Oct. 23, 1928. 1,688,604

G. R. WELCH

EXHAUST HEATED OIL VAPORIZER

Filed Feb. 15, 1924 2 Sheets-Sheet 1

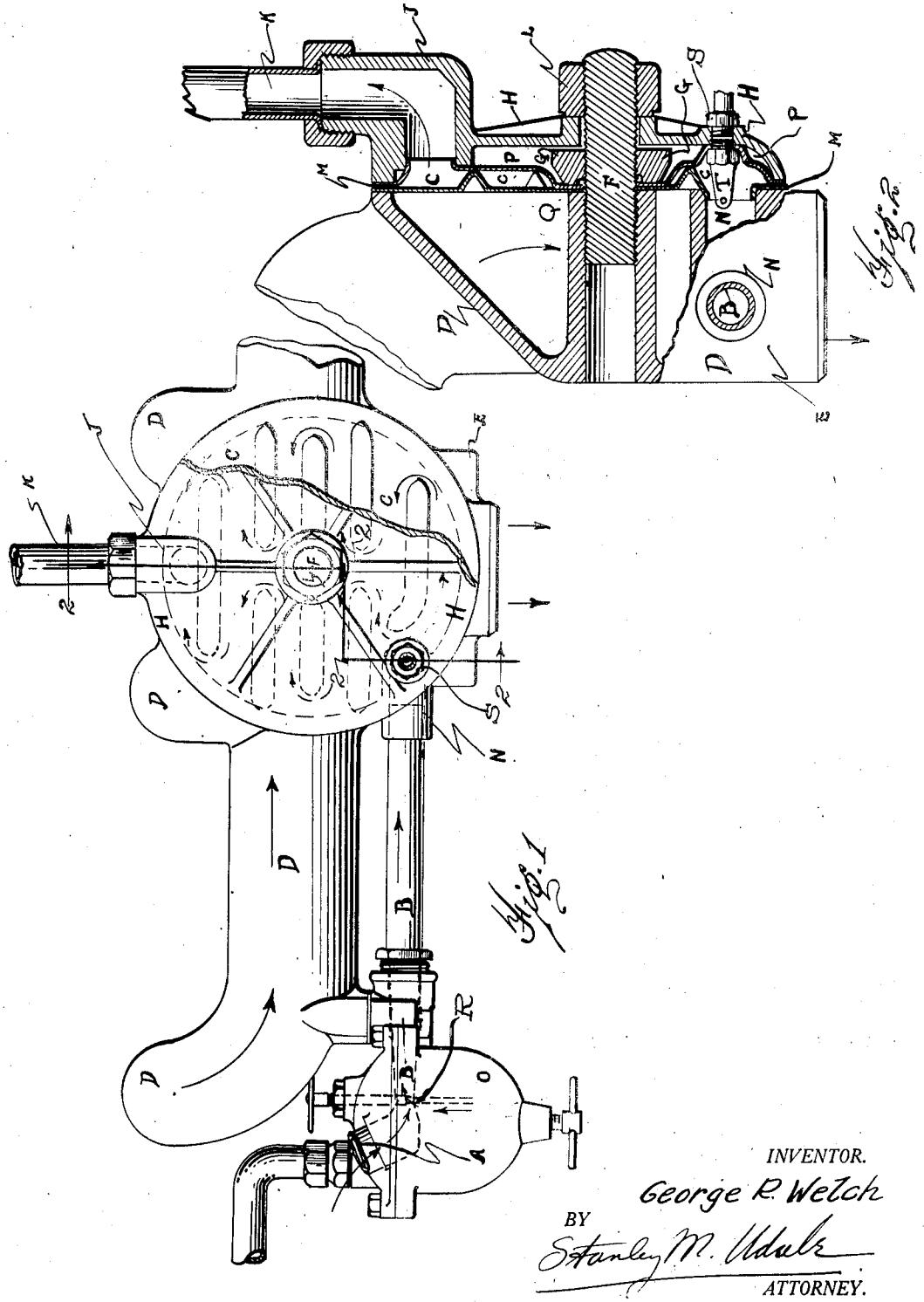


Fig. 2

Fig. 1

INVENTOR.
George R. Welch
BY
Stanley M. Udale
ATTORNEY.

Oct. 23, 1928. 1,688,604

G. R. WELCH

EXHAUST HEATED OIL VAPORIZER

Filed Feb. 15, 1924 2 Sheets-Sheet 2

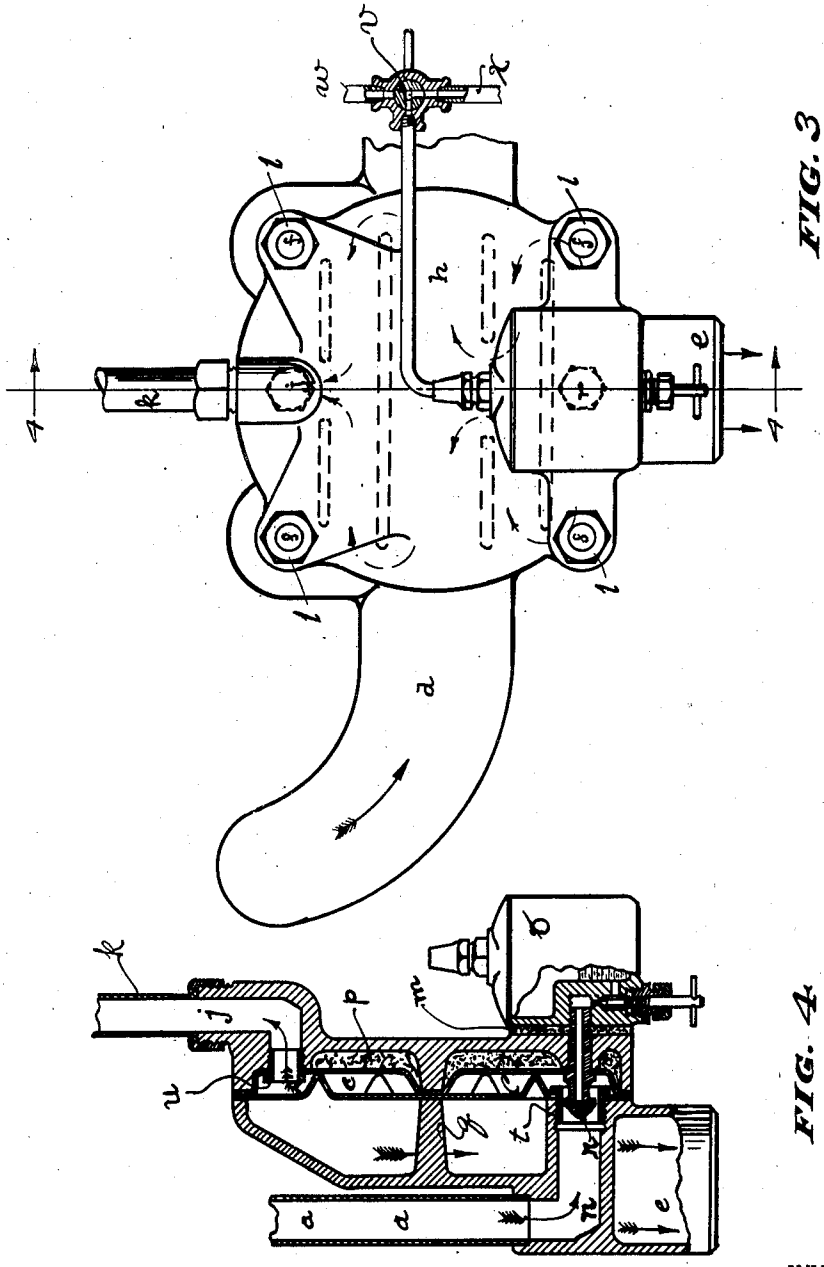


FIG. 3

FIG. 4

INVENTOR.
George R. Welch

BY

Stanley M. Udale
ATTORNEY.

Patented Oct. 23, 1928. 1,688,604

UNITED STATES PATENT OFFICE.

GEORGE R. WELCH, OF DETROIT, MICHIGAN, ASSIGNOR TO GEORGE M. HOLLEY, OF DETROIT, MICHIGAN.

EXHAUST-HEATED OIL VAPORIZER.

Application filed February 15, 1924. Serial No. 693,087.

This invention relates to externally heated oil fuel vaporizers in which the oil is first atomized or sprayed with air and then heated so as to form a heated rich mixture. The vaporizer is adapted to be used in conjunction with an internal combustion engine and to be heated by the exhaust gases therefrom. The heated rich mixture is thus prepared which is subsequently diluted with cold air so as to form a suitable mixture which may be compressed and exploded effectively in an internal combustion engine cylinder in a well known manner.

The difficulty heretofore experienced has been that the complex hydrocarbon molecules split up under the action of heat and release carbon which adheres to the walls of the vaporizer during the progress of vaporization, this carbon thus clogs the vaporizing passages and also prevents the transfer of heat from the exhaust gases to the fuel and air.

On the other face of the vaporizing surface, next the exhaust gases, carbon is also deposited as during combustion a small percentage of carbon is released from combination due to the heat of combustion of the major and more volatile portion of the fuel decomposing the less volatile and more complex molecules of the fuel.

Another difficulty experienced is the delay when heating a cold engine before the load may be applied. This delay is much more pronounced when the engine is first run on gasoline before transferring to kerosene, this delay amounting to as much as five minutes.

The object of this invention is to provide means whereby the vaporizing surfaces of the heating elements is accessible so that it may be easily cleaned on both sides and whereby they may be replaced at slight expense and whereby the heating elements are of such a character and so located that they may heat up in the shortest possible period of time, whereby the load may be applied immediately after starting the engine and, when operating on kerosene, the transfer from gasoline to kerosene may be made in the minimum period of time.

Figure 1 shows the vaporizer in elevation with its cover partially removed exposing the vaporizing elements. The fuel float chamber, the primary air entrance, and the connecting pipe therefrom are also shown in elevation together with the exhaust manifold on which the vaporizer is mounted.

Figure 2 shows the transverse section on the plane 2—2 of Figure 1, the lower portion of which shows an elevation through the rich mixture entrance with a water injection nozzle therein, and the upper portion shows the cross sectional elevation through the rich mixture outlet.

Figure 3 shows in elevation a slight variation of the invention in which the center stud is eliminated and four studs substituted therefor.

Figure 4 is a section on the plane 4—4 of Figure 3.

Description.—In Figures 1 and 2, A is the primary air entrance, O is the float chamber maintaining the fuel at a constant level from which fuel is sprayed at R by the primary air flowing through a Venturi restriction so as to form a rich mixture which flows through the pipe B in a well known manner. The pipe B discharges into the vaporizer C which is located in the cover H of the exhaust manifold D so that the exhaust sweeps over it as it flows to the outlet E.

The vaporizer is formed by one inner corrugated sheet and one outer flat plate which may be of brass or steel, preferably 1/40th of an inch in thickness (#42 B. & S. gauge), which together form a labyrinth through which the rich mixture circulates whilst it is being vaporized. The path of the rich mixture through this vaporizer is shown by arrows in Figure 1. The two plates forming the vaporizer are locked in place by the stud F and the nut G so as to form an airtight joint in the center between the two plates and the shoulder Q of the exhaust manifold.

The cover H is bolted to the exhaust manifold D, also by means of the stud F and a second nut L. In order to ensure an airtight annular closure of the outer edges of the two plates forming the vaporizer C a compressible gasket M may be provided upon which pressure is applied by means of the cover H when the nut L is tightened on the stud F. The cover H, or rather the air space P between H and the outer of the plates C, prevents cooling of the vaporizer by the atmosphere. This cover H also provides an outlet passage J to which is connected an outlet pipe K.

A rich mixture elbow N is cast integral

within the exhaust manifold D, one leg of which engages with the pipe B and the other engages with a flange projecting from the inner corrugated plate of the vaporizer C. A corresponding flange on the outer plate of the vaporizer C engages with the entrance to the exit J of the plate H. S is a water connection preferably from a float chamber (not shown) which delivers water to the water nozzle T located in the mixture entrance N.

In Figures 3 and 4 the float chamber *o* is shown supported on the cover plate *h* and connected to two sources of fuel, *w* and *x*, through the two-way valve *v*. The lower studs *f* of the four studs which bolt the cover *h* to the manifold *d* also support the float chamber *o*, but a gasket *m* is used so as to reduce the heat flow from the cover *h* to the float chamber *o*. *t* and *u* are bushings clamping the vaporizer plates in place.

The vaporizing passage *c* is formed by two corrugated plates which are clamped between the cover *h* and the manifold *d*. The air space *p* between the vaporizer *c* and the cover *h* may be filled with asbestos, and in addition the inside of the cover *h* and the outside of the outer of the two plates forming the vaporizer *c* may be painted with a heat-resisting paint, for example that disclosed in the Meloche Patent #1,453,593.

Operation.—In Figures 1 and 2 the primary air enters at A, flows past the fuel nozzle R, and forms a rich mixture which flows through B at the entrance to the elbow N where water is sprayed in from the nozzle T. From M it flows through the passage C formed between the vaporizing plates where it is heated by contact with the exhaust gases flowing through the exhaust manifold D to the exhaust outlet E. The heated rich mixture of fuel, air, and water in the vaporizer C then flows through the elbow J to the outlet pipe K. It is then taken to a mixing device, not shown, where it is diluted with the main body of cold air drawn into the engine in a well known manner.

In Figures 3 and 4 primary air enters through *a* and flows past the nozzle *r* located in the entrance *n* to the vaporizer *c*. The float chamber *o* is first connected to the gasoline supply pipe *w* and subsequently connected to the kerosene supply pipe *x*, after the engine has run for 3½ minutes, when the plates forming the vaporizer *c* should be sufficiently heated to vaporize kerosene.

Cleaning.—In Figures 1 and 2 in order to clean the vaporizer of accumulated carbon within and without the pipe K is first released from the elbow J and then the nut L is removed from the stud F. The cover plate H is thereby released exposing the vaporizer C.

By removing the nut G the two plates forming the vaporizer C may be removed, cleaned, and replaced in five minutes. In Figures 3 and 4 the accessibility is somewhat reduced by the reason that the four nuts *l* have to be removed from the cover *h*, together with the float chamber *o*. In this case the plates forming the vaporizer *c* are conneced to the cover plate *h* and the exhaust manifold *d* by the hexagon bushings *u* and *t*, so that on removing the plate *h* the inner of the two plates forming the vaporizer *c* is removed with it and in order to clean the inner of the two vaporizing plates it is necessary to remove the bushing *t*.

The vaporizer plates may be made of sheet iron, steel, or other metal, such as aluminum alloys, which will stand the high temperature of the exhaust. Calorized steel plates have been found to give satisfactory results.

One of the difficulties experienced with the design shown in Figures 1 and 2 is that in extremely cold weather the nozzle marked R has a tendency to become frozen due to water carried in suspension in the kerosene or other liquid fuel. In the case of Figures 3 and 4 the location of the float chamber *o* adjacent to the cover *h* prevents the freezing of the fuel in the nozzle *r* or in the needle valve which controls it. This greatly increases the reliability of the device.

By adding another float chamber to the device shown in either Figures 1 and 2 or 3 and 4 arrangements may be made for the injection of water. I have found it advantageous to inject the water adjacent to the point where I inject the fuel, so that the combined spray of fuel and water is converted into steam and fuel vapor together, the water appearing to assist in tearing apart the hydrocarbon molecules.

What I claim is:—

1. In a vaporizer for an internal combustion engine, an exhaust pipe having an opening therein, a cover for closing said opening, two thin sheet metal plates adapted to be bolted between said cover and said exhaust pipe closing said opening, and spaced apart from each other and from said cover, the space between said plates being provided with an entrance and an exit and a passage therebetween.

2. In a vaporizer for an internal combustion engine, an exhaust pipe, an opening therein, a cover for closing said opening, two thin sheet metal disks arranged to be bolted between said cover and said exhaust pipe, closing said opening and spaced apart from each other and said cover, corrugations in one of said disks so as to form a labyrinth between said disks, said labyrinth being provided with an entrance and an exit and a passage therebetween.

In testimony whereof I affix my signature.

GEORGE R. WELCH.