April 26, 1927. 1,626,061

L. M. WOOLSON

INTERNAL COMBUSTION ENGINE

Filed April 21, 1923

Fig. 1

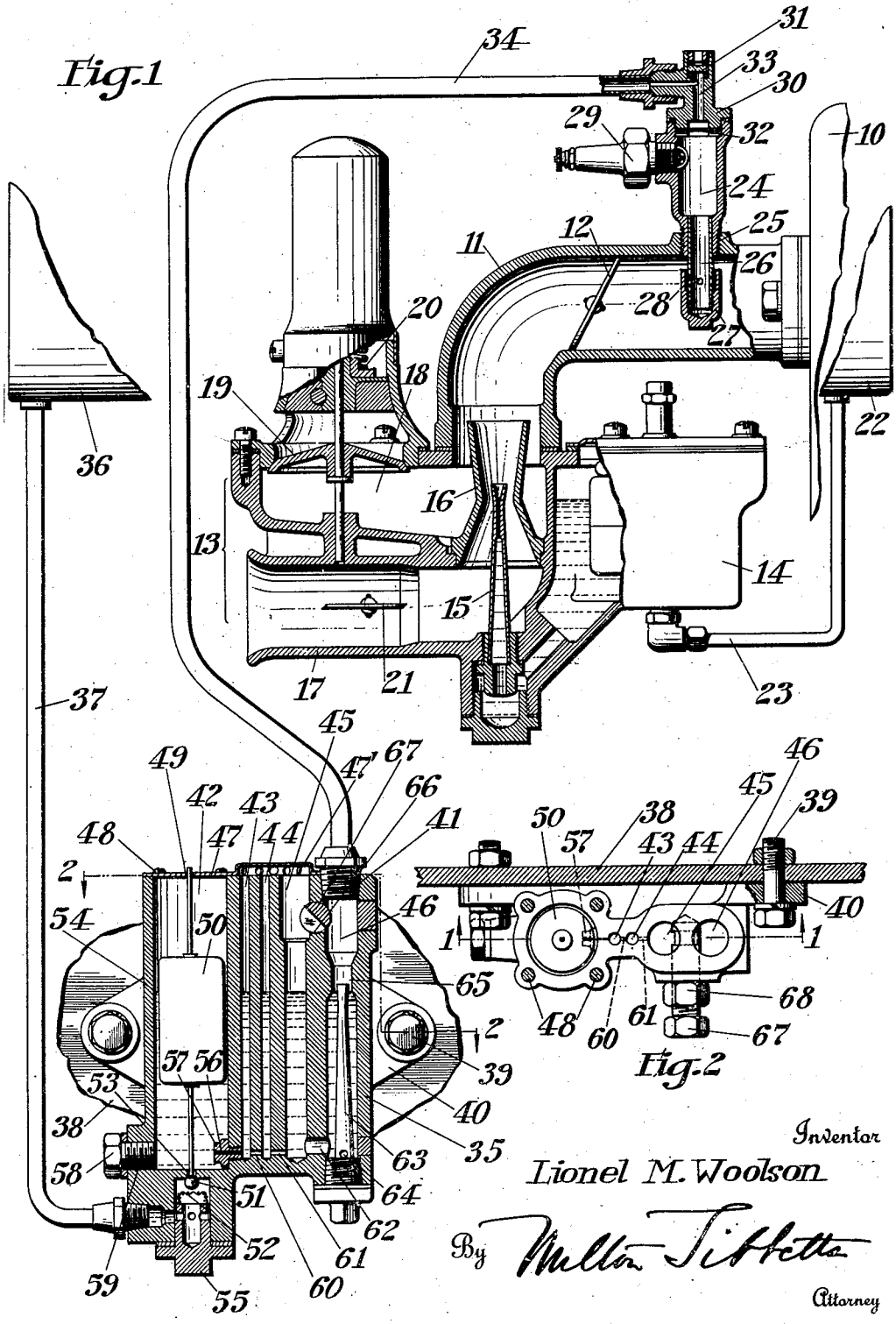


Fig. 2

Inventor

Lionel M. Woolson

By Miller & Tibbetts

Attorney

Patented Apr. 26, 1927. 1,626,061

UNITED STATES PATENT OFFICE.

LIONEL M. WOOLSON, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

INTERNAL-COMBUSTION ENGINE.

Application filed April 21, 1923. Serial No. 633,595.

This invention relates to internal combustion engines and particularly to methods and means for operating an internal combustion engine and for feeding a mixture thereto and to a combustion heater.

In one form of the invention it relates to methods and means for operating a combustion heater for an internal combustion engine, and particularly for forming and feeding a combustible mixture to such heater.

One of the objects of the invention is to provide a simple and practical method of operating a combustion heater.

Another object of the invention is to provide a simple and practical method of supplying a constant combustible mixture to a combustion heater.

Another object of the invention is to provide a simple and practical mixture forming device for a combustion heater.

Another object of the invention is to provide a carburetor which will supply unvarying amounts of fuel for any successive units of time under normal operating conditions.

Another object of the invention is to provide a carburetor in which the liquid fuel is supplied thereto under a substantially constant gravity head not affected by the carburetor suction.

Another object of the invention is to provide a carburetor with varying amounts of air dependent upon the suction and with a substantially constant flow of liquid fuel.

Another object of the invention is to provide a novel and practical carburetor for feeding extremely small quantities of combustible mixture.

Other objects of the invention will appear from the following description taken in connection with the drawings, which form a part of this specification, and in which:

Fig. 1 is a general view, partly in elevation and partly in section, illustrating the invention as applied to an internal combustion engine, the section through the lower carburetor part of the view being taken substantially on the line 1—1 of Fig. 2; and

Fig. 2 is a section substantially on the line 2—2 of Fig. 1, the dust cover being removed.

Internal combustion engines as built today for automobile use, are usually supplied with some means for heating the mixture which is supplied by the main carburetor of the motor to the cylinders thereof. One of such means is known as a combustion heater or "fuelizer" and it consists generally of a combustion chamber having an outlet in the motor intake pipe between the throttle valve and the cylinders and having a spark plug or other means to ignite the mixture in the chamber. Mixture is supplied to the combustion heater, usually by the suction of the motor, from a carbureting device of some sort. In some cases a special small carburetor is used to supply the mixture to the combustion heater, and in others the mixture is withdrawn from the mixture supply of the main carburetor.

When the combustion heater or fuelizer is built into the engine as standard equipment it is not particularly difficult to adapt it to the special characteristics of the engine or the main carburetor, but when an attempt is made to build a combustion heater of this type for use generally on motors of several different forms and with carburetors and intake passages of different types, considerable difficulty arises and heretofore it has not been practical to so build and supply combustion heaters.

The present invention contemplates supplying the engine with its mixture from the main carburetor and supplying the combustion heater with its mixture from another and differently acting carburetor whereby the engine may be operated with a richer mixture from the main carburetor when idling than when running with the throttle partly or fully open and the combustion heater may be supplied with a leaner mixture when the engine is idling than when the engine is running on partly or fully open throttle. It will be understood that the combustion heater operates at its maximum when the motor is operating at its minimum because it is at that time that the greatest amount of heat is required for the mixture, the motor supplying its own heat very largely when it is operating at partly or fully open throttle.

The invention further contemplates the use of a carburetor for supplying combustible mixture to the combustion heater in which the liquid fuel is supplied at a sub-

stantially unvarying rate under normal operating conditions while the air for the carburetor is supplied at a varying rate, dependent upon the suction.

One form of the invention is illustrated in the drawings hereof. Referring thereto, 10 represents an internal combustion engine or the cylinder block thereof and 11 is the intake conduit which supplies the mixture to the engine cylinders. A throttle valve of the butterfly type is shown at 12, it being understood that this valve is usually manually controlled and the operator opens and closes it as he desires a greater or less amount of mixture to be fed to the engine.

13 represents generally the main carburetor which is connected to the intake conduit 11 to supply a combustible mixture thereto for the engine. It comprises the usual float chamber 14, a nozzle 15 which is supplied with liquid fuel by the float chamber, a mixture tube 16 surrounding the nozzle and supplied with air by the main air intake passage 17, and an auxiliary air intake passage 18 which is controlled by a valve 19 and a spring 20 which is usually adjustable. A butterfly valve 21 is arranged in the main air passage for choking the air supply when starting in cold weather. The float chamber maintains the liquid fuel at the desired level just below the top of the nozzle 15, in the usual way, and it is supplied with gasoline from a tank 22 through a pipe 23.

In this type of carburetor the valve 19 is usually so adjusted that it is closed when the motor is idling and a richer mixture is then supplied to the engine than is obtained when the throttle valve is opened and the suction is sufficient to open the valve 19 against its spring. The carburetor therefore will supply a somewhat richer mixture when idling than when running on partly or fully open throttle and this is desirable because a richer mixture is required to operate the engine smoothly when idling.

The burner part of the combustion heater shown in Fig. 1 comprises a combustion chamber 24 formed in a suitable casting which is threaded into the intake conduit 11 between the throttle valve 12 and the engine cylinders. This threaded attachment is shown at 25 and the chamber 24 has an outlet into the intake conduit in the form of a pipe 26 having a cup 27 attached to its lower end, the pipe being formed with lateral openings 28 into the cup, thus providing a circuitous passage for the exhaust gases from the chamber 24 into the intake conduit 11. A spark plug 29 is secured in one side of the chamber 24 and an inlet cap 30 is threaded in the top of the chamber and provided with a glass window 31 through which the operation of the burner may be observed. The inlet cap 30 retains a screen 32 in place over its inlet passage 33 and a pipe 34 is connected with the inlet cap for supplying mixture to it.

The carburetor part of the combustion heater or the device for supplying combustible mixture to the combustion chamber 24 of the burner is indicated generally at 35. It is supplied with gasoline or other liquid fuel from a tank 36 through a pipe 37. The tanks 22 and 36 may be the same or different tanks.

The carburetor 35 is shown as mounted on a support 38 as by the bolts 39 extending through ears 40 formed on the casting of which the carburetor is made. The outlet of the carburetor is connected to the pipe 34 as at 41.

The casting 35 is formed with a plurality of vertically extending chambers or wells numbered respectively 42, 43, 44, 45 and 46, the latter of which communicates with the pipe 34 as above stated. A dust cover 47 is secured over the upper ends of the other chambers, being secured to the casting as by screws 48 and being provided with air openings 49 and 47′ so that the upper ends of these chambers are always open to the atmosphere.

The chamber 42 is a float chamber of rather usual form, there being a float 50 mounted therein and controlling a valve 51 which thereby regulates the level of the gasoline in the chamber 42. The gasoline or other liquid fuel enters the chamber 42 through the pipe 37 above referred to, the screen 52, and a port 53 which the valve 51 controls. The level of the liquid is indicated at 54.

The screen 52 above referred to is secured to a movable plug 55 so that the screen may be readily cleaned. The screen is preferably of fine mesh so that dirt may be kept from the float chamber and the consequent clogging of the outlet from the float chamber prevented.

One of the greatest difficulties heretofore encountered in the making of a small carburetor, or a carburetor adapted to supply a small quantity of mixture is that the outlet from the float chamber or the fluid inlet to the carburetor, must be made so small that it is impracticable from a commercial viewpoint. This is because said inlet has heretofore been subjected to part or all of the suction of the engine and the flow of liquid fuel, therefore, into the carburetor is greatly increased as the suction of the engine increases.

In the present invention an inlet orifice of practical size is used and it is subjected to only the gravity head of the chamber to which it is connected, in the present case the float chamber 42. This orifice is so far removed in effect, from the chamber which is subjected to the engine suction, that said

suction has no appreciable effect whatever upon the flow of liquid fuel through the orifice and thus the orifice delivers unvarying amounts of fuel for any successive units of time under normal operating conditions over a range of speeds or under varying suctions.

The outlet orifice from the float chamber 42, or the inlet orifice for the carburetor, is indicated at 56. It is formed in a plug 57 threaded into an opening between the float chamber 42 and the adjacent chamber 43, so that the orifice 56 connects those chambers. The orifice 56 may be cleaned or the plug 57 may be removed for cleaning by first removing the plug 58 which closes an opening 59 formed in the casting opposite the plug 57.

The chamber 43 communicates with the chamber 44 by means of an orifice or passage 60 at the lower ends of the chambers, and the chamber 44 communicates with chamber 45 through a similar passage 61. Each of these passages 60 and 61 is preferably larger than the passage or orifice 56 so that there is free passage for all of the fuel that may be fed by the orifice 56.

A somewhat larger passage 62 connects the chamber 45 at its lower end so that the liquid fuel may be fed to the inside of the nozzle. The nozzle 63 has an opening 64 at its lower end and it extends upwardly in the chamber 46 to a contracted part 65 thereof and the upper end of the nozzle also is slightly above the normal level 54 of the fuel in the float chamber 42.

An air passage 66 extends between the upper ends of chambers 45 and 46, for diluting the mixture formed in the upper part of chamber 46, and this passage is regulated by a valve 67 which is in the nature of a plug or bolt as shown particularly in Figs. 1 and 2. The bolt extends to the outside of the casting as shown particularly in Fig. 2 and after being set in any desired position it is locked by a nut 68 thereon.

The operation of this carburetor may be described as follows: With the internal combustion engine at rest so that there is no suction through the burner chamber 24 of the fuelizer and the pipe 34 which connects the latter with the carburetor 35, the liquid level in the carburetor is as indicated in Fig. 1, this level being the same in all of the chambers 42, 43, 44, 45 and 46. When the engine is turned over for starting, with the throttle valve 12 nearly closed, there will be suction in the pipe 34 and consequently in the upper end of the chambers 46. This suction will draw some air through the valve opening 66 and considerable gasoline from the lower part of the chamber 46, thus passing a rich mixture to the pipe 34, and consequently to the chamber 24 of the combustion heater. This rich mixture will be ignited by the spark plug 29 and will continue for some time as the engine is warming up because the carburetor 35 will not begin to operate normally until the accumulated gasoline in the chambers 43, 44, 45 and 46 has been used up. Thus, the gasoline in chamber 46 will first be used and that from chamber 45 will flow into it through the passage 62 and will be used up also. As all three chambers 43, 44 and 45 are open to the atmosphere at their upper ends the suction on the chamber 46 will be considerably more than in the chamber 45 and in the latter it will be more than in the chamber 44 as the chamber 44 is emptied of gasoline through the passage 61. As the gasoline flows out of chamber 43 through the passage 60 the depression or suction of chamber 46 is so far reduced through the successive chambers that the chamber 43 is practically at atmospheric pressure. The flow of gasoline, therefore, into chamber 43 through the orifice 56 is due entirely to the head of liquid in the float chamber 42 and it is not affected in any way by the suction of the mixing chamber 46.

It will be seen, therefore, that after the chambers or wells 46, 45, 44 and 43 have had their supplies of gasoline exhausted by the initial operation of the engine, the sole supply of gasoline to the mixing chamber 46 will come from the orifice 56 which is under a low head of gravity pressure only and with the passages 60 and 61 so much smaller than the open upper ends of chambers 45 and 44, the continued operation of the engine draws air through those chambers and with it the small quantity of gasoline passing through the orifice 56 into the chamber 43. Thereafter, as the suction increases, more air will be drawn through the cascade of vertical chambers and yet the same quantity of gasoline per unit of time will be delivered to the carburetor and consequently the mixture will be leaner than on the lighter suction. In other words, the carburetor will feed a relatively lean mixture to the combustion chamber 24 under high suction and a relatively rich mixture thereto under low suction, and the degree of richness may be adjusted by turning the air valve 67 which controls the port or passage at the upper ends of the chambers 45 and 46. This means that the combustion heater will operate on a relatively lean mixture when the motor is idling and is consequently being fed a rich mixture by the main carburetor 13 and a somewhat richer mixture will be fed to the combustion chamber 24 when the suction through the combustion heater is less, as when the throttle valve 12 is partly or fully opened. With this lesser suction through the chamber 24 the somewhat richer mixture is desirable because of the lesser speed of the gas through the cham-

ber 24. Moreover, the heater is not required to supply so much heat under those conditions as when the motor is idling because the motor itself will supply enough heat when the throttle is partly or fully open.

While I have herein described in some detail a specific embodiment of my invention, which I deem to be new and advantageous and may specifically claim, I do not desire it to be understood that my invention is limited to the exact details of the construction, as it will be apparent that changes may be made therein without departing from the spirit or scope of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A method of operating a fuelizer consisting in feeding a rich mixture to the combustion chamber under low suction conditions and a less rich mixture under high suction.

2. A method of operating a combustion heater consisting in feeding a relatively lean mixture to the combustion chamber under high suction and a relatively rich mixture thereto under low suction.

3. A method of operating an internal combustion engine having a combustion heater, consisting in feeding a richer mixture to the engine when idling than when running with the throttle partly or fully open while at the same time feeding a leaner mixture to the combustion heater when the engine is idling than when the engine is running on partly or fully open throttle.

4. A device of the character described including in combination a combustion chamber and a carburetor for supplying combustible mixture to said chamber, said carburetor including a mixing chamber and means to supply said chamber with unvarying amounts only of fuel for any units of time, under normal varying suction conditions.

5. In an internal combustion engine having an intake manifold, a carburetor for supplying properly proportioned combustible mixture to said manifold, a combustion chamber having communication with said manifold on the cylinder side of the throttle valve, a second carburetor connected to supply combustible mixture to said chamber, said second carburetor constructed and arranged to carburet only unvarying amounts of fuel for any successive units of time under normal operating conditions over a range of speeds.

6. In an internal combustion engine having an intake manifold, a carburetor for supplying properly proportioned combustible mixture to said manifold, a combustion chamber having communication with said manifold on the cylinder side of the throttle valve, a second carburetor connected to supply combustible mixture to said chamber, said second carburetor including a mixing chamber, and means to supply said chamber with fuel at an unvarying rate under normal operative conditions over a range of speeds.

7. The method of operating a combustion heater for internal combustion engines consisting in supplying the same with a rich mixture for a short period when starting, and thereafter supplying a constant amount of fuel per unit of time regardless of the speed or suction of the motor.

8. The method of operating a combustion heater for internal combustion engines consisting in feeding a stubstantially constant amount of fuel per unit of time regardless of the suction and mixing air with said fuel in amounts varying with the suction in the heater whereby a richer mixture is obtained under low suction conditions than under high.

In testimony whereof I affix my signature.

LIONEL M. WOOLSON.