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E. RYDER

VAPORIZING ATTACHMENT FOR INTERNAL COMBUSTION ENGINES

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Fig. 1

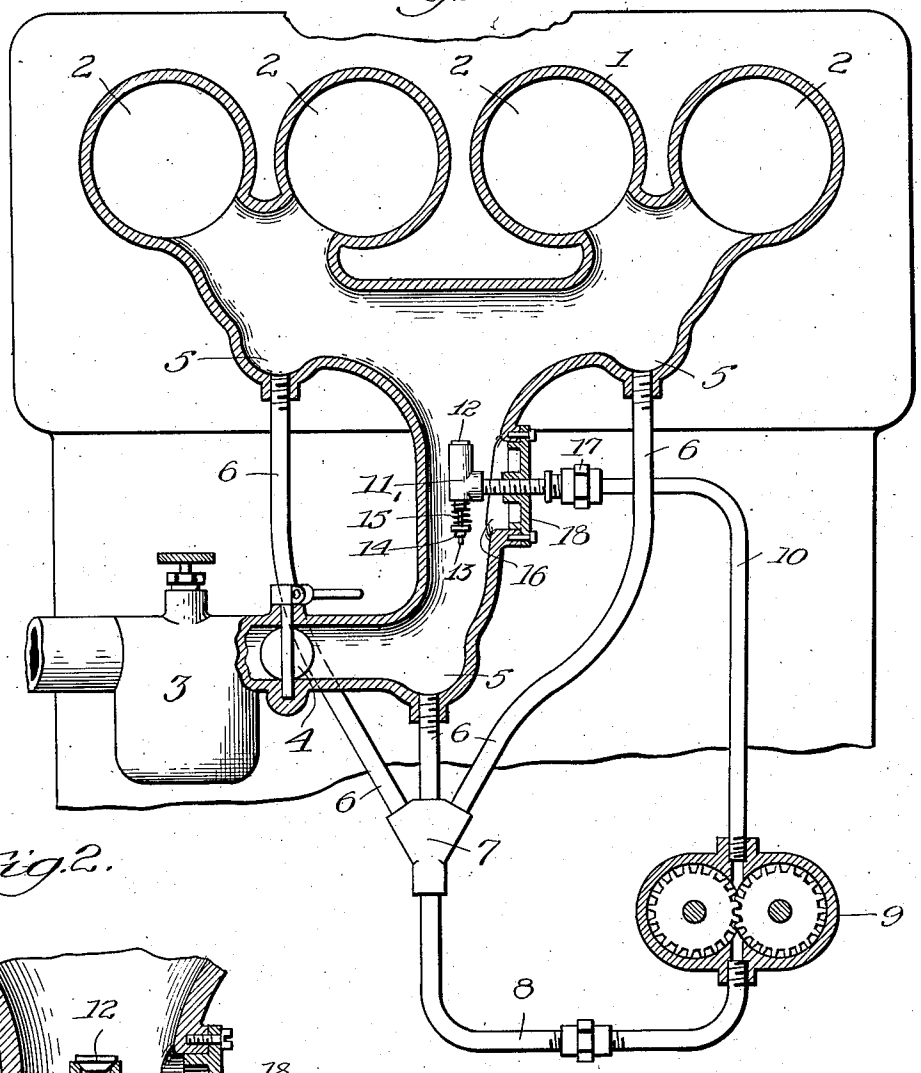
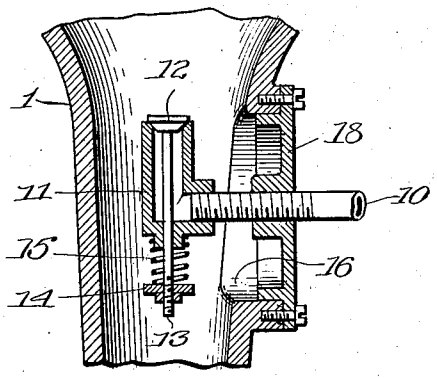


Fig. 2.



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UNITED STATES PATENT OFFICE.

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VAPORIZING ATTACHMENT FOR INTERNAL-COMBUSTION ENGINES.

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In the operation of automobile engines, so-called "wet pockets" form in the intake manifolds, due to the dropping out of the gas streams of the heavier unvaporized particles of the liquid fuel. This is especially noticeable with low grade or cheap fuels, and also when the manifold is cold as when first starting the engine. Manifolds, as heretofore used, have had no way to clear them of these deposits of unvaporized fuel, with the result that some, if not a greater portion of this fuel finds its way into the crank case past the engine pistons to dilute the crank case oil, with a consequent thinning of the lubricant and injuring the wearing parts of the motor. Even after the engine has warmed up and running, the heavier particles of unvaporized fuel continue to drop out of the gas stream and collect in the manifold to do injury as stated.

One object of my invention is to provide means in connection with the manifold to free or clear it continually of the liquid fuel particles which are deposited therein from the passing gas streams, and thus avoid the formation of "wet pockets" to do injury to the motor as heretofore.

A further object of my invention is to continuously feed this deposited liquid fuel back into the manifold under a pressure greater than that in the manifold, so as to finely atomize the liquids and cause them to readily and quickly vaporize for use in the gas supply, and thus increase the efficiency of the engine.

Another object of my invention is to provide means whereby the pressure at which the collected liquid is discharged into the manifold may be regulated, and thus enable the mechanism to be set for fuels of different grades.

The invention consists further in the matters hereinafter described and claimed.

In the accompanying drawings:—

Fig. 1 is a view of an intake manifold, in vertical section, and showing applied thereto the assembly of my invention; and

Fig. 2 is an enlarged vertical sectional view through the discharge nozzle of the assembly and associated portion of the manifold.

In the drawings, I have shown an intake manifold 1 of a type designed for a four cylinder motor, it being of course understood that my invention can readily be applied to manifolds of other types. The motor is indicated in outline behind the manifold, which is connected to the intake ports 2 of the motor in the customary manner. The inlet end of the manifold is connected with a carbureter 3, as usual in assemblies of this kind. A throttle valve 4 is at the intake end of the manifold, as customary.

In accordance with my invention, I provide one or more depressions 5, 5 in the lower walls of the manifold to collect the unvaporized liquid fuel particles which drop by gravity to said walls from the gas streams passing through the manifold.

These depressions form pockets, and tapped into the bottom of each one is an outlet pipe 6. The pipes from the several pockets or depressions 5 lead to a common collecting fitting 7, preferably located below the lowermost point of the manifold, so that the liquid fuel collected in the pockets may drain by gravity into said fitting. The latter has a downwardly extending outlet pipe 8, which connects with the intake of a mechanical forcing means 9, which may be in the form of a gear pump. The intake of the pump is below the fitting 7 so as to be supplied with liquids thereby. The outlet of the pump is connected by a pipe 10 to a nozzle 11 located in the manifold 1 at a point between the intake ports 2 of the engine and the throttle valve 4, as shown in Fig. 1.

The nozzle 11 is arranged to discharge toward the intake ports 2, and has a valve 12 at its discharge end, as shown in Figs. 1 and 2. This valve, as shown in Fig. 2, is of the poppet type and is designed to seat against the upper end of the nozzle, which is made tapered for the purpose. The stem 13 of the valve extends downward through the lower portion of the nozzle casing and is threaded to receive a nut 14 for adjusting the tension of a coil spring 15 surrounding the lower part of the stem between the nut and the under side of the nozzle casing, as clearly shown in Fig. 2. By adjusting the tension of the spring through the turning of the nut up or down the stem, the valve may be set to regulate the pressure at which the liquids are discharged from the nozzle into the manifold.

The operation of the assembly is as follows: A mixture of air and liquid fuel, the latter being supplied by the carbureter, is drawn into the manifold 1 on the suction strokes of the pistons in the engine cylinders.

All of the liquid fuel picked up by the air stream at the carbureter does not sufficiently mix with the air to be vaporized thereby, and consequently a certain percentage of the liquids is carried in suspension in the air and, being heavier, drops out of the air stream before reaching the engine cylinders. This liquid collects on the inner walls of the manifold and drains toward the lowermost point of the latter. By the provision of the pockets 5, 5 in the path of this drain, the deposited liquids collect in these pockets and flow out of the same to the pump 9 through the piping shown. The pump is operated either by the engine or at the same time as the engine, if a separate source of power is used, and discharges the collected liquids back into the manifold under a fairly high pressure as compared to that in the manifold.

In having the pump discharge the liquids into the manifold under pressure, the discharged liquids will be broken up into finer particles than at the feed nozzle of the carbureter and vaporize much more readily and thoroughly. In this way the heavier liquid particles, which naturally drop out of the gas streams passing through the manifold, are returned to the manifold under pressure and vaporized to increase the efficiency of the engine. Moreover, the manifold is kept substantially free of the heretofore objectionable "wet pockets," thereby minimizing crank case dilution. Furthermore, by collecting the deposited liquids from the manifold and discharging them back into the manifold under pressure so as to vaporize the liquids, I am able to use the cheaper low grade fuels and still gain efficient engine operation, for practically all of the liquid fuel supplied to the engine is vaporized and thus employed for power purposes.

By reason of my invention, starting of the motor is greatly facilitated and made quicker than heretofore, due to the fact that it is not necessary to depend on the partial vacuum in the manifold to vaporize all of the liquid fuel supplied thereto. The pump 9 in discharging the liquid fuel collected from the manifold at a greater pressure than that in the manifold, will cause an immediate vaporization of the injected fuel and thus permit quicker starting of the engine regardless of how cold the motor may be.

In order to assemble the nozzle 11 in the manifold 1 and also reach the nozzle for adjustment from time to time as may be required, I provide in one side of the upright portion of the manifold an opening 16 through which the nozzle may be inserted and removed on disconnection of the union 17 between the nozzle and the feed pipe 10. A plate 18 is clamped over the opening 16 to close the same. This plate supports the nozzle in the manifold 1 in the manner shown.

While I have shown my invention applied to an intake manifold, it may be applied to any conduit through which a combustible mixture, as liquid fuel and air, is supplied to a motor. Moreover, the details of structure and arrangement of parts may be variously changed and modified without departing from the spirit and scope of my invention.

I claim as my invention:

1. In an internal combustion engine, the combination with a fuel intake conduit through which a mixture of combustible liquid fuel and air is supplied to the engine, of means in the conduit for collecting the unvaporized liquid fuel particles dropped from the mixture, and means including a pump for removing the collected liquids from the conduit and for discharging the same back into the conduit under pressure for causing the vaporization of said liquids.

2. In an internal combustion engine, the combination with a fuel intake conduit through which a mixture of combustible liquid fuel and air is supplied to the engine, of means in the conduit for collecting the unvaporized liquid fuel particles dropped from the mixture, means including a pump for removing the collected liquids from the conduit and for discharging the same back into the conduit under pressure for causing the vaporization of said liquids, and means for regulating the pressure at which said liquids are discharged into the conduit.

3. In an internal combustion engine, the combination with an intake manifold, of pockets in the lower walls of the manifold for collecting the unvaporized liquid fuel particles dropped from the gas mixture passing through the manifold, outlet pipes tapped into said pockets, a nozzle in said manifold, and a force pump connected with said pipes and nozzle, respectively, for removing the liquids from said pockets and discharging the same into said conduit under pressure through said nozzle.

4. In an internal combustion engine, the combination with an intake manifold, of pockets in the lower walls of the manifold for collecting the unvaporized liquid fuel particles dropped from the gas mixture passing through the manifold, outlet pipes tapped into said pockets, a nozzle in said manifold, a force pump connected with said pipes and nozzle, respectively, for removing the liquids from said pockets and discharging the same into said conduit under pressure through said nozzle, and a valve for regulating the pressure at which the liquids are discharged from said nozzle.

5. In an internal combustion engine, the combination with an intake manifold, of pockets in the lower walls of the manifold for collecting the unvaporized liquid fuel particles dropped from the gas mixture pass-

ing through the manifold, outlet pipes tapped into said nozzle, a nozzle in said manifold, a force pump connected with said pipes and nozzle, respectively, for removing the liquids from said pockets and discharging the same into said conduit under pressure through said nozzle, said manifold having an opening at the nozzle for the passage of the same therethrough, and a cover plate for said opening and supporting said nozzle.

In testimony whereof I affix my signature this 16 day of August, 1926.

ELMER RYDER.