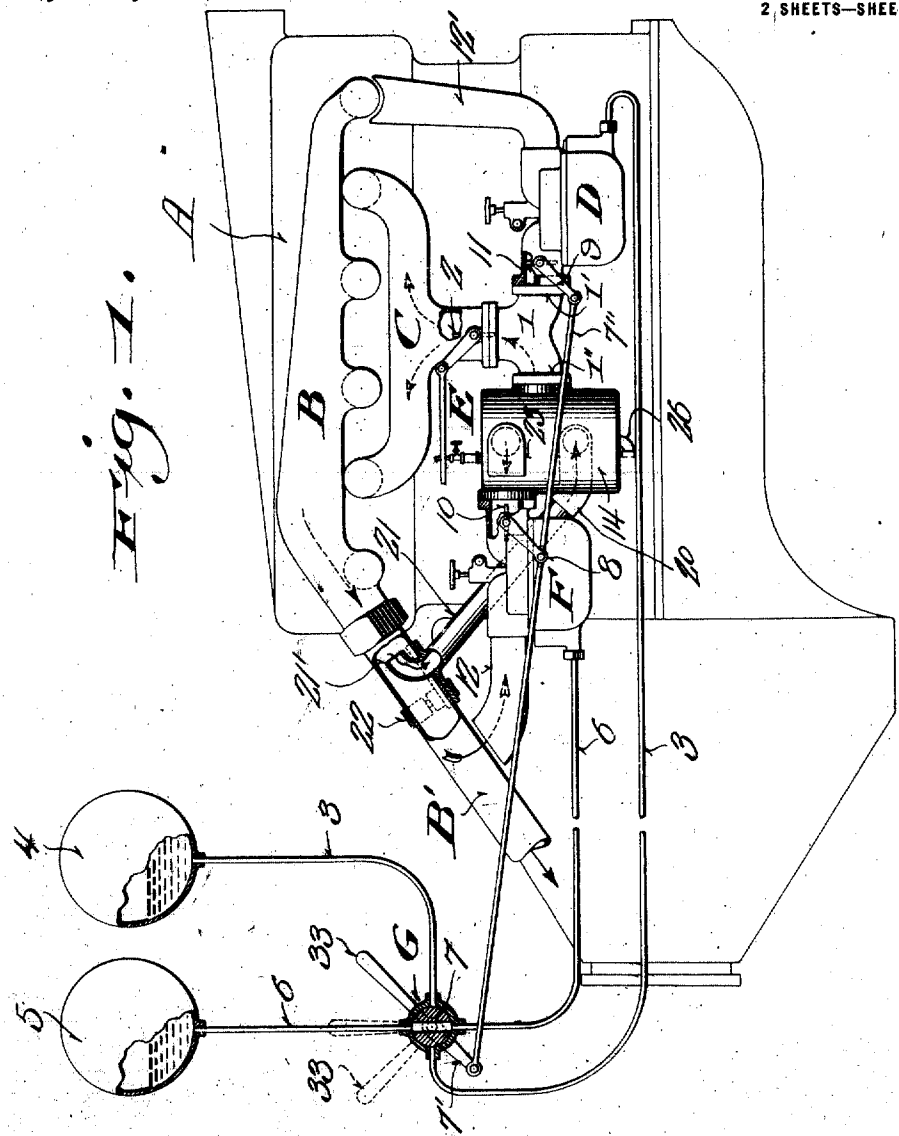


C. E. STEERE.
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 APPLICATION FILED JUNE 8, 1916.

1,253,642.

Patented Jan. 15, 1918.
 2 SHEETS—SHEET 1.



Witness:
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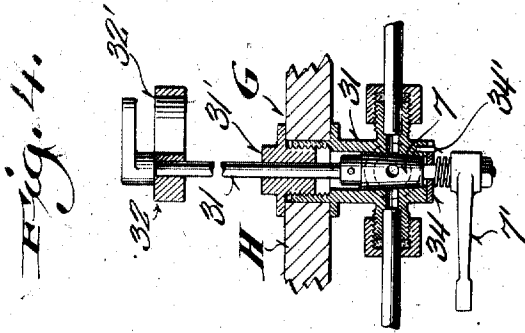
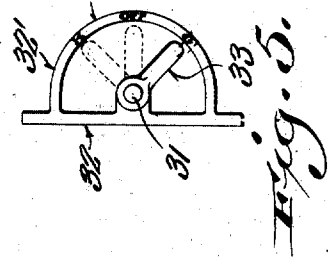
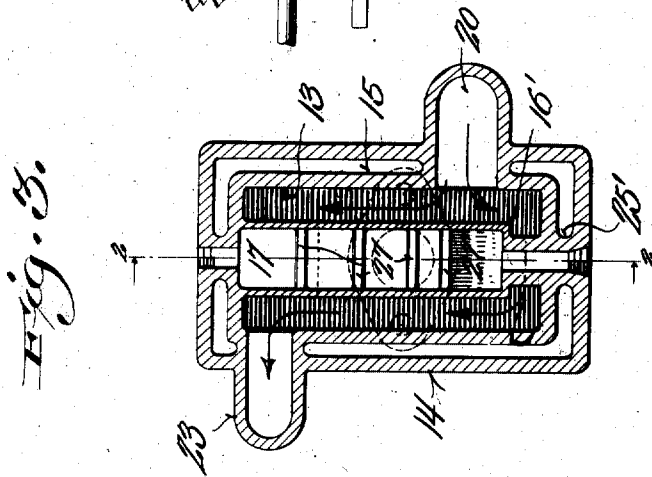
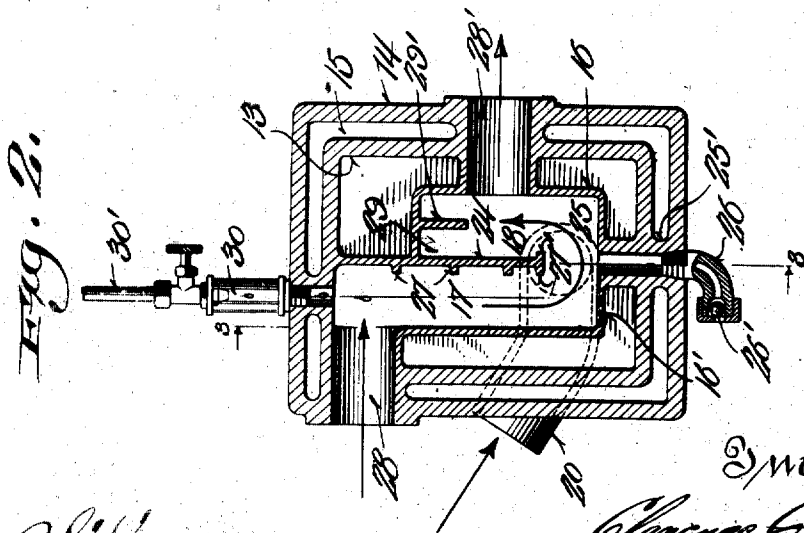
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Witness:
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UNITED STATES PATENT OFFICE.

CLARENCE E. STEERE, OF MILWAUKEE, WISCONSIN, ASSIGNOR OF ONE-HALF TO HENRY SCARBOROUGH, OF MILWAUKEE, WISCONSIN.

FLUID-FUEL-SUPPLY APPARATUS FOR INTERNAL-COMBUSTION ENGINES.

1,253,642.

Specification of Letters Patent.

Patented Jan. 15, 1918.

Application filed June 8, 1916. Serial No. 102,479.

To all whom it may concern:

Be it known that I, CLARENCE E. STEERE, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Fluid-Fuel-Supply Apparatus for Internal-Combustion Engines; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its primary object to provide a simple, economical and effective apparatus for utilizing a volatile fluid fuel of low grade for internal combustion engines.

A further object of my invention is to provide a superheater associated with the low grade fuel, whereby it is thoroughly atomized and increased in its efficiency to such an extent as to eliminate carbonization or sooty deposits within the engine to a minimum. By actual reduction to practice I have ascertained that, in utilizing a low grade fuel distillate, it is necessary to heat the air before introducing it into a standard carbureter, and the heated air will thus pick up a variable amount of fuel depending upon the temperature of said air, its volume, velocity and the fuel supply. The atomized fuel from the carbureter is then passed through a superheater of novel construction, resulting in breaking up of the atomized fuel in the minutest particles due to its contact with baffle-plates in the form of corrugated surfaces. In this finely atomized form the fuel will absorb heat from the plates and sides of the chamber, the superheater being maintained at a desired temperature by utilizing the exhaust gases from the engine, which gases pass about the superheating chamber. The superheating chamber is provided with a novel vacuum dome offset from the line of travel of the gas, which dome is employed to neutralize the tendency of back pressure or flow of the gases incidental to closure of the intake valve of the engine, this back pressure being, under ordinary conditions, a serious result to contend with. The superheater chamber is also provided with a collector pocket or drain at its bottom, which communicates with a valve-controlled discharge to the atmosphere. The superheater, in its entirety is also incased in a vacuum space for the purpose of insulating it and maintaining said superheater

at a uniform temperature, the vacuum jacket being connected to the walls of the superheater proper only at the points of communication with its chamber, whereby heat absorption to the outer jacket by conduction is reduced to a minimum.

With the above objects in view the apparatus consists in certain peculiarities of construction and arrangement of parts as hereinafter set forth with reference to the accompanying drawings and subsequently claimed.

In the drawings

Figure 1 represents a diagrammatic view of an engine and apparatus exemplifying my invention, parts being broken away and in section to more clearly illustrate certain details of construction, it being understood that elements embodying certain features of the invention are shown distorted to more clearly illustrate the general scheme;

Fig. 2 represents a sectional elevation of a superheater embodying features of my invention, the section being indicated by line 2—2 of Fig. 3;

Fig. 3, a vertical cross-section of the same, the section being indicated by line 3—3 of Fig. 2;

Fig. 4, a detailed sectional view of a single controlling valve mechanism for selective fuel supply, and

Fig. 5, a plan view of an indicator dial employed in connection with the valve to show to the operator the positions of the valve for supplying either one of two fuels or its neutral position, whereby both fuels are cut off.

Referring by characters to Fig. 1 of the drawings, A represents an engine of the internal combustion type, B the exhaust manifold, and C the intake manifold, which manifold is provided with a branched intake head 1 in the form of an inverted T, and a controlling valve 2 of the butterfly type above the same, the said controlling valve being connected to a suitable lever on the steering post (not shown), whereby the fuel supply may be throttled. As shown, the leg 1' of the intake head has attached thereto a carbureter D, which carbureter may be of any standard type and, in this exemplification of my invention, the same is utilized in connection with gasoline as a fuel, the same being supplied thereto through a pipe 3 from a tank or reservoir 4. The opposite branch 110

1" of the intake head communicates with a superheater E and the superheater, in turn, also communicates with a second carbureter F, which carbureter is utilized to supply, for example, kerosene or other volatile fluid from a tank or reservoir 5, the reservoir and carbureter F being connected by a feed pipe 6. The gasoline feed pipe 3 and the kerosene feed pipe 6 are interrupted by a controlling valve G, the plug 7 of which valve is adapted to establish communication between the interrupted sections of the pipe 6 or 3 as may be required, whereby the fuels may be selectively supplied to their respective carbureters. The valve-plug 7 has attached thereto an arm 7', which is coupled by a rod 7'' to corresponding arms 8 and 9 of the valves 10, 11, constituting elements of the carbureters F, D, respectively, the said valves being of the butterfly type. Air is admitted to the kerosene carbureter F by an intake pipe 12 and to the carbureter D by an intake pipe 12', the mouths of each of which pipes are in juxtaposition to branches of the exhaust manifold B, whereby the air entering the same will contact with the hot surfaces of said manifold and be heated to a certain degree when the engine is in operation.

As best shown in Figs. 2 and 3 of the drawings, the superheater E which is interposed between the kerosene carbureter and the intake manifold C of the engine embodies a housing 13 that is incased in an outer jacket 14 which is offset from the housing walls to form a vacuum space 15. Suspended at four points within the housing is a shell 16 that is rectangular in cross-section, the inner part of the shell constituting a superheating chamber or retort having an intake leg 17 and a discharge leg 18. The housing wall 13 and the shell wall 16 are spaced apart to form a heating space 19 that envelops the superheating chamber, whereby the same is maintained at the desired temperature. The heating space is provided with an intake nozzle 20, which nozzle communicates with one end of a supply pipe 21 that terminates at its opposite end with a goose-neck intake head 21' that projects through an aperture in the exhaust pipe section B' of the manifold B, the mouth of the goose-neck being directed toward the flow of the exhaust gases as they pass out of said pipe in the direction of the arrow indicated in Fig. 1. The goose-neck head 21 may be attached by a clip 22 to the pipe B', or in any other suitable manner within the knowledge of the skilled mechanic. The heating space opposite the intake 20 and offset therefrom is also provided with a discharge nozzle 23, which nozzle is piped to the atmosphere to discharge at any desired point. Hence it will be observed that a certain per cent. of the exhaust or spent gases

from the engine will be directed into the mouth of the goose-neck head 21' and will be caused to circulate about the superheater shell, whereby the chamber therein is maintained at the desired temperature and the gases, after performing their function, are discharged to the atmosphere through the nozzle 23. The vertical legs 17 and 18 of the heating chamber are separated by a deflector plate 24, which terminates at a predetermined distance from the bottom wall 16' of the chamber to form a communicating port between said legs. Thus it will be observed that, between the bottom wall 16' of the chamber and the deflector plate 24, there is formed a pocket which may be termed a drain 25. The drain or pocket is connected to the outer jacket 14 and housing 15 by a neck 25' that is channeled throughout and has attached to its mouth a nipple 26 that communicates with the atmosphere and is provided with a suitable check-valve 26', whereby residue oil accumulating in the drain pocket will be caused to freely flow therefrom, while, at the same time, air is prevented from entering the chamber by the check-valve. Thus the drain and check-valve mechanism constitutes a trap whereby all sediment and superfluous products extracted from the fuel vapor are disposed of. The deflector wall 24 is provided with a series of transverse ribs 27 that project slightly into the intake leg of said chamber and the deflector wall terminates with a pair of oppositely extended ribs 27'. The atomized fuel supply from the kerosene carbureter F is drawn into the intake leg 17 of the superheater through a port 28, which port communicates with the upper end of the intake leg and the fuel gases are discharged from the superheating chamber into the branch 1" of the manifold head 1 through a port 28' which is positioned at the upper portion of the discharge leg 18. The discharge leg 18, however, extends above the discharge port 28' to form a dome 29 and this dome is also interrupted vertically by a depending baffle-plate or rib 29'.

In order to provide moisture to the gasified fuel I may, as shown in Fig. 2, attach a valve-controlled cup 30, which cup is in threaded union with the channel that communicates with the head end of the chamber intake leg 17, whereby water may be added to the mixture in desired minute quantities, it being understood that the supply is obtained from a reservoir, not shown, that communicates with the cup through a pipe 30'.

Fig. 4 of the drawings illustrates the mechanical construction of the single fuel controlling valve which is shown in the diagram view Fig. 1 indicated by the general reference letter G. The valve referred to comprises a casing 31, in which is seated

the tapered valve-plug 7 and the said casing is fitted through a conveniently positioned aperture in the floor H of a motor vehicle to which the apparatus is attached, said casing being held in position by a threaded binding-head 31'. A stem 32 projects from the plug through the casing cap and terminates at a point accessible to the operator, at which point the stem is journaled in a gage bracket 32 that is preferably in skeleton form with a circular index plate 32' extending therefrom provided with arbitrary indices to show positions for selective fuels and an intermediate position for cut-off. The index plate is associated with a pointer constituting a handle 33 that is fast to the upper end of the valve-stem. The valve-plug 7 has a shank that projects through the lower end of the housing and fast to this shank is a stop-plate 34 which operates in conjunction with a pin 34' whereby movement of the valve-plug is limited in both directions. Thus, for example, the valve-plug shown is arranged to make a quarter turn and, as illustrated in Fig. 5, when the handle or pointer 33 is alined with the index "G", the valve-plug is positioned to establish communication through the gasoline supply pipe. When the pointer or handle is opposite the word "Off" the valve is closed to both fuel supplies and when the pointer is in the position as indicated in dotted line with the index "K", the gasoline supply is cut off and communication between the sections of the kerosene pipe is established, whereby this fuel is utilized to supply the gas medium. Hence it will be apparent, by again referring to the diagram, that the interrupted fuel supply pipes are broken at approximately right angles to each other, at which points they are tapped into the valve housing 31 in such manner that when the valve-plug port is in one of its extreme positions it establishes direct communication to the selective fuel supplies and, when in the intermediate position, both fuel supplies are cut off. It will be also observed that, when the fuel valve is in the intermediate position referred to, its connection between the two carbureter valves will cause them to only partially close. This will have no detrimental effect as, although both the carbureters F and D may supply a small quantity of fuel mixture to the engine, this quantity will soon be exhausted and the engine will then become dead.

From the foregoing description taken in connection with the diagrammatic view Fig. 1, it will be manifest that, when the parts are in the position as shown in this view, assuming that the engine is running, the fuel supplied thereto is from the kerosene reservoir or tank 5. The exhaust gases which enter the superheater will maintain

the incased retort chamber at the desired temperature and, as the atomized fuel from the carbureter enters the retort chamber, it will be broken up into a fine vapor and increased in its volatility due to heat. Any surplus oil of the fine atomized particles entering the retort will be converted into vapor due to the contact of the mixture with the hot walls of the retort and especially due to the passage of the mixture over the series of corrugations. Thus the vapor is broken up and will travel in more or less eddying currents to the bottom portion of the retort and the oil adhering to the sides of the retort by capillary attraction will gradually settle into the pocket 25. The respiratory action of the engine will thus draw the gas through the retort with each suction stroke of the engine cylinder pistons and as the velocity will increase more or less with the speed of the engine when the respective intake valves close there is a tendency of a back pressure. The velocity of the gases passing through the retort, however, will cause a partial vacuum to be manifested in the dome 29 and this back pressure due to the valve action will be compensated for as the vacuum thus developed will serve as a receiving pocket to accommodate the back flow, whereby the flow of gas through the system is maintained practically uniform. After an accumulation of oil and waste products has settled in the pocket 25 they will be trapped and discharged through the valve-controlled nozzle 26. Where conditions require it, moisture can be added to the mixture through the valve-controlled cup 30.

By embodying the superheater in the system as shown, crude oil can be utilized as a fuel with entirely satisfactory results and experience has demonstrated that a small quantity of low-grade fuel will produce the maximum of mileage when the apparatus is used in connection with a motor vehicle and that, after long runs, there is no appreciable development of sooty deposits within the firing head of the engine cylinder due to the functions and capacity of the superheater.

It is apparent that, when the engine is to be started, gasoline is employed as a preferable fuel because of its greater volatility. Hence, in a starting operation, the valve lever 33 is shifted to the position indicated in dotted lines Fig. 1, it being shifted from its central or neutral point. This movement will establish a direct communication between the gasoline fuel tank and its associated carbureter, whereby carburated air is introduced into the manifold and the engine is started in the usual manner. By the coupled connection between the single fuel supply valve and the carbureters, when the said fuel valve is shifted

from one fuel to the other, it will be seen that the carbureters will be alternately cut off from the manifold. Thus the apparatus is what may be termed in shop parlance, "fool-proof," and any one unskilled in the art of mechanics can readily shift from one fuel to the other, whereby the mechanism will cut off all communication with that fuel which is not used.

While I have shown and described the various mechanical units embodying the apparatus in detail, it should be understood that I may vary such details within the knowledge of skilled mechanics without departing from the spirit of my invention and, while I have shown the apparatus equipped with carbureters of the "Kingston" type which is known to the trade, it is apparent that any suitable carbureter can be used with the same advantageous results as that described and I may also use various kinds of volatile fluid as selective fuel other than those mentioned in this exemplification of my invention.

Attention is directed to the fact that a single butterfly valve may be inserted in the crotch of the intake manifold head as a substitute for the independent carbureter valves shown, without departing from the spirit of my invention, and also I may, in some instances, employ other heating mediums than that illustrated and described in connection with the superheater or retort. For example, the retort may be heated electrically by embedding a resistance coil therein; or by utilizing the hot water from the engine jacket.

I claim:

1. A superheater of the type described comprising, in combination, a retort embodying an intake leg and a discharge leg, a deflector wall therebetween and extending from the top of the retort to near the bottom thereof, an intake communicating with the top of the intake leg, and an outlet communicating with the discharge leg, moistening means discharging into the top of the intake leg, a heating chamber disposed about the retort and adapted to receive a suitable medium, and a vacuum chamber disposed

about the heating chamber substantially as described.

2. A superheater for treating fluid fuels comprising a retort chamber having an intake and an exhaust leg therein formed by a deflector wall, a chamber disposed about the retort and having an inlet and an outlet connected therewith, the said inlet communicating with the exhaust manifold of a gas engine and the said outlet communicating with the atmosphere, and means for adding moisture to fuel vapors in their passage through the superheater comprising a pipe communicating with the intake of the retort, and a valve controlled drain leading from the bottom of the retort to carry off excess moistening fluid.

3. A superheater for treating fluid fuels for gas engines comprising a retort chamber having a downwardly discharging intake leg and an upwardly discharging exhaust leg, transverse corrugations extending from the walls of the retort, a valve-controlled trap extending from the base of the retort, means for introducing heat about the outer walls of the retort, and a vacuum space surrounding the retort exteriorly of the heating means.

4. A superheater for treating fluid fuels for gas engines comprising an inner shell forming a retort chamber having a deflector wall extending vertically thereof whereby the chamber is divided into an intake leg and a discharge leg, a valve-controlled cap in communication with the bottom of the chamber, transversely disposed corrugations extending from the walls of the chamber to form interruptions for the volume of gas passing therethrough, a dome above the discharge leg of the retort chamber, a housing about the retort chamber forming a heating space, means for introducing and exhausting a heating medium to the space, and a vacuum space surrounding the heating space.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee, in the county of Milwaukee and State of Wisconsin.

CLARENCE E. STEERE.