Jan. 13, 1931. H. C. LORD 1,788,578

MEANS FOR FORMING EXPLOSIVE MIXTURES

Filed Feb. 15, 1926 2 Sheets-Sheet 1

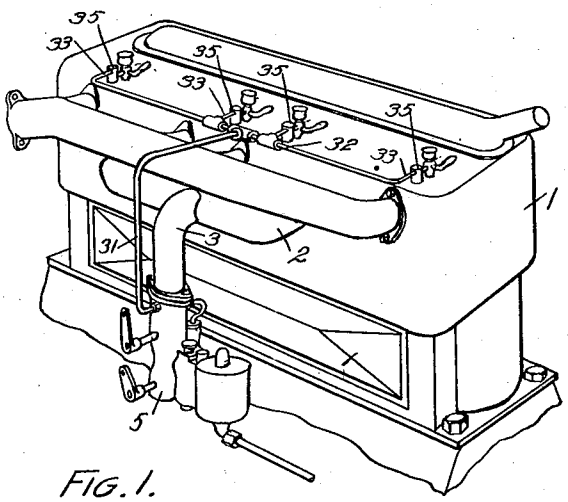


FIG. 1.

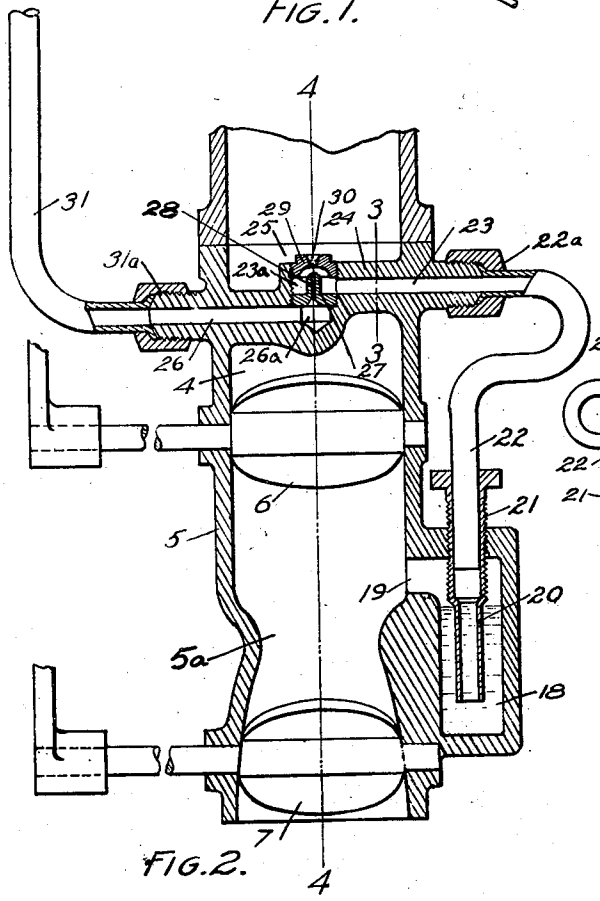


FIG. 2.



FIG. 3.

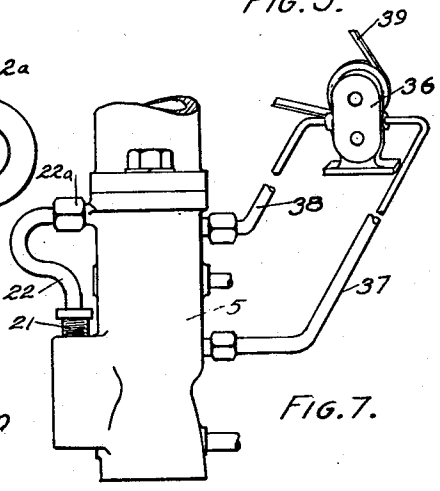


FIG. 7.

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MEANS FOR FORMING EXPLOSIVE MIXTURES

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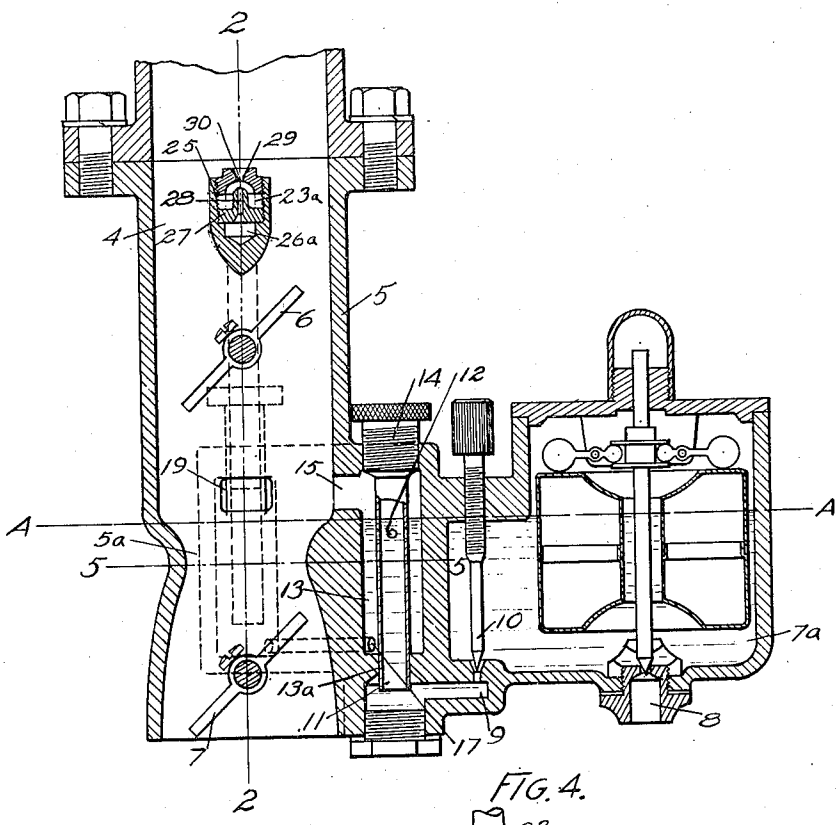


FIG. 4.

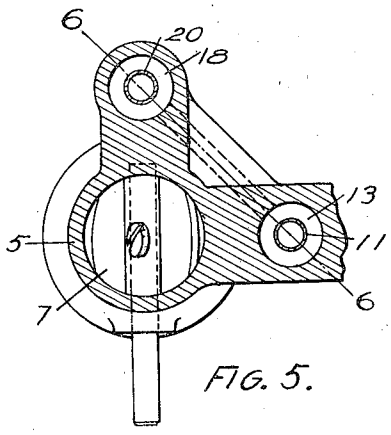


FIG. 5.

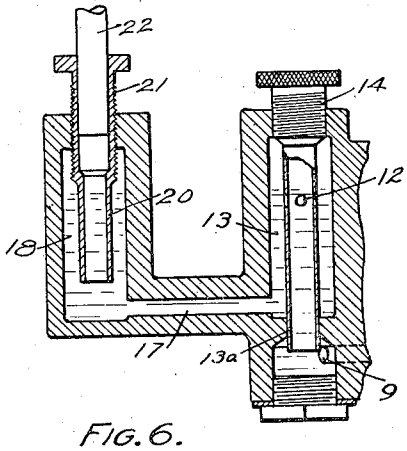


FIG. 6.

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MEANS FOR FORMING EXPLOSIVE MIXTURES

Application filed February 15, 1926. Serial No. 88,481.

This invention is designed to improve carburetor performance. The ordinary carburetor uses the suction effort involved in drawing in the air to also draw in the fuel, the suction effort varying on the fuel and air with variations in the requirements and thus maintaining the desirable proportions between the air and fuel. This has proven a very sensitive and flexible means of proportioning the air and fuel forming the explosive mixture. In the ordinary carburetor also the inflowing air is used to atomize the fuel and in order to get the necessary velocity for this purpose the intake passages are reduced with Venturi restrictions and other devices and the construction is a compromise as between as little restriction as possible, which is desirable for engine capacity, and as great a restriction as possible, which is desirable for the atomizing effect. In order to permit of a sufficient capacity for the engine at higher speeds it is necessary to sacrifice velocity at the lower speeds and consequently proper atomization of the fuel. By reason of this it is common to provide means operative with the lower speeds of the engine to increase the flow of fuel so that with this excess and an atomization of some of the fuel there will be sufficient fuel atomized to give an explosive mixture and in order to give flexibility to engine performance it is common to run the engine at normal speeds at richer mixtures than is necessary in order that the fuel atomized at the lower speeds may be sufficient to provide an assured explosive mixture. The present invention is designed to afford perfect and complete atomization at all speeds and at the same time utilize the sensitive and simple control that proportions the fuel and air as now employed in the common carburetor.

In carrying out the invention in the particular exemplification shown both the air and fuel are drawn into the carburetor in response to suction effort on the carburetor. The passages for the air and fuel are proportioned to give the proper or desirable explosive mixture. The fuel after being so measured is sprayed or atomized to the air stream with the application of an outside force preferably a gaseous fluid and in the more restricted form of the invention a gaseous fluid under pressure is bled from the engine cylinders. Features and details of the invention will appear from the specification and claims.

The apparatus forming the subject matter of the invention and with which the method may be practiced is illustrated in the accompany drawings as follows:

Fig. 1 shows a perspective view of the invention.

Fig. 2 a section of the carburetor on the line 2—2 in Fig. 4.

Fig. 3 a section on the line 3—3 in Fig. 2.

Fig. 4 a section on the line 4—4 in Fig. 2.

Fig. 5 a section on the line 5—5 in Fig. 4.

Fig. 6 a section on the line 6—6 in Fig. 5.

Fig. 7 a perspective view of an alternative construction.

1 marks the engine block, 2 an intake manifold, and 3 an intake pipe leading from the carburetor to the manifold.

The carburetor body 5 has the ordinary suction passage 4 through it, a controlling throttle 6 in the upper part of the carburetor, and a choke valve 7 in the lower part of the passage.

The carburetor is supplied with the ordinary float chamber 7*a* giving the fuel level A—A. This has a supply passage 8 and discharge passage 9. The discharge passage 9 is controlled by a metering valve 10. The fuel passage 9 is connected with the lower end of a fuel nozzle tube 11, this tube having radial openings 12 leading into a well 13, the tube extending through an opening 13*a* in the bottom of the well into the passage 9. The upper end of the tube is secured to a screw 14 by means of which the level of the discharge openings 12 relatively to the fuel level may be adjusted giving ordinarily and preferably a slight gravity feed. The well 13 communicates with the suction passage by way of an opening 15.

The well 13 is connected at its bottom by a passage 17 with a well 18. The well 18 is connected by an opening 19 with the suction passage. A tube 20 extends down-

wardly into the well. It is provided with the screw-threaded upper end 21 by means of which the level of the bottom of the tube may be adjusted. The tube 20 telescopes a tube 22 which leads to and is connected by a fitting 22*a* with a cross passage 23 arranged in a cross bar 24 above the throttle and terminates in an atomizing chamber 25 arranged in the cross bar. In the atomizer gaseous fluid under pressure is used as the atomizing agent and this is delivered through a passage 26 to the chamber 26*a*. A gaseous fluid nozzle 27 is screwed into the atomizing chamber 25 seating on the bottom of said chamber and is provided with a fluid nozzle 28 communicating with the chamber 26*a*. The fuel delivered through the passage 23 leads into a small chamber 23*a* directly above the nozzle 27 and the spray nozzle 29 is screwed into the upper part of the chamber 25 forming the upper wall of the chamber 23*a*. It is provided with the jet opening 30 which is preferably flared slightly so as to flare the atomized jet. With such a device and fairly high pressure air, or fluid, perfect atomization may be accomplished with a negligible input of actuating fluid.

The passage 26 is connected by a fitting 31*a* with a pipe 31. The pipe 31 leads to a manifold pipe 32 which is connected by branches 33 with pet cocks leading to each of the cylinders of the engine. A small check valve 35 may be placed in the branches, if desired, to prevent a return flow of fluid to the cylinders although the pressure delivered by the engine as a whole without such check valve may be utilized, if desired.

The suction effort on the suction passage draws in fuel through the nozzle openings 12, and air through the lower restriction of the passage which may be provided simply by a valve 7, or a slight permanent restriction 5*a*. In as much as the velocity through the passage is of no consequence this restriction may be made very slight as compared with ordinary carburetors. The fuel delivered to the well follows, therefore, very closely the variations of air delivered to the suction passage and this will be controlled by the throttle position and conditions as in the ordinary carburetor responding to engine speeds indirectly through the suction effort as in the ordinary carburetor. The fuel delivered to the well 13 is carried into the well 18 and is immediately drawn out of this well through the ejector effect of the pressure air in the atomizer which should be sufficient to deliver to the atomizer all the fuel as it is delivered to the well. The openings 15 and 19 may be slightly restricted so that with the higher speeds and greater pressure on the atomizer solid fuel may be discharged from the passage 17 and some added suction effort delivered to the well 13 and to the nozzle 12. The openings to the well 13 may be varied as in the common carburetor to vary the suction effort on the nozzles to get such refinements of mixture as may be desired—in other words, the ordinary carburetor practice is available for this purpose in this device.

By varying the level of the openings 12 the gravity factor of the feeding of fuel may be varied as in common carburetor practice and by raising and lowering the tube 20 the initial fuel which is delivered for starting the engine may be varied and also the possibility of emptying the chambers also varied so that in addition to the ordinary carburetor controls this variation in control may be added, if desirable.

In starting the engine the first cylinder getting compression will deliver sufficient air to spray the initial fuel for forming an explosive mixture and the amount bled from the cylinders should be sufficient to completely operate the atomizer with the slowest speeds of the engine. Thus the slow speeds, idling and starting, are provided with a perfectly atomized mixture and this without unduly restricting the inlet passage for the higher speeds. It will be noted that except as suggested by the restrictions of the openings 15 and 19 the atomizing of the fuel does not in any way disturb the sensitive measuring of the fuel and air and if desired the openings 15 and 19 may be such as to maintain the pressures in the wells approximately the suction passage pressure under all conditions. It will be noted also that the air which may be drawn through the tube 20 when the ejector effect of the atomizer is not satisfied by fuel alone is merely bypassing the measured air of the suction passage so that again there is no particular disturbance in the mixture. The delivery of the approximately inert gas from the cylinders again does not disturb this quality and what heat there is in such gases aids to some extent to vaporize the fuel but with complete atomization of sufficient fineness the heating or vaporization of the fuel is of minor consequence.

In the construction shown in Fig. 7 a pump 36 supplies the gaseous fluid under pressure for atomization. It draws the air by way of a pipe 37 from a point in the suction passage below the throttle and discharges the air through the pipe 38 to the passage 23. The pump is driven by a belt 39 belted to any convenient part of the engine, such as the fan shaft (not shown). In this structure the air taken from the suction passage below the throttle is in effect simply bypassed around the throttle and consequently does not disturb the proportioning of air and fuel as they are delivered to the carburetor.

This structure as in the preferred struc-

ture may have the air taken from the suction passage in such relation to the fuel well as to somewhat influence the flow to the fuel well. However, in all the structures the dominant control is the gaseous fluid pressure operating on the fuel and air exterior of the suction passage as compared with the delivery end of the conduits, or passages conveying the air and fuel, namely the pressure in the suction passage itself at the inlet nozzle and at a point beyond the restriction for the air. In the embodiment shown the gaseous fluid forcing the inflow of air and fuel is atmospheric pressure, the difference in pressures at the two ends of the passages being due to the reduction of pressure in the suction passage.

What I claim as new is:—

1. The method of preducing explosive mixtures which consists in feeding and measuring fuel and air by a fluid pressure force varying approximately correspondingly with variations of pressure of the mixture and atomizing the fuel so delivered and delivering the same to the air with a force separately applied.

2. The method of producing explosive mixtures which consists in feeding and measuring fuel and air by fluid pressure force varying approximately correspondingly with variations of pressure of the mixture and atomizing the fuel so delivered and delivering the same to the air with a gaseous fluid separately applied.

3. The method of producing explosive mixtures which consists in feeding and measuring fuel and air to an engine by fluid pressure force varying approximately correspondingly with variations of pressure of the mixture and atomizing the fuel so delivered and delivering the same to the air with gaseous fluid bled from the engine.

4. The method of producing explosive mixtures for engines which consists in drawing in air and fuel and measuring the fuel through the suction effort of the engine, and atomizing the fuel through a force separately applied and delivering the same to the air.

5. The method of producing explosive mixtures for engines which consists in drawing in air and fuel and measuring the fuel through the suction effort of the engine, and atomizing the fuel with a gaseous fluid separately applied and delivering the same to the air.

6. The method of producing explosive mixtures for engines which consists in drawing in air and fuel and measuring the fuel through the suction effort of the engine, and atomizing the fuel with a gaseous fluid from the engine separately applied and delivering the same to the air.

7. In a carburetor, the combination of an intake passage; an air inlet responding to passage pressure; a fuel inlet responding to and controlled mainly by passage pressure; and means acting independently of the passage pressure atomizing the fuel and delivering the same to the air.

8. In a carburetor, the combination of an intake passage; an air inlet to the passage responding to passage pressure; a fuel inlet responding to and controlled mainly by passage pressure; a nozzle leading from the fuel inlet; and means withdrawing the fuel delivered at the inlet to a point remote from the inlet and atomizing the same and delivering the same to the air.

9. In a carburetor, the combination of an intake passage; an air inlet to the passage responding to passage pressure; a fuel inlet responding to and controlled mainly by passage pressure; a nozzle leading from the fuel inlet; means withdrawing the fuel delivered at the inlet to a point remote from the inlet; and means atomizing the same and delivering it to the air by pressure fluid acting independently of the passage pressure.

10. In a carburetor, the combination of an intake passage; an air inlet responding to passage pressure; a fuel inlet responding to and controlled mainly by passage pressure; and means acting independently of the passage pressure and without disturbing the inducing pressure on the fuel and air atomizing the fuel and delivering the same to the air.

11. In a carburetor, the combination of an intake passage; an air intake responsive to passage pressure; a fuel intake responsive to and controlled mainly by passage pressure; and means withdrawing the fuel delivered at the inlet and atomizing the same and delivering it to the air in the inlet passage, the atomizing influence on the passage pressure operating approximately equally on the fuel and air delivery.

12. In a carburetor, the combination of an intake passage; a throttle in the passage; an air intake responsive to passage pressure; a fuel intake responsive to passage pressure; means withdrawing the fuel delivered at the inlet and atomizing the same and delivering it to the air in the inlet passage, the atomizing influence on the passage pressure operating approximately equally on the fuel and air delivery.

13. In a carburetor, the combination of an intake passage; an air inlet responding to passage pressure; a supply means; a fuel well communicating with said means and with the passage; a fuel nozzle in the well; means for withdrawing fuel from the nozzle and spraying the same from the well; and means acting independently of the passage pressure atomizing the fuel as it is withdrawn and delivering the same to the air.

14. In a carburetor, the combination of a

carburetor passage; a supply means; a fuel well communicating with said means and with said passage; an air inlet responsive to passage pressure; a fuel nozzle in the well responsive to passage pressure; an atomizer delivering to the air in the passage; means for supplying the atomizer with gaseous fluid; and a connection between the atomizer and the fuel well.

15. In a carburetor, the combination of a carburetor passage; a fuel well communicated with said passage; an air inlet responsive to passage pressure; a fuel nozzle in the well responsive to passage pressure; an atomizer in the passage; means for supplying the atomizer with gaseous fluid; a connection between the atomizer and the fuel well; and a throttle in the carburetor passage interposed between the atomizer and the well.

16. In a carburetor, the combination of an intake passage; a fuel well communicating with the passage; an atomizer well communicating with the passage and with the fuel well; an air inlet to the passage responsive to passage pressure; a fuel inlet to the fuel well responsive to passage pressure; and an atomizer communicating with the atomizer well and delivering the atomizing fuel to the intake passage.

17. In a carburetor, the combination of an intake passage; a fuel well communicating with the passage; an atomizer well communicating with the passage and with the fuel well; an air inlet to the passage responsive to passage pressure; a fuel inlet to the fuel well responsive to passage pressure; an atomizer communicating with the atomizer well and delivering the atomizing fuel to the intake passage; and a throttle interposed between the atomizer and the wells.

In testimony whereof I have hereunto set my hand.

HUGH C. LORD.