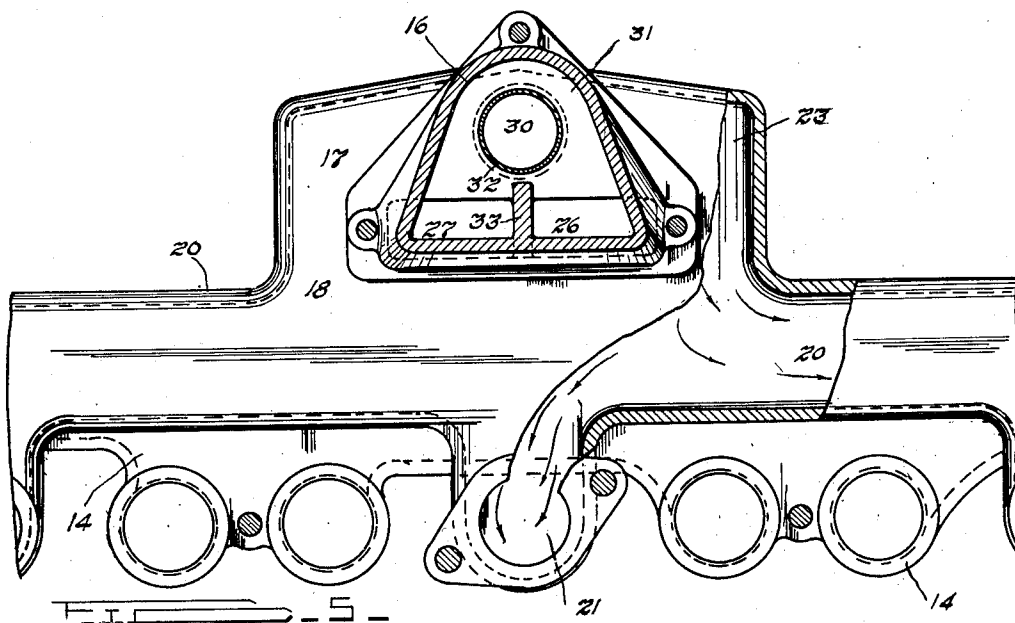
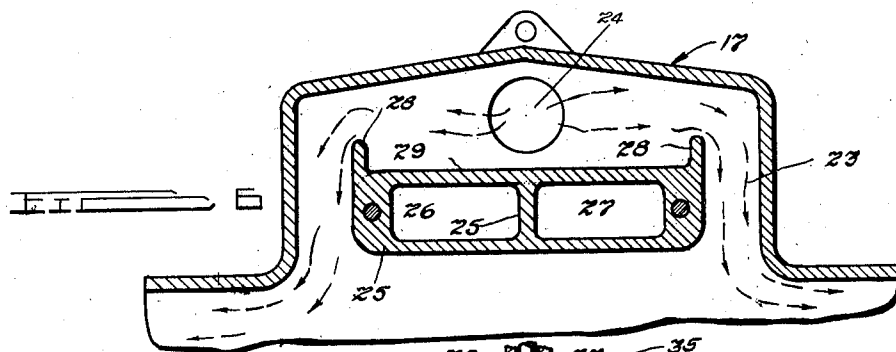
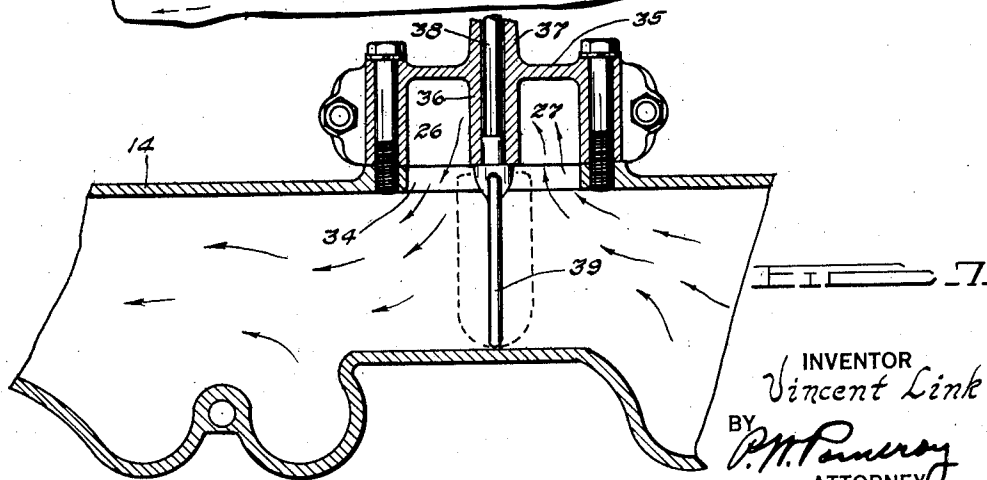
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INTERNAL COMBUSTION ENGINE

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4 Sheets-Sheet 3



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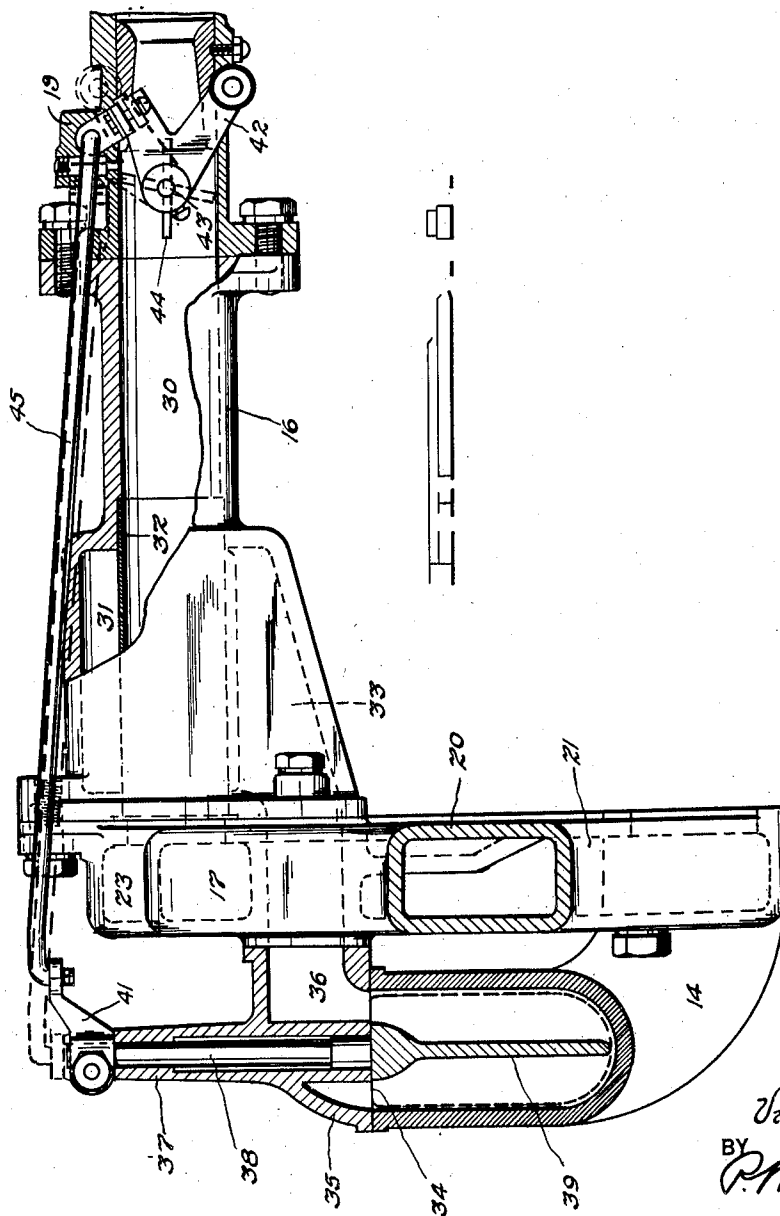
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INTERNAL COMBUSTION ENGINE

Filed Jan. 10, 1927

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

Application filed January 10, 1927. Serial No. 160,119.

This invention relates to internal combustion engines and particularly to manifold constructions therefor, the principal object being to provide a construction in which the combustible mixture may be readily vaporized and distributed equally to the various cylinders of the engine.

Another object is to provide a manifold construction for an internal combustion engine in which the combustible mixture from the carburetor will be directed into a pocket heated by the exhaust gases where the unvaporized particles of the fuel will be separated out and will thereafter be vaporized by the heat in said pocket.

Another object is to provide a manifold construction for an internal combustion engine in which a pocket in the intake manifold is formed above and in contact with the exhaust manifold, the combustible mixture from the carburetor being directed into said pocket and deflected therein to deposit liquid fuel particles carried by the mixture stream in said pocket, said pocket serving as a reservoir for holding such particles until such time as they are boiled off and vaporized by the heat transmitted thereto from the exhaust manifold.

Another object is to provide a manifold construction for an internal combustion engine, in which the combustible mixture from the carburetor is initially heated and then introduced into a pocket where its direction of flow is changed to deposit the liquid fuel particles carried thereby in a reservoir formed in the bottom of said pocket, the bottom of said pocket having a wall common to an exhaust passage whereby the same is heated, such liquid fuel particles as are deposited thereon being vaporized by the heat thereof and returned to the combustible mixture stream.

Another object is to provide a manifold construction for an internal combustion engine in which a portion of the intake passage is formed of a thin walled tube about which exhaust gases may be circulated to heat the combustible mixture therein, the combustible mixture flowing from said tube being projected against a baffle whereby the liquid particles of fuel carried thereby will be separated out from the mixture stream and will drain into a reservoir provided therebelow, said reservoir being heated by exhaust gases whereby such liquid fuel particles deposited therein

will be heated and vaporized and returned to the mixture stream.

A further object is to provide a manifold construction for an internal combustion engine in which the combustible mixture from the carburetor is led horizontally through a thin walled tube surrounded by a passage for exhaust gases, the combustible mixture from said tube being projected against the side wall of a pocket positioned transversely to said tube, the particles of liquid fuel carried by the combustible mixture being deposited against said side wall and draining down into a pocket formed in the lower part of said pocket, the lower wall of said pocket being common to said passage for exhaust gases whereby said wall will be heated and will cause said liquid fuel particles deposited thereon to be vaporized and returned to the mixture stream, said exhaust passage being connected to the exhaust manifold and a valve being provided in the exhaust manifold for controlling the passage of the exhaust gases through said exhaust passage, said valve being connected for relative movement with the throttle valve of the carburetor whereby when the throttle valve is open, the valve in the exhaust manifold is positioned to prevent passage of exhaust gas through said exhaust passage, and when said throttle valve is closed or in partly closed position the valve in the exhaust manifold is positioned to force the exhaust gases through said exhaust passage.

The above being among the objects of the present invention, the same consists of certain features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed, having the above and other objects in view.

In the accompanying drawings which illustrate a suitable embodiment of the present invention and in which like numerals refer to like parts throughout the several different views,

Figure 1 is a side view of an internal combustion engine in which a suitable embodiment of the present invention is incorporated.

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1 showing the upper portion of the internal combustion engine and the manifold system connected thereto.

Figure 3 is a plan view of the central portion of the manifolding system shown in the previous views.

Figure 4 is a sectional view taken on the broken line 4—4 of Figure 2.

Figure 5 is a sectional view taken on the line 5—5 of Figure 2.

Figure 6 is a sectional view taken on the line 6—6 of Figure 2.

Figure 7 is a sectional view taken on the line 7—7 of Figure 2.

Figure 8 is a partially broken sectional view similar to Figure 2 but looking toward the front of the motor as on the line 8—8 of Figure 1, illustrating the hook-up between the throttle valve and the exhaust manifold valve.

In manifold designs for internal combustion engines the result invariably sought to be obtained is an equal distribution of the combustible mixture to the various cylinders. It is generally accepted that this may be obtained if sufficient heat is applied to the combustible mixture stream to entirely vaporize all particles of liquid fuel carried thereby. The heating of the combustible mixture to a sufficiently high temperature to accomplish this result is objectionable at high engine speeds for the reason that the volumetric efficiency of the engine is impaired thereby and materially affects the high speed performance of such engine, and also because such high heating of the combustible mixture causes detonation of the same in the engine cylinders which is almost impossible to control. On the other hand, the application of a large amount of heat to the combustible mixture at low engine speed is not objectionable but in fact is desirable, as at low engine speeds the speed of the air passing through the carburetor is so low that a very incomplete vaporization of the fuel occurs, and consequently at low engine speeds the combustible mixture from the carburetor carries a relatively large percentage of unvaporized fuel particles which, if not vaporized, will be drawn into the engine in liquid state where it will dilute the oil and cause deposits of carbon to be built up on the piston head and on the walls of the combustion chamber.

The present invention contemplates a construction in which the heating effect of the combustible mixture varies inversely as the speed of the engine, and is so formed that at low engine speeds sufficient heat may be applied to the combustible mixture to cause complete vaporization of any particles of liquid fuel carried thereby, and in which at higher engine speeds the amount of heat will be controlled so as not to materially affect the volumetric efficiency of the engine.

As illustrative of the present invention I show the same in the accompanying drawings in combination with an internal combustion engine having a cylinder block 10, cylinder head 11, a crank case 12, and an oil pan 13.

The exhaust manifold 14, which is of conventional construction excepting for the features hereinafter described, is secured to the side of the cylinder block 10 in the usual position by conventional securing means 15.

The intake manifold is made up of two main portions 16 and 17 suitably secured together by screws 18. The portion 16 serves to carry the combustible mixture from the carburetor 19 across and above the cylinder head 11 to the portion 17 and for other purposes to be hereinafter described, the portion 17 serving as a header and a distributor. The distributor part of the portion 17 comprises a relatively long and flat extending part 20 formed to provide a duct therein of like shape which is connected by the downwardly extending ducts 21 to the inlet ports 22 of the engine. This portion of the intake manifold is positioned between the exhaust manifold 14 and the cylinder block 10. The upper walls of the portion 17 adjacent the center thereof are formed to provide an upwardly extending pocket 23, the upper portion of which is in communication with the portion 16 of the manifold through the opening 24. Extending between the inner walls of the pocket 23 and spaced from the front and rear edges thereof immediately below the opening 24 are walls 25 formed to provide ducts 26 and 27 extending transversely through the portion 17 at this point. The ends of the walls 25 are extended upwardly a short distance to form baffles 28 whereby a reservoir 29 is formed above the ducts 26 and 27 and below the opening 24 for a purpose to be hereinafter described.

The portion 16 of the intake manifold is formed to provide a tubular passage 30 extending for a short distance from the carburetor 19 and then the walls thereof are enlarged to form a chamber 31 which extends up to and is secured to the portion 17 by the screws 18 previously described. The passageway 30 is continued in normal size through the chamber 31 by means of a thin metallic tube 32 the interior of which is connected with the opening 24 of the portion 17 previously described. The lower portion of the chamber 31 extends down and is connected with the ducts 26 and 27 in the portion 17, and a vertically positioned baffle 33, best shown in Figures 4 and 5, extends upwardly from the lower face of the chamber 31 up to a point adjacent the lower face of the tube 32, it acting to continue the separation of the ducts 26 and 27 to the lower face of the tube 32.

The upper wall of the exhaust manifold 14 is provided with a central opening 34 which is covered by the member 35 which connects the interior of the exhaust manifold 34 with the ducts 26 and 27 in the portion 17, the central baffle 36 dividing the interior thereof into a pair of ducts which effect a continuous

tion of the ducts 26 and 27 down to the opening 34. The member 35 is also provided with an upstanding boss 37 positioned centrally of the exhaust manifold 14 which rotatably receives the shaft 38 of the valve 39 which is positioned within the exhaust manifold 14. It will be apparent that when the valve 39 is turned to the position shown in Figure 2, the exhaust gases flowing forwardly from the rear portion of the engine shown in Figure 1, are deflected by the valve 39, and the baffle 36 up through the rear side of the member 35 through the duct 27 and into the chamber 31 where it is forced up around the tube 32 and down back into the duct 26 from which it passes back through the forward side of the member 35 into the exhaust manifold 14. It will be apparent that the exhaust gases in passing through the ducts 26 and 27 and chamber 31 in the manner just described come in contact with the bottom walls of the reservoir 29 and in contact with the tube 32, and a transfer of heat therefrom to these parts occurs. When the valve 39 is turned 90° from the position shown in Figure 2, or in accordance with the position shown in Figure 8, the exhaust gases, by following the path of least resistance, will pass directly through the exhaust manifold 14 without any material flow through the chamber 31. In such a case neither the bottom wall of the reservoir 29 nor the tube 32 will receive any material amount of heat from the exhaust gases.

As an illustration of the construction just described, when the valve 39 is in the position indicated in Figure 2 in which the exhaust gases are forced through the duct 27 and into the chamber 31 from which they are returned through the duct 26 to the exhaust manifold 14, it will be apparent that the combustible mixture flowing from the carburetor 19 through the passage 30 and interior of the tube 32 will be heated in passing through the tube 32 by reason of the transfer of heat thereto from the exhaust gases in contact therewith. This heat is sufficient to vaporize the smaller and more easily vaporized particles of liquid fuel being carried by the combustible mixture stream without materially raising the temperature of the entire combustible mixture. The combustible mixture in passing through the tube 32 is projected through the opening 24 against the outer face or wall of the pocket 23 which abruptly changes its direction of flow 90° and splits it up so that half of the same passes either side of the opening 24 up over the baffles 28 and then downwardly into the distributor portion 20 of the intake manifold. When the combustible mixture stream is thus abruptly changed in the direction of its travel by the outer wall of the pocket 23, the inertia of the particles of liquid fuel carried by the combustible mixture stream causes the same to be

projected against this wall, and these particles of liquid fuel after having come in contact with this wall cling to the same and drain by gravity down into the reservoir 29 from which they are prevented from escaping by the baffles 28. When the particles of liquid fuel thus drain down into the reservoir 29 they come in contact with the heated lower wall thereof and the heat transmitted thereto from the same causes such liquid fuel particles to be vaporized and returned to the mixture stream as a gas. The result is that the combustible mixture actually entering the distributor portion 20 is substantially freed of all particles of liquid fuel and contains nothing but a completely vaporized mixture which is readily distributed in equal proportions through the distributor portion 20 of the intake manifold to the various intake ports 22 of the engine.

As previously mentioned, liquid fuel particles in the mixture stream are usually present to an objectionable degree only at the lower engine speeds and consequently the application of heat thereto as just described is only necessary and desirable at these lower speeds. Accordingly, in the present invention, I provide means whereby the heating effect on the combustible mixture is reduced as the engine speed increases and substantially disappears at wide open throttle.

The means employed for accomplishing this result are best shown in Figures 3 and 8. As indicated in those figures a lever 41 is secured to the upper end of the shaft 38. The free end of the lever 41 is pivotally connected by the link 45 to the lever 42 secured to the shaft 43 of the carburetor throttle valve 44, the relation of the levers 41 and 42 being such that when the throttle valve 44 is closed the valve 39 is positioned to obstruct the free-flowing of the exhaust gases through the exhaust manifold 14 and to force them up through the chamber 31 as previously described, and when the throttle valve is in wide open position, or top engine speed, the valve 39 in the exhaust manifold 14 is positioned to allow a free flow of the exhaust gases directly therepast. Any variation of the position of the throttle valve between wide open and closed position will cause a like movement of the valve 39 in the exhaust manifold 14 and will consequently allow a greater or lesser amount of exhaust gases to pass through the chamber 31, and in this manner the amount of heat transferred to the combustible mixture flowing through the intake manifold will be controlled in accordance with the position of the throttle valve, and therefore in a more or less proportionate manner, inversely in accordance with the speed of the engine of which the construction forms a part.

It will be noted from the foregoing that the amount of heat transferred to the combustible mixture at low engine speed from

the bottom of the reservoir 29 is very small and will not heat the body of the combustible mixture to any substantial degree, its main purpose being to collect the particles of liquid fuel and supply sufficient heat thereto to return them to the mixture stream in vaporized condition. The main transfer of heat of course occurs at the tube 32 which, being of relatively thin metal, is quickly affected by the presence of the exhaust gases in contact therewith and transmit the heat therefrom to the combustible mixture flowing there-through. The length of the tube 32 may, of course, be varied to suit the particular engine in connection with which the construction is adapted, so as to obtain the most favorable results without overheating the complete body of the combustible mixture.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit and substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. In combination with an internal combustion engine having an intake manifold, an exhaust manifold, and a carburetor, said intake manifold formed to provide a pocket therein, a wall extending between the inner walls of said intake manifold within said pocket forming a passage for exhaust gases, baffles projecting upwardly from the upper face of the first-mentioned wall to provide a reservoir therebetween, a horizontally extending duct for conducting the combustible mixture from said carburetor to said pocket, and means for conducting exhaust gases from said exhaust manifold through said pocket and into contact with said duct.

2. In combination with an internal combustion engine having an intake manifold, an exhaust manifold, and a carburetor, said intake manifold formed to provide a pocket in the upper portion thereof, hollow walls extending through said pocket forming a pair of passages for exhaust gases, baffles projecting upwardly from said walls to form a reservoir therebetween, a horizontally extending duct for conducting the combustible mixture from the carburetor into said pocket and projecting the same against the side wall thereof, a chamber surrounding said duct in communication with said passage, means for connecting said passages with said exhaust manifold, and means for forcing said exhaust gases from said exhaust manifold through one of said passages into said chamber and then out of said chamber through the other of said passages back into said exhaust manifold.

3. In combination with an internal combustion engine having an intake manifold, and a carburetor, a pocket formed in said intake manifold, a reservoir formed in said pocket, a horizontally extending duct for conducting the combustible mixture from the

carburetor into said pocket and projecting it against the side wall thereof, a chamber surrounding said duct, a pair of passages connecting said exhaust manifold with said chamber, said passages having a wall in common with said reservoir, and a valve positioned in such exhaust manifold between said passages whereby exhaust gases may be forced from said exhaust manifold through one of said passages into said chamber and then out of said chamber through the other of said passages back into said exhaust manifold at will.

4. In combination with an internal combustion engine having an intake manifold, an exhaust manifold, and a carburetor, a pocket formed in said intake manifold, a duct leading from said carburetor into said pocket and positioned to project the combustible mixture from said carburetor against a side wall of said pocket, a reservoir formed in said pocket for collecting particles of liquid fuel projected against said side wall, exhaust passages having a wall in common with a wall of said reservoir, a valve in said exhaust manifold for controlling the flow of exhaust gases between said passages, and means for operatively connecting said valve with the throttle valve of said carburetor to control the position of said valve in said exhaust manifold in direct relation to the position of said throttle valve in said carburetor.

5. In combination with an internal combustion engine having an intake manifold, an exhaust manifold, and a carburetor, a pocket formed in said intake manifold, means forming a duct leading from said carburetor into said pocket and formed to project the combustible mixture from said carburetor against the side wall of said pocket, a portion of the wall of said duct being formed of a relatively thin tube, a chamber formed to surround said tube, a reservoir formed in said pocket below said duct, and exhaust passages connecting said exhaust manifold with said chamber and having a portion of the walls thereof in common with the wall of said reservoir, a valve in said exhaust manifold for controlling the flow of exhaust gases through said passages, a valve in said carburetor for controlling the flow of combustible mixture from said carburetor to said intake manifold, and means operatively connecting both of said valves whereby when said valve in said carburetor is closed said valve in said exhaust manifold is positioned to cause a maximum flow of exhaust gases through said passages, and when said valve in said carburetor is positioned in open position said valve in said exhaust manifold is positioned to allow a flow of exhaust gases through said exhaust manifold without passing through said passages.

Signed by me at Detroit, Michigan, this 3rd day of Jan., 1927.

VINCENT LINK.

CERTIFICATE OF CORRECTION.**Patent No. 1,706,623.****Granted March 26, 1929, to****VINCENT LINK.**

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, line 61, claim 3, after the word "manifold" insert the words and comma "an exhaust manifold,"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of May, A. D. 1929.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)

CERTIFICATE OF CORRECTION.

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