Aug. 28, 1928.

1,681,937

G. M. HOLLEY

VAPORIZING DEVICE

Filed Nov. 24, 1924

2 Sheets-Sheet 1

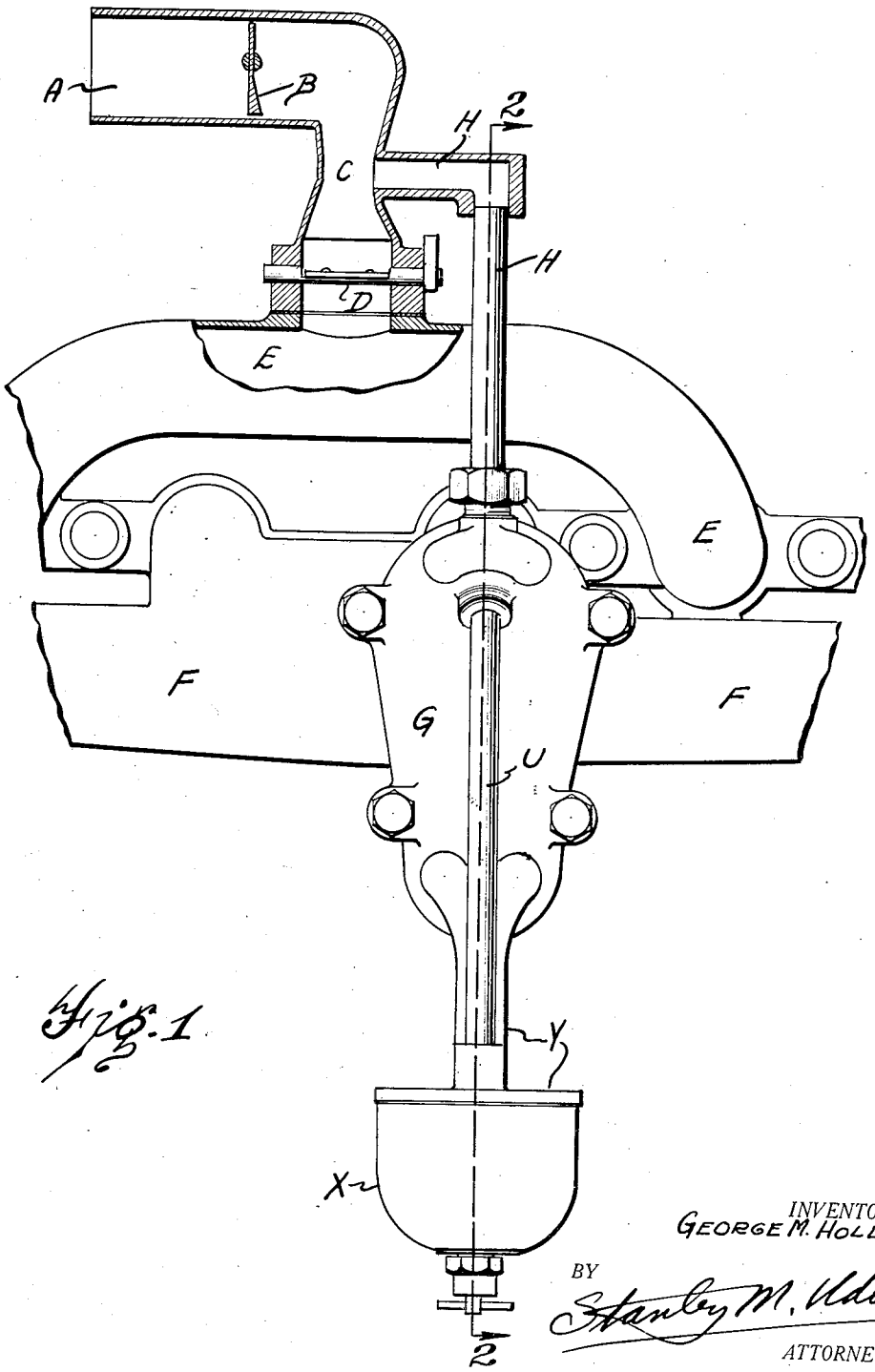


Fig. 1

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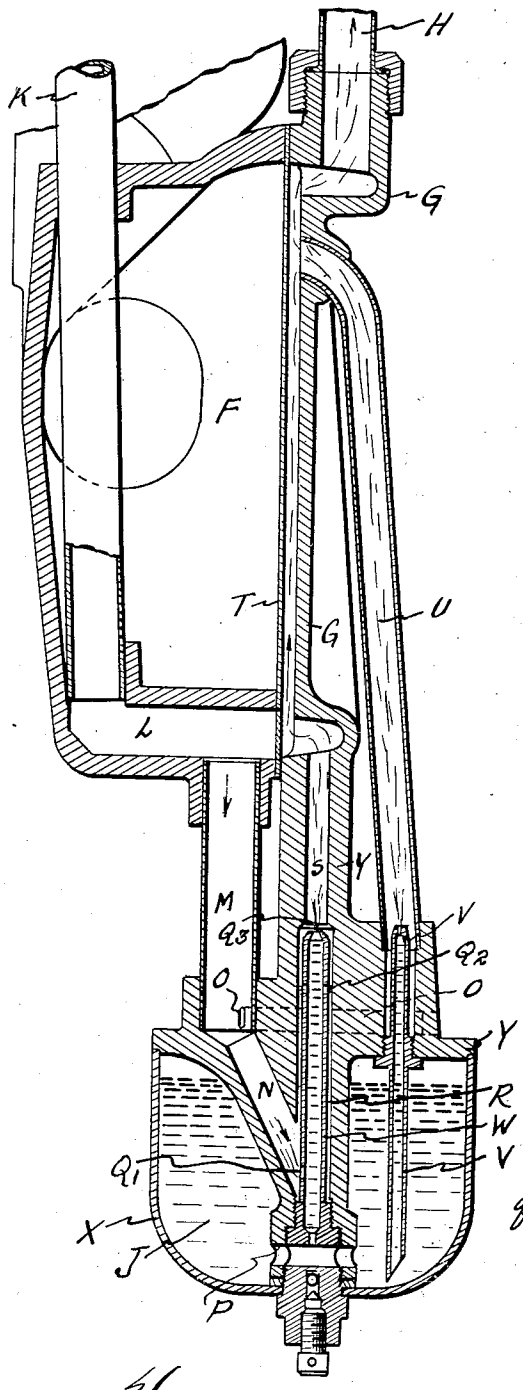


Fig. 2

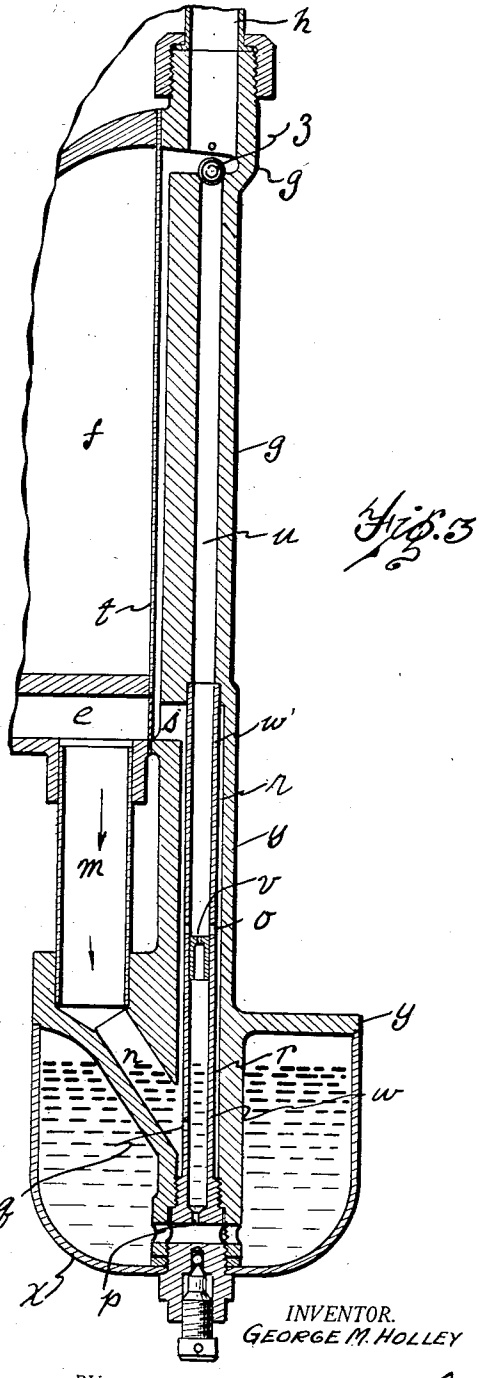


Fig. 3

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Patented Aug. 28, 1928. 1,681,937

UNITED STATES PATENT OFFICE.

GEORGE M. HOLLEY, OF DETROIT, MICHIGAN.

VAPORIZING DEVICE.

Application filed November 24, 1924. Serial No. 751,819.

This invention relates to an improved fuel vaporizing device adapted to be used in conjunction with internal combustion engines. The specific object of this invention is to automatically prevent the overheating of the mixture when developing the maximum power of the engine. An additional object is to minimize the formation of carbon in the vaporizing device.

Figure 1 shows a partial cross sectional elevation of a carbureting system incorporating the improved vaporizing device.

Figure 2 shows in sectional elevation, on the plane 2—2 of Figure 1, a view of the lower portion of the device illustrated in Figure 1. This device is more particularly adapted for use with kerosene.

Figure 3 shows a view, taken on the same plane, of a slight modification of the construction illustrated in Figure 2. This construction is more adapted for use with gasoline.

In Figure 1, A is the main air entrance, B is the automatic air valve controlling the said main air entrance, C is the Venturi tube which forms the main mixing chamber, D is the throttle valve controlling the mixture outlet, E is the inlet manifold superimposed above the exhaust manifold F. For convenience in manufacture these are shown cast together. G is a detachable cover plate which renders the interior of the exhaust manifold F accessible.

This cover G forms with a plate T an exhaust heated vaporizing passage located in the wall of the exhaust manifold F and leading to the outlet tube H, which discharges into the throat of the Venturi tube C, this detail of the construction corresponding to the co-pending application of George R. Welch, Serial No. 312,304.

The cover G has a depending portion Y to which the float chamber X is attached in a well known manner. (The float and float mechanism are not shown.) A primary air tube K is shown passing through the exhaust manifold F and communicating with the horizontal outlet L. This primary air flowing along L, however, is diverted so as to pass through a tube M, which communicates with an inclined passage N, which connects with the vertical passage R, in which passage (R) a fuel nozzle W discharges, being aspirated by the primary air.

This fuel nozzle W is provided with a fuel entrance P, preferably #40 (.098″), and a plurality of fuel outlets Q (Q^1=#58=.042″; Q^2=#45=.082″; Q^3=#52=.0635″) located at different levels both above and below that of the fuel in the float chamber X. It will be obvious, therefore, that the total area of Q^1 Q^3 and the two orifices Q^2 is approximately twice the area of the orifices P. The orifice Q^1 is, roughly speaking, between 1/5 and 1/6 of the area of the orifice P, and the orifice Q^3 is just less than half the orifice P. The passage R communicates with the passage S, which in its turn communicates with the passage between the plate T and the cover G.

A second fuel nozzle V, having a restricted outlet, preferably #60=0.04″ in diameter, is provided which is aspirated by means of primary air drawn from the passage M through a horizontal passage O which is provided for that purpose.

This nozzle V discharges into the tube U, which communicates with the passage between T and G in the upper portion thereof, thus discharging against the hottest portion of the plate T. It will be noted that the discharge point of the fuel nozzle V is located at a considerable distance above the level of the fuel in the float chamber X, whereby the discharge of fuel through U is delayed until the speed of the engine increases. That is, until there is sufficient depression in H to cause the fuel to discharge out of V.

In Figure 3 a primary air passage *e* is provided communicating with a passage formed in the outer wall of an exhaust manifold *f* by a plate *t* and a cover *g*. The cover *g* is provided with a depending portion *y* to which the float chamber *x* is attached. (The float and float mechanism are not shown.) The passage *e* is provided with a vertical passage *m* which communicates with an inclined passage *n*, which in its turn connects with a vertical passage *r* through which the primary air passes.

A fuel nozzle *w* discharges in this passage *r*, which is provided with a restricted submerged fuel entrance *p* (#43=.089″) communicating with the float chamber and with a side outlet *q* (#58=.042″) which discharges at a point below the level of the fuel in the float chamber *x*. The passage *r* communicates with the outlet *s*, which discharges into a passage formed in the wall of the exhaust manifold *f* between the plate *t* and the cover *g*.

The nozzle w is provided with an extension w', which communicates with a passage u drilled in the cover g. w' is provided with two air entrances o (#45=.082″) located opposite a restricted fuel nozzle v (#60=.04″), which is located a considerable distance above the level of the fuel in the float chamber x. In the upper portion of u is located a ball check valve z. This ball check valve being located in the outlet from the passage u located in the cover at a point where it meets the passage formed between the plate t and cover g.

In Figure 2 the primary air flowing down KL and M and up through R immediately sweeps out the small quantity of fuel which is collected in N. By doing so the port Q^1 is uncovered. Owing to the large size of the passage KLM and N substantially atmospheric pressure prevails in the well M, and owing to the fact that the fuel port Q^1 is less than 1/5th the area of P the fuel discharges from Q^1 under the gravity head between Q^1 and the level in the constant level chamber from which it is fed. We thus have a substantially constant flow per unit of time from the outlet Q^1. At the lowest depressions the fuel in the nozzle W will not be raised to the level of the two outlets Q^2, and therefore the engine will operate on the fuel thus supplied by the nozzle Q^1.

As the speed and load of the engine increase the depression in H also increases and the fuel in the nozzle W rises to the level of the outlets Q^2 from which it discharges, being aspirated by the air flowing up R. Meanwhile the fuel continues to discharge from the nozzle Q^1 at a constant rate, being under a constant head and discharging into the passage N which is at substantially atmospheric pressure. As the depression in H increases the fuel rises and eventually discharges from the fuel outlet Q^3, which outlet is slightly less than half the area of the fuel outlet P. Under these conditions the fuel restriction P having approximately half the area of the fuel outlets Q^1 Q^2 Q^3, causes less than half the discharge from these orifices and the deficiency can only be made up by air drawn in through Q^1 and Q^2, the reason for this being that the nozzle outlet Q^3 faces up stream, whereas the outlets Q^2 discharge laterally into the air stream and the outlet Q^1 being at substantially atmospheric pressure. A mixture of fuel and air is therefore discharged into S from the nozzle W. In the meanwhile the fuel has also risen in the nozzle V and is discharging from the outlet thereof into the passage U where it is aspirated by the priming air which is supplied by the passage O.

This latter mixture of fuel and air in U discharges against the upper portion of the plate T, mingling with the vaporized fuel discharged from the nozzle Q conveyed through S and vaporized in the lower portion of the passage formed between the plate T and the cover G. The effect of this relatively cold mixture discharged through U is to lower the mean temperature of the air and fuel discharged through H, thus the temperature of the mixture drawn in at E is lower and the horsepower of the engine is maintained at the maximum possible.

Although the degree of vaporization is thereby lessened, owing to the fact that the engine is running faster, and also because the compression is higher when the throttle is further opened, the interior of the engine, especially the head of the piston, is much warmer and therefore the necessity for complete vaporization is lessened and satisfactory operation can be secured with the partial vaporization provided by the means disclosed. The discharge of a cold mixture from U against the hottest portion of the plate T lowers the temperature at this point where heretofore the greatest accumulation of carbon has taken place when running with kerosene as fuel, hence the period between cleaning is extended by preventing the overheating which is the direct cause of the "cracking" of the kerosene fuel which results in the deposition of carbon on the plate.

Figure 3 shows a construction which is somewhat simpler and cheaper. When running at low speeds and light loads the fuel discharges from the nozzle q and is aspirated by the primary air flowing down m across n and up r. When the speed of the engine increases the flow of primary air increases and the ball z is lifted from its seat, fuel is aspirated from the fuel nozzle v and a relatively cold mixture of fuel and air is drawn up the passage u to the rich mixture outlet h, where it lowers the temperature of the vaporized fuel drawn between the plate t and the cover g.

In this construction the fuel flowing through u passes to h without any direct heating, but as this construction is intended more especially for use with gasoline no harm results.

What I claim is:—

1. A vaporizing device adapted for use in conjunction with an internal combustion engine, comprising an exhaust manifold having an opening therein, a plate covering said opening, a cover forming with said plate a vaporizing passage, a conduit communicating with the atmosphere leading to said passage, a fuel nozzle discharging into said conduit, a vapor outlet from said passage, a second conduit, a second fuel nozzle discharging into said conduit, a fuel and air entrance discharging into said conduit, an exit from said conduit located in said cover adjacent said vapor outlet, whereby an additional supply of air and fuel are discharged over the upper portion only of said plate.

2. A vaporizing device adapted for use in

conjunction with an internal combustion engine, comprising an exhaust manifold having an opening therein, a vaporizing element located in said opening, a cover for said vaporizing element, a conduit communicating with the atmosphere leading to said vaporizing element, a fuel nozzle discharging into said conduit, a vapor outlet from said conduit located in said cover, an additional air passage, a fuel nozzle discharging therein, said passage having an outlet located in said cover adjacent said outlet from said vaporizing element, means for delaying the discharge of said second fuel nozzle until the depression in said vapor outlet reaches a predetermined minimum depression.

In testimony whereof I affix my signature.

GEO. M. HOLLEY.