J. M. KING.

EXHAUST MANIFOLD.

APPLICATION FILED APR. 7, 1916. RENEWED AUG. 30, 1918.

**1,374,927.**

**Patented Apr. 19, 1921.**

2 SHEETS—SHEET 1.

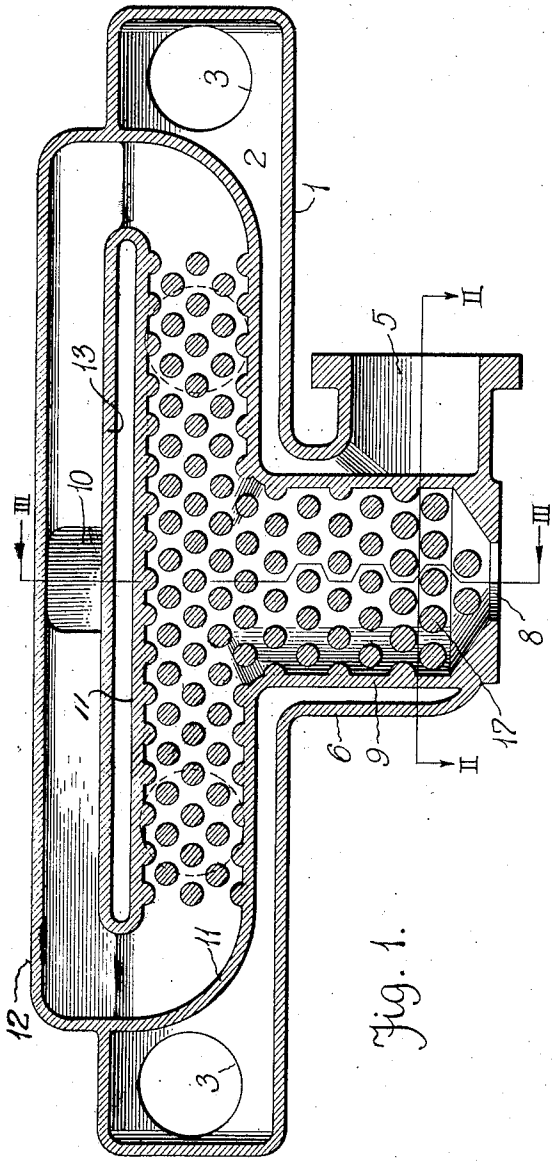
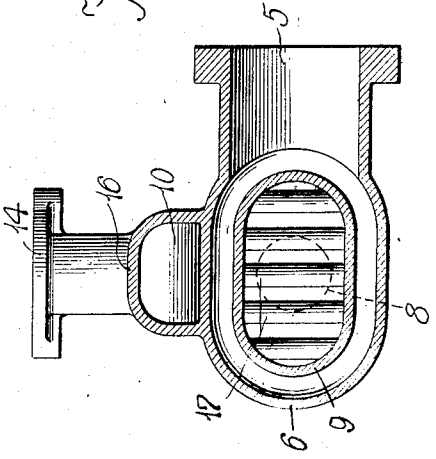



Fig. 1.

Fig. 2.




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2 SHEETS—SHEET 2.

Fig. 5.

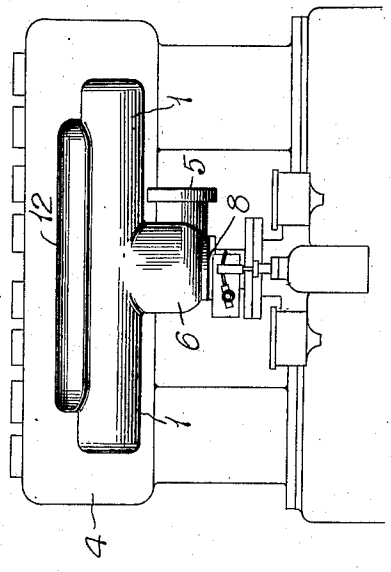
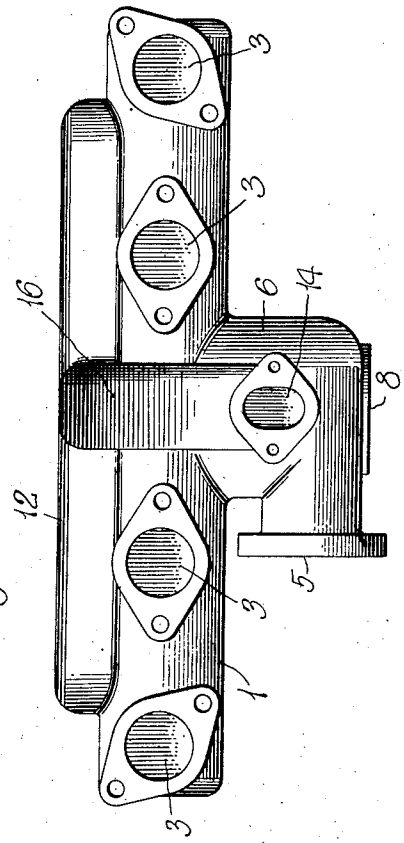



Fig. 4.



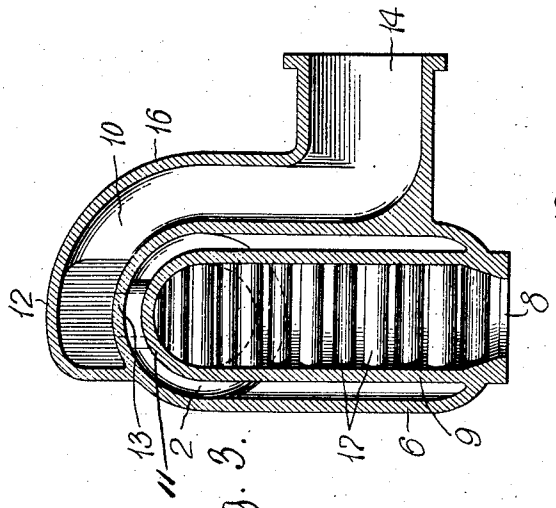




Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## EXHAUST-MANIFOLD.

1,374,927. Specification of Letters Patent. Patented Apr. 19, 1921.

Application filed April 7, 1916, Serial No. 89,570. Renewed August 30, 1918. Serial No. 252,129.

*To all whom it may concern:*

Be it known that I, JOSEPH MARION KING, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented new and useful Improvements in Exhaust-Manifolds for Internal-Combustion Engines, of which the following is a specification.

This invention relates to the preparation of the motive fuel charge for an internal combustion engine, the accomplishment of which is effected in the engine's exhaust manifold; especially does it have for one of its objects, the preparation of such heavy distillations of petroleum as kerosene, distillate, fuel oil and even the light Oklahoma crude, such liquid hydrocarbons as require very high temperatures to produce vaporization.

The invention contemplates a fuel passage formed in the exhaust manifold of an engine, where it is subjected to the initial heat of the exhaust gases as they enter the manifold from the engine-cylinders, the fuel passage being provided with transverse baffling members set in staggered relation to each other to cause impingement on their surfaces of the liquid fuel and its consequent vaporization; the invention further contemplates the thorough mixing of the air and vapor by reason of the staggered impingement members to conserve the preferred process of combustion.

Heretofore many devices have been designed, whose object was the utilization of kerosene and heavier distillations of petroleum as a motive fuel for internal combustion engines; many of them in the form of carbureters, provided with impingement means and heated by the exhaust gases, others simple fuel passages equipped with staggered impingement members and heated by the exhaust gases, while at least in one instance, the intake manifold is shown equipped with staggered rods and heated by the exhaust gases, the gases being led away from the exhaust manifold to a heating chamber formed on the sides of the intake manifold. The forming of the fuel passage in the exhaust manifold, without impingement members however, is also a construction in connection with heating the air to the carbureter, for the purpose of burning kerosene.

Now, in all the devices of this type, where staggered impingement members are used and where the expended gases are employed to heat the fuel passage, the heating is accomplished by leading the expended gases away from the exhaust manifold to the device. Experience shows that the heat of the gases, when employed in this manner, is not sufficient to properly vaporize the liquid fuel. A portion of the charge enters the cylinders in liquid form and from there passes to the crank-case, where it impairs the lubricating oil and often causes burned-out bearings. The method is not only also wasteful but in very cold weather, where the temperature falls to zero and below zero it is impracticable, especially so when light running or "idling" is required of an engine.

Even with the construction disclosed in the accompanying drawings, which embodies my invention, all the heat obtainable of the exhaust gases is necessary, especially for the vaporization of the heavier grades of petroleum, as will be more particularly referred to hereinafter.

Differing from all other constructions of this type, my device provides a fuel passage equipped with transverse impingement members arranged in staggered formation, the said fuel passage being formed in the exhaust manifold where its wall is exposed to the initial temperature of the enveloping gases; and preferably, the exhaust-outlet of the manifold is formed at approximately its longitudinal center, so that each intake fuel charge is heated by a simultaneous exhaust-gas discharge.

The invention consists in the matters hereinafter more fully set forth, illustrated in the accompanying drawings, forming a part of this application and pointed out in the appended claims.

Referring to the drawings, like designating characters will denote like parts.

Figure 1 is a view in longitudinal section through a device that embodies features of the invention;

Fig. 2 is a view in transverse section taken on or about line II—II of Fig. I;

Fig. 3 is a view in transverse section taken on or about line III—III of Fig. I;

Fig. 4 is a view in slightly reduced scale in elevation on the outlet side of the device;

Fig. 5 is a view in front elevation showing the device connecting a carburetor to the intake of a multi-cylinder explosive engine, the latter being shown diagrammatically;

Describing the device in detail, the device comprises a combined intake and exhaust manifold for an internal combustion engine with provision for thoroughly intermingling and uniformly heating the indrawn fuel vapors by the waste gases from the exhaust opening. As herein shown the structure is an integral one but obviously may be built up of parts united in any particular manner desired. As shown in the drawings, a casing 1 that is designed and proportioned to provide an outlet duct 2 for the exhaust openings 3 of a multi-cylinder engine 4 of conventional type, has a common discharge 5 with which the duct 2 communicates through a lateral extension 6, the outlet itself being preferably in an elbow formed on the extension.

A fuel inlet opening 8 into the extension 6, the latter being symmetrically disposed between the side openings 3, is connected by a conduit 9 that is bifurcated and leads into a return passage 10. The duct 9 is formed within the outlet duct 2 by a suitably disposed inner wall 11 that is placed within the duct 2. The return passage is formed by an exterior wall 12 in spaced relation to a wall 13 which is spaced from the inner wall 11 to permit jacketing of the conduit 9 by the gases of the exhaust passage. An outlet opening 14 that is situated in such relation to the exhaust openings 3 as to register with the inlet opening of the engine when the exhaust openings are secured to the cylinder, is the terminal of the return passage 10, an outer wall 16 of suitable design and proportion being formed on the manifold to provide a passage therefor.

A series of pins 17 is formed across the passage 9, being disposed in staggered relation and at varying intervals so as to completely baffle the inspired vapor and communicate the heat received from the enveloping exhaust gases uniformly throughout the indrawn column.

What I claim as new, is,

1. Fuel heating and mixing means for internal combustion engines comprising a casing with a lateral extension forming an exhaust passage leading from lateral openings symmetrically disposed in relation to the extension, an inner wall concentric with the casing and extension forming a bifurcated fuel conduit from a fuel inlet opening in the extension completely jacketed by the exhaust passage, a series of baffles connecting the sides of the fuel conduit throughout the major portion thereof and an exterior wall on the casing forming a return passage leading from the end portions of the conduit branches to a lateral outlet on the extension.

2. Fuel heating and mixing means for internal combustion engines comprising a casing with a lateral extension forming an exhaust passage leading from lateral inlet openings symmetrically disposed in relation to the extension, an exhaust opening in the extension, an inner wall concentric with the casing and extension forming a bifurcated fuel conduit from a fuel inlet opening in the extension completely jacketed by the exhaust passage, a series of baffle pins intimately connected at the ends to the wall of the fuel conduit across which they extend for the major portion of the extension and branch length thereof, and an exterior wall on the casing forming a return passage leading from the ends of the conduit arms to a lateral outlet on the extension.

3. Fuel heating and mixing means for internal combustion engines comprising a casing with a lateral extension forming an exhaust passage leading from lateral intake openings symmetrically disposed in relation to an outlet at the extension, an inner wall concentric with the casing and extension forming a bifurcated fuel conduit from a fuel inlet opening in the extension completely jacketed by the exhaust passage, a series of baffle pins in staggered relation across the extension portion and arms of the fuel conduit connecting the sides thereof to which the pins are intimately connected, and an exterior wall on the casing forming a return passage leading from the end portions of the conduit to a lateral outlet on the extension.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH MARION KING.

Witnesses:
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