April 26, 1927. L. M. WOOLSON 1,626,062

MIXTURE FORMING MEANS FOR INTERNAL COMBUSTION ENGINES

Filed April 21, 1923

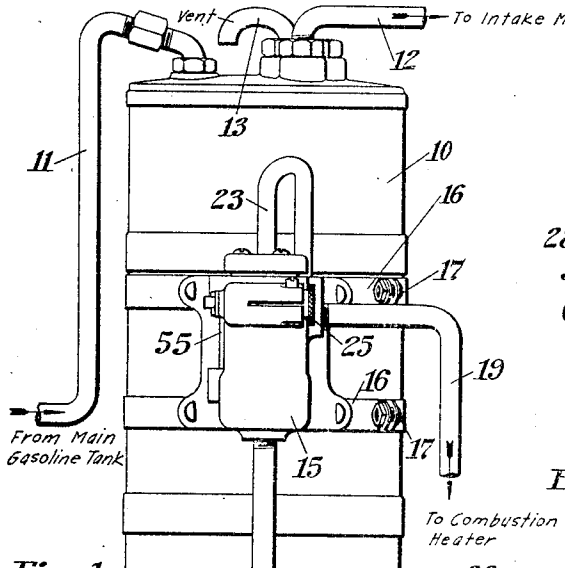


Fig. 1

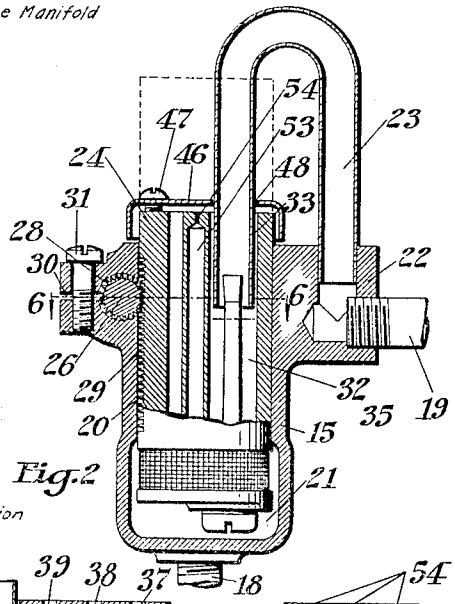


Fig. 2

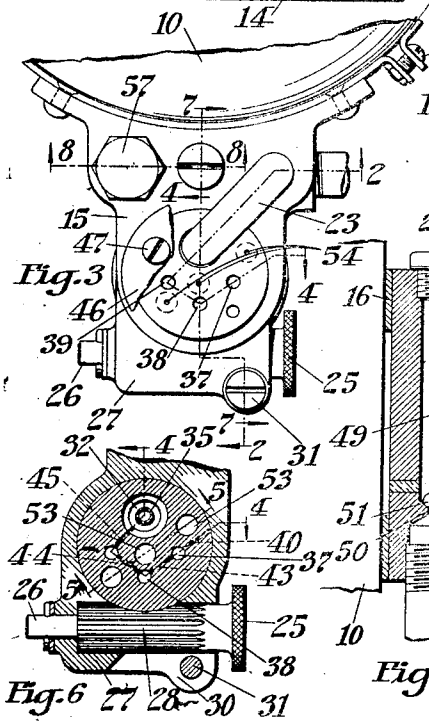


Fig. 3

Fig. 6

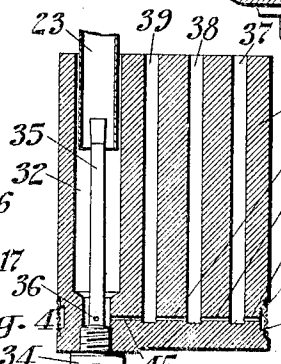


Fig. 4

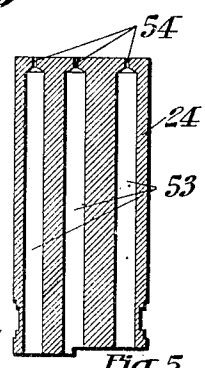


Fig. 5

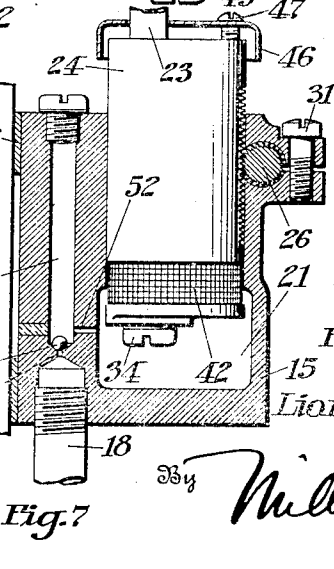


Fig. 7

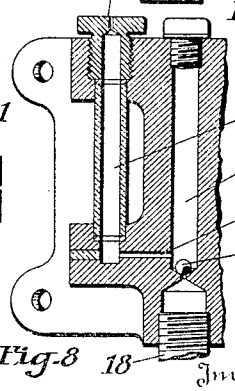


Fig. 8

Inventor,
Lionel M. Woolson,
By Milton Tibbetts,
Attorney

Patented Apr. 26, 1927. 1,626,062

UNITED STATES PATENT OFFICE.

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

MIXTURE FORMING MEANS FOR INTERNAL-COMBUSTION ENGINES.

Application filed April 21, 1923. Serial No. 633,773.

This invention relates to mixture forming means for internal combustion engines.

The invention further relates to a combination Stewart type vacuum tank and a carburetor adapted to operate on the varying level of such tank.

The invention further relates to a carburetor device particularly adapted for use with a combustion heater or fuelizer of an internal combustion engine such as shown in my Patent No. 1,448,650, dated March 3, 1923.

One of the objects of the invention is to provide a carburetor that will operate satisfactorily with the somewhat varying liquid fuel level of a Stewart type of vacuum tank.

Another object of the invention is to provide a carburetor that will adequately and yet economically supply mixture to a combustion heater or similar device.

Another object of the invention is to provide a carburetor of small capacity with means adapted to prevent clogging of the fuel passages thereof.

Another object of the invention is to provide a storage chamber for a carburetor with a check valve to prevent back flow therefrom, so that the carburetor may have less fluctuation of level than the tank from which it is supplied.

Another object of the invention is to provide a carburetor, particularly adapted for supplying mixture to a combustion heater, with means for easily adjusting the nozzle level relative to the supply chamber part of the carburetor, whereby the carburetor may be readily adjusted in position.

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 an elevation showing a Stewart type vacuum tank and a carburetor made in accordance with this invention;

Fig. 2 is a vertical section of the carburetor shown in Fig. 1, the section being taken substantially on the line 2—2 of Fig. 3;

Fig. 3 is a plan view of the tank and carburetor shown in Fig. 1;

Fig. 4 is a vertical section on the lines 4—4 of Figs. 3 and 6;

Fig. 5 is a vertical section on the line 5—5 of Fig. 6;

Fig. 6 is a horizontal section on the line 6—6 of Fig. 2;

Fig. 7 is a vertical section on the line 7—7 of Fig. 3, the sliding member, however, being in elevation and shown in a somewhat higher position than in Fig. 2; and

Fig. 8 is a vertical section on the line 8—8 of Fig. 3.

Referring to the drawings, 10 represents a liquid fuel supply tank of the Stewart type adapted to be operated by the suction of the internal combustion engine, the main carburetor of which it is adapted to supply. This type of vacuum tank is well known and reference is made to patent to Jay No. 1,158,924, dated November 2, 1915, for its internal construction. In the operation of such a tank the level therein varies somewhat as the liquid is intermittently drawn from the main tank. This variation is usually around one-half inch and is, therefore, too great a variation to permit the direct connection of the vacuum tank to the motor carburetor, and consequently that carburetor is supplied with a float chamber to determine the level of liquid fuel at the nozzle.

The present invention, however, contemplates the use of means whereby this variation of the level will have little or no effect upon the action of the carburetor, and the carburetor is so designed that it will operate substantially uniformly even though the level changes somewhat.

The vacuum tank 10 has a pipe connection 11 which extends to the main gasoline tank as indicated and it is through this pipe that the gasoline or other liquid fuel is drawn by the suction effect of the engine into the tank 10. The suction connection to the engine intake manifold is indicated at 12 and the vent is shown at 13. The openings to these pipes are opened and closed by the float mechanism in the tank for the purpose of operating it in the well known manner.

The outlet from the vacuum tank 10 to the main carburetor of the engine is shown at 14. This usually connects with the float chamber of the carburetor as indicated above.

The carburetor of this invention is mounted upon the vacuum tank 10 and is supplied with liquid fuel therefrom at the level in said tank. The carburetor is indicated generally at 15 and it is attached to the tank

by a pair of bands 16 which may be tightened thereon as by bolts and nuts 17. The carburetor may be positioned vertically on the tank by loosening these bands.

After the carburetor is properly positioned on the tank 10, it is connected with the interior of the lower part thereof by means of a pipe 18 and there is a pipe 19 which extends from the carburetor to the combustion heater or other device to which a small quantity of combustible mixture is to be supplied.

The carburetor 15 comprises a body portion 20 the lower part of which is in the form of a storage chamber 21 and the upper part is substantially cylindrical in form and opens upwardly. In the upper part also is a boss 22 into which the pipe 19 extends and a tube 23 is also supported in this boss. This tube 23 is of inverted U-shape and has one end in the boss 22 so that it communicates with the pipe 19 and its other end extends downwardly into the bore of the body portion 20 of the carburetor. This tube 23 may be called a mixture tube or conduit as it withdraws the mixture from the carburetor and delivers it to the pipe 19 which carries it to the combustion heater.

Mounted in the body portion of the carburetor is a member 24 of barrel shape. It has a sliding fit in the cylindrical portion of the carburetor body and extends beyond the top thereof. Thus the member 24 slides vertically in the body portion and its lower end extends into the storage chamber 21 and into the body of liquid fuel therein. It is adjusted vertically by means of a thumb nut 25 which has a shaft 26 extending transversely through a boss 27 formed on the side of the upper part of the body portion of the carburetor, preferably opposite the boss 22. This shaft has a gear 28 thereon which meshes with a rack 29 formed in one side of the member 24, as shown particularly in Figs. 2 and 6.

By splitting the boss 27 as shown at 30 and providing a set-screw 31, the thumb nut 25 may be locked in set position.

Thus it will be understood that the member 24 may be adjusted vertically in the body portion of the carburetor by turning the thumb nut 25, and when the desired position of the member 24 is reached the screw 31 may be tightened and the member will be held in its adjusted position.

The adjustable member 24 is formed with a vertical passage 32 which is slightly larger than the depending end of the tube 23 so that the tube 23 may enter the passage and leave a space 33 for air to enter. The lower end of the passage 32 is closed by a plug 34 which supports a nozzle 35 vertically in the passage, with its upper end extending into the tube 23. At its lower end the nozzle 35 has one or more small openings 36 so that liquid fuel may pass from the lower part of the passage 32 into the nozzle.

It will be seen that the vertical adjustment of the member 24 will also cause a movement of the nozzle 35 vertically relative to the mixture tube 23 and the body of the carburetor and thus the position of the upper end of the nozzle may be varied relative to the level of the liquid in the tank 10 which supplies the chamber 21.

The sliding member 24 is also formed with a series of vertical air passages or wells indicated at 37, 38 and 39. The first of this series of wells is supplied with liquid fuel from the chamber 21 through a small orifice 40 at its lower end, which orifice communicates with a circular channel 41 in the circumference of the lower part of the member 24. A fine mesh screen 42 covers the channel 41 so that dirt may be kept out of the latter. Thus a large surface of screen is provided to protect the orifice 40.

The lower ends of the wells 37 and 38 are connected by a small orifice 43 and the lower ends of the wells 38 and 39 are connected by a small orifice 44. Likewise, a small orifice 45 connects the well 39 with the lower part of the passage 32 so that the latter is supplied with liquid fuel successively through the wells 37, 38 and 39. These wells are open to the atmosphere at their upper ends so that after the wells are drained of their liquid fuel supply, which they accumulate when inoperative, they will act as air passages to form an emulsion with the small quantity of fuel that is fed to the carburetor through the small passage or orifice 40. By thus providing a series of wells or a cascade of fuel and air passages a rich mixture is supplied to the combustion heater when the engine is started and this is later modified to a leaner mixture as the wells are drained. By reason of the succession of wells there is no appreciable suction on the orifice 40, the wells having reduced the suction step by step.

Over the top of the member 24 is a dust shield 46 which is secured thereto as by screws 47 with sufficient space left to permit of free access of air to the upper ends of the wells 37, 38 and 39. The tube 23 extends through an opening 48 in this dust cover.

As above explained, the storage chamber 21 is fed with gasoline from the vacuum tank 10 through the pipe 18. The connection of this pipe to the body portion of the carburetor is shown particularly in Fig. 7. The interior of the pipe connects with a vertical passage 49 in the body portion of the carburetor through a port 50 which is controlled by a check valve 51, and an orifice 52 connects the passage 49 with the chamber 21. Thus when the level of liquid in the vacuum tank 10 is at its highest the level will rise to its maximum in the chamber 21, but if the

level in the vacuum tank falls faster then the operation of the carburetor 15 will cause the level in the carburetor to fall, the check valve 51 will retain the gasoline in the carburetor at a higher level than in the vacuum tank. As the tank, in its intermittent action, again fills to its highest level, the check valve will open to permit additional gasoline to enter the chamber 21. Thus the level in the carburetor 15 is always as high as in the tank 10 and it is sometimes higher than the level of the latter.

For the purpose of increasing the capacity of the storage chamber 21, the adjustable member 24 is drilled out to a more skeleton form by the formation of several chambers 53, as shown particularly in Figs. 5 and 6. These chambers are vented at the top as shown at 54 so that they will fill up as the gasoline enters the chamber 21. They have no action in connection with the mixture forming part of the carburetor, being merely additional storage space for gasoline in the chamber 21. These chambers are not connected with the wells 37, 38 and 39.

In adjusting the member 24 it is desirable to know the position of the liquid level in the carburetor and this may be observed by placing a glass gauge 55 on one side of the body portion, as shown particularly in Fig. 8. This gauge is arranged parallel with the passage 49 above described, being connected with that passage by an orifice 56 and being vented at the top as at 57.

In applying the carburetor 15 to a Stewart type vacuum tank 10 the carburetor is secured to the tank as nearly as practicable at the desired level and the metal bands 16 are tightened. With all of the connections made to the gasoline tank and the engine, including the connection 19 to the combustion heater, the engine is operated and the action of the carburetor 15 is noted. After the engine has been run long enough to drain the wells 37, 38 and 39, if the mixture supplied to the combustion heater is then too rich, the sliding member 24 is adjusted upwardly to raise the upper end of the nozzle further above the liquid level. This will provide a leaner mixture. Should the mixture be too thin the sliding member 24 is moved downwardly and a richer mixture is then formed. When the correct position has been found the screw 31 is tightened and the adjustable member 24 is held in its set position.

It is found that the check valve 51 assists in maintaining the level in the chamber 21, and the carburetor 15 will operate over a rather wide range of changes in level due to the fact that but a very small quantity of liquid fuel is required to supply this carburetor. Because of the cascade arrangement of the wells in the mixture forming part of the carburetor there is no appreciable suction on the orifice 40 and that orifice consequently feeds under gravity head only. Since it feeds under gravity head only, its feed, per unit of time, changes very little regardless of the level.

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 spirt or scope of my invention.

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

1. In mixture forming means for internal combustion engines, the combination with a Stewart type vacuum tank, of a carburetor adapted to operate on slightly varying levels and supported with definite relation to the level of said tank, and a check valve connection between the tank and carburetor.

2. In mixture forming means for internal combustion engines, the combination with a Stewart type vacuum tank, of a carburetor adapted to operate on slightly varying levels and supported with definite relation to the level of said tank, said carburetor having a storage chamber, and a check valve connection between the tank and said storage chamber.

3. A carburetor comprising a body member having a storage chamber therein, a mixture conduit in stationary relation to said body member and having a part extending into the body member, and a sliding member mounted in the body member and having a fuel nozzle fed from said chamber and extending into said conduit.

4. A carburetor comprising a body member having a storage chamber therein, a mixture conduit in stationary relation to said body member and having a part extending into the body member, a sliding member mounted in the body member and having a fuel nozzle fed from said chamber and extending into said conduit, and means accessible on the outside of the carburetor to adjust said sliding member relatively to the body member.

5. A carburetor comprising a body portion, a relatively fixed mixture conduit extending downwardly into the body portion, and a sliding member in the body portion having a passage to receive said conduit.

6. A carburetor comprising a body portion, a mixture conduit extending downwardly into the body portion, and a nozzle member slidable in said body portion and having a passage adapted to receive said conduit.

7. A carburetor comprising a body portion, a relatively fixed mixture conduit ex-

tending downwardly into the body portion, and a nozzle member sliding in said body portion and telescoping with said conduit.

8. A carburetor comprising a chamber, a member sliding therein and having a vertical passage fed by said chamber, a nozzle in said passage receiving liquid fuel from the passage, and a mixture pipe extending into said passage and around said nozzle.

9. A carburetor comprising a chamber, a member slidably mounted in said chamber and having a vertical passage, a nozzle supported by said member in said passage and fed with liquid fuel from said chamber, and a mixture pipe extending into said passage and around said nozzle.

10. A carburetor comprising a chamber, a member slidably mounted in said chamber and having a vertical passage, a nozzle supported by said member in said passage and fed with liquid fuel from said chamber, and a mixture pipe extending downwardly into said passage, said member being adjustable vertically relatively to said chamber and said pipe.

11. A carburetor comprising a storage chamber, and a member extending into said chamber and vertically slidable relatively thereto, said member having a storage well therein opening into said chamber.

12. A carburetor comprising a storage chamber, and a member extending into said chamber and vertically slidable relatively thereto, said member having a storage well therein opening into said chamber and vented at its upper end.

13. A carburetor comprising two relatively slidable parts, one of said parts carrying the nozzle and air passage and the other said part carrying the liquid supply and mixture outlet conduit.

14. A carburetor comprising a chamber adapted to receive liquid fuel, a member slidably mounted therein and having a plurality of vertical wells, said wells having inter-connecting passages, a nozzle supported by said member and adapted to be supplied by one of said wells, and means for supplying another of said wells from said chamber.

15. A carburetor comprising a body portion adapted to be connected to a source of liquid fuel and having an outlet pipe for receiving mixture, a sliding member mounted in said body portion and having a vertical passage therein, and an inverted U-shaped tube having one end extending into said passage and having the other end connected to said mixture outlet pipe.

16. A carburetor comprising a body portion of substantially cylindrical form, means for feeding liquid fuel to the lower part of said body portion, a barrel member slidably mounted in said body portion and having a vertical passage therein closed at the bottom except for a small orifice connecting with the lower part of said body portion whereby liquid fuel is supplied to said pipe, a tube mounted on said body portion and having an end extending downwardly into said passage, a nozzle mounted in the passage in said barrel and extending upwardly into said tube, and means for adjusting said barrel vertically in said body portion and relative to said tube.

17. A carburetor comprising a body portion of substantially cylindrical form, means for feeding liquid fuel to the lower part of said body portion, a barrel member slidably mounted in said body portion and having a vertical passage therein closed at the bottom except for a small orifice connecting with the lower part of said body portion whereby liquid fuel is supplied to said pipe, a tube mounted on said body portion and having an end extending downwardly into said passage, a nozzle mounted in the passage in said barrel and extending upwardly into said tube, and a thumb nut geared to said barrel portion and adapted to adjust the latter vertically in said body portion.

18. A carburetor comprising a body portion and an adjustable member mounted in the body portion and having a series of vertical wells therein, said wells being open to the atmosphere at their upper ends and inter-connected with small orifices at their lower ends, a small orifice connection between the lower end of one well and the lower part of said body portion whereby liquid fuel is fed to that well, a nozzle mounted in the adjustable member and having communication with one of said wells.

19. A carburetor comprising a body portion, an adjustable member mounted therein and having a series of vertical wells open to the atmosphere at their upper ends and connected in series by small orifices at their lower ends, the first of said series of wells having an orifice connecting its lower end with the lower part of said body portion so that the wells are supplied with liquid fuel therefrom, and a nozzle mounted in said adjustable member and communicating at its lower end with the last of said series of wells.

20. A carburetor comprising a body member, means for supplying it with liquid fuel, an adjustable member mounted in said body member and having a cascade of fuel and air wells, said adjustable member also having a vertical passage with a nozzle therein communicating with the last of said wells, and a mixture tube extending downwardly into said passage around the upper end of said nozzle.

21. A carburetor comprising a liquid fuel chamber, and a mixture forming member mounted in said chamber and having a cir-

cumferential channel around its lower part, a fine mesh screen over said channel, and means comprising a small orifice leading from said channel to the mixture forming part of said member.

22. A carburetor comprising a chamber adapted to receive liquid fuel, a mixture forming member extending into said chamber and having a channel formed around its lower part, said member also having a well therein, a fine mesh screen secured to said member over said channel, and means consisting of a small orifice connecting said channel with said well.

In testimony whereof I affix my signature.

LIONEL M. WOOLSON.