H. A. MILLER & F. M. ADAMSON.

CARBURETER.

APPLICATION FILED MAY 1, 1916.

1,301,483.

Patented Apr. 22, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

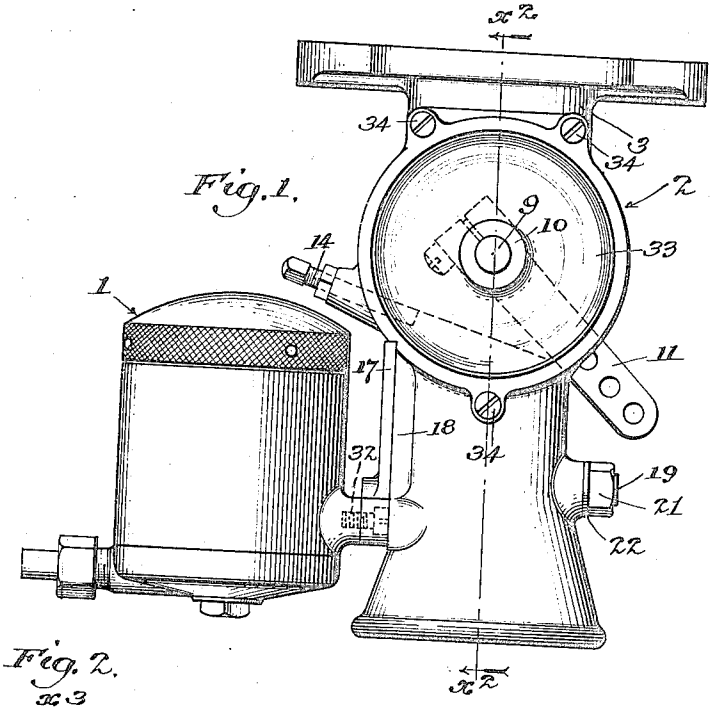


Fig. 2.

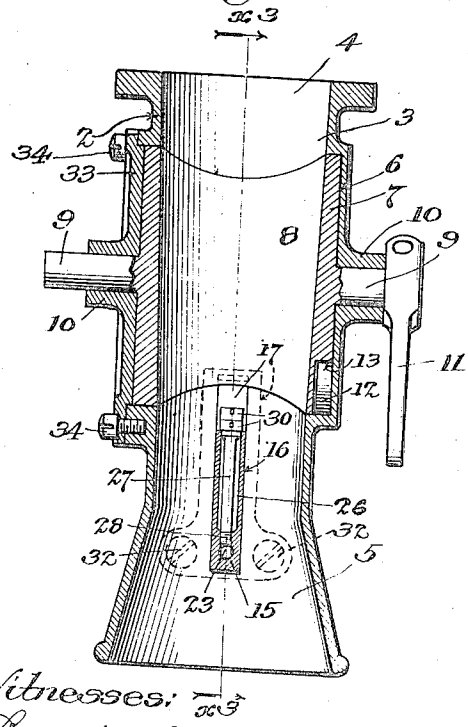
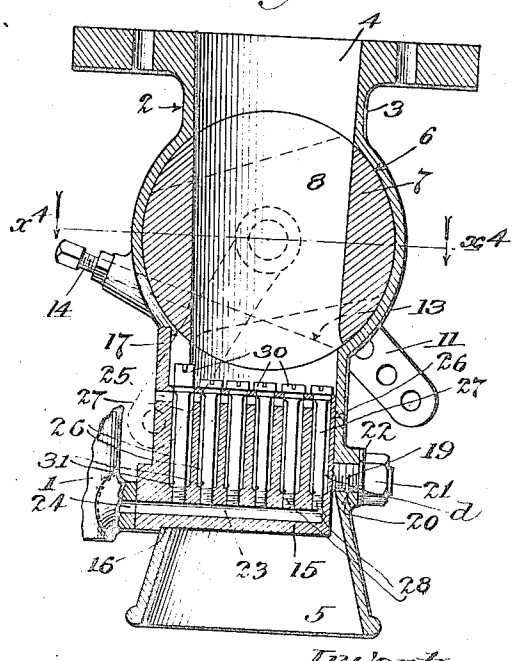


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

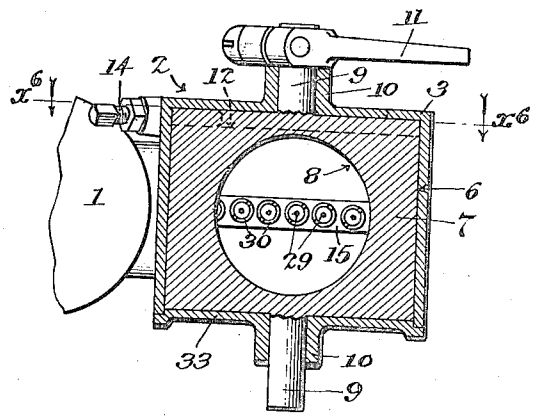


Fig. 5.

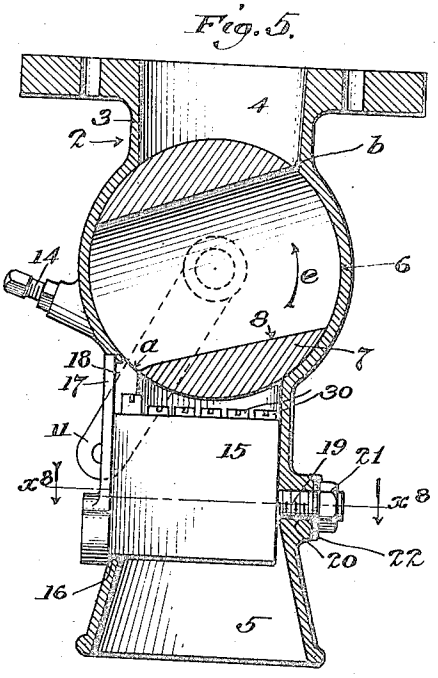


Fig. 6.

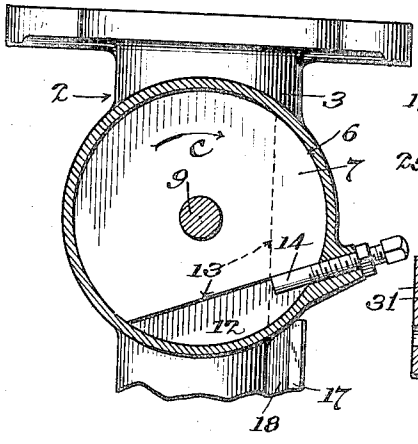


Fig. 7.

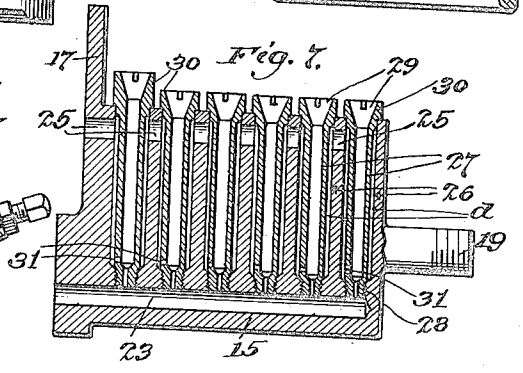
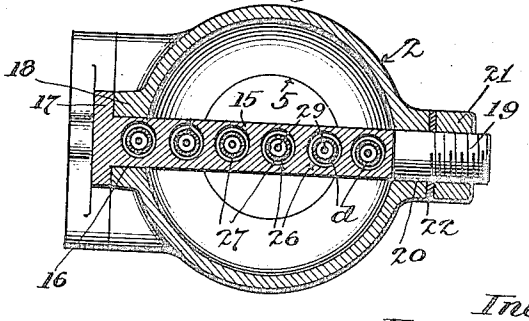


Fig. 8.



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UNITED STATES PATENT OFFICE.

HARRY A. MILLER AND FRANK M. ADAMSON, OF LOS ANGELES, CALIFORNIA.

CARBURETER.

1,301,483. Specification of Letters Patent. Patented Apr. 22, 1919.

Application filed May 1, 1916. Serial No. 94,549.

To all whom it may concern:

Be it known that we, HARRY A. MILLER and FRANK M. ADAMSON, citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Carbureter, of which the following is a specification.

This invention relates in general to carbureters or air and liquid fuel mixers and more particularly to the mixing chamber and its parts, the float chamber and the parts thereof not being described in detail and claimed herein but being the subject of our application for patent for carbureter issued into U. S. Letters Patent No. 1,227,817, dated May 29th, 1917.

An object of this invention is to make provision for mixing the air and liquid hydrocarbons with maximum thoroughness so as to produce a charge of explosive mixture of uniform quality throughout.

Another object is to make provision for progressively and definitely increasing the quantities of liquid hydrocarbon and air so as to obtain greater volumes of mixture when greater engine speed is desired.

The object last mentioned above is accomplished by providing a bank or battery of nozzles, and an object of this invention is to so arrange said battery of nozzles that when the valve plug is in full open position, all of the nozzles will be effective to supply liquid fuel and so that as the valve plug is turned from full open position toward closed position, it will progressively cover the nozzles one at a time so that less and less liquid fuel will be discharged into the mixing chamber, and this is effected by arranging the battery of nozzles in a plane that coincides with the plane of rotation of the valve plug. By this construction it is unnecessary to have any recesses in the wall of the passage through the valve plug and the intake end of said valve plug passage is substantially circular; and this construction insures against the formation of eddies, which of course would interfere with the speed of the mixture through the carbureter.

In high engine speed it is particularly necessary that the mixture flow through the carbureter and into the engine cylinders with as little impeding thereof as possible, and an object of this invention is to make provision for furnishing explosive mixture for extremely high engine speeds such as those demanded in aeroplane flight and in automobile racing.

Another object of this invention is to insure an abundant fuel supply being furnished by the nozzle or nozzles when said nozzle or nozzles are first acted on by the air current for sucking the fuel therefrom.

Another object is to make provision at high engine speeds for preliminary mixing of air and fuel particles in the nozzles themselves.

Another object is to so construct the nozzles that they may be of relatively large bore so that they will not readily clog with any foreign particles that may be taken into the carbureter with the liquid fuel.

Another object is to make provision for overcoming as quickly as possible the inertia of the liquid fuel when in a state of rest in the nozzles.

Another object is to so construct the device that expansion of the mixture may readily take place as it passes from adjacent the nozzles to the manifold.

Another object is to effect the foregoing by a simple construction and one which is easy and inexpensive to manufacture.

Other objects and advantages may appear in the subjoined detail description.

The accompanying drawings illustrate the invention:

Figure 1 is a side elevation of a carbureter embodying the invention.

Fig. 2 is a sectional elevation on line indicated by x^2—x^2, Fig. 1.

Fig. 3 is a sectional elevation on line indicated by x^3—x^3, Fig. 2, most of the float chamber being broken away. The valve plug is in full open position.

Fig. 4 is a plan section on line indicated by x^4—x^4, Fig. 3.

Fig. 5 is a sectional elevation analogous to Fig. 3, excepting that the valve plug is turned to idling-speed position and the nozzle support is shown in elevation.

Fig. 6 is a fragmentary elevation partly in section on line indicated by x^6—x^6, Fig. 4, dotted lines showing the idling-speed position of the valve plug.

Fig. 7 is an enlarged longitudinal section of the nozzle support and its battery of nozzles.

Fig. 8 is a plan section on line indicated by x^8—x^8, Fig. 5.

The carbureter is shown complete in Fig. 1 and comprises a float chamber, designated in general at 1, and a mixing device, indi-

cated in general at 2. The float chamber and the mechanism thereof are not disclosed in detail and claimed herein but are the subject of our hereinbefore mentioned application for patent for carbureter.

The construction of the mixing device will now be described. There is provided a hollow body 3 having a passage therethrough, said passage comprising a cylindrical outlet 4, a cylindrical inlet 5 and between said outlet and inlet a cylindrical valve chamber 6, the axis whereof is at right angles to the axes of the outlet and inlet.

Fitting inside of the valve chamber 6 is a cylindrical valve plug 7 having a cylindrical passage 8 extending transversely to the axis of the valve plug to form an opening extending from the periphery on one side of said valve plug to the periphery on the other side thereof. The outlet 4 and the passage 8 expand outwardly from the end of the passage 8 that is adjacent the inlet 5, said outlet 4, inlet 5 and passage 8 altogether forming, when the valve plug is turned to wide open position, as in Fig. 2, a single passage extending from end to end of the body 3.

The valve plug 7 is provided at its opposite ends with shafts 9 which are journaled in bearings 10, one of said shafts being provided with an arm 11 adapted to be operated to turn the valve plug 7 to control the size of the apertures *a*, *b* between the outlet and inlet 4, 5 and passage 8.

The valve plug 7 is provided at one end with a recess 12 forming a shoulder 13 adapted to engage the inner end of a screw 14 which is screw-threaded through the peripheral wall of the valve chamber. The shoulder 13 and screw 14 together form stop members adapted to limit turning of the valve plug in both directions, the shoulder engaging the side of the screw to limit the turning of the valve plug in the direction of the arrow *c* in Fig. 6, and the shoulder 13 engaging the end of said screw as in dotted lines, Fig. 6, to limit turning of said valve plug in the opposite direction to the arrow *c*.

Located in the inlet portion 5 of the passage is a nozzle support 15, one end of said nozzle support being accommodated in an angular slot 16 in one side of the body 3 and provided with a flanged portion in the form of a head 17 adapted to seat against a boss 18 through which the slot 16 extends; and the opposite end of said nozzle support being provided with a screw-threaded stud 19 which passes through a hole 20 in the body 3 and is provided on its outwardly projecting end with a nut 21 adapted when screwed up tight against a spring washer 22 to draw the head 17 tightly against the face of the boss 18. The upper end of the slot 16 communicates with the valve chamber 6.

The nozzle support 15 is provided near its lower edge with a longitudinally extending fuel supply duct 23 communicating at its outer end with an outlet port 24 of the float chamber 1, as shown in Fig. 3, liquid hydrocarbon being supplied from the float chamber through said outlet port as is clearly understood from our hereinbefore mentioned application for patent for carbureter.

The nozzle holder 15 is provided near its upper edge with a longitudinally extending air supply duct 25 opening outward through the head 17 to the atmosphere and extending transversely to and communicating with vertically extending bores 26 which extend from the upper edge of the nozzle support to within a short distance of the fuel duct 23. Said bores 26 are provided internally with nozzles 27 of less diameter than the bores 26 so as to produce annular passages *d* between the nozzles and the walls of the bores. The inner ends of the nozzles 27 are screw-threaded at 28 into the nozzle support 15 between the inner ends of the bores 26 and the fuel duct 23 so that the ducts 29 of said nozzles communicate with the duct 23. The nozzle ducts 29 expand outwardly at the outer ends of the nozzles and said outer ends are in the form of enlarged heads 30 which seat against the upper edge of the nozzle support when the nozzles are screwed tightly into place as clearly shown in Fig. 7. The nozzle ducts 29 communicate through ports 31 with the interior of the bores 26 so that it is evident that air flowing through the duct 25 may pass through the annular passages 26 and thence through the ports 31 into the nozzle ducts. It is noted that the fuel duct and air duct discharge into the nozzles in directions at right angles to one another so that the fuel discharging into the nozzles will be broken up into fine particles to a maximum degree and the flow will not be obstructed as it would, for instance, if the fuel ducts discharged in a direction toward the discharge of air through the air ducts 31.

The construction just described produces, as is clear, a bank or battery of nozzles arranged in a plane that coincides with the plane of rotation of the valve plug 7 and, since the valve passage 8 is of as large a diameter as the passage 5 and the battery of nozzles extends from side to side of said passage, when the valve plug is in the full open position as shown in Fig. 2 all of the nozzles are exposed to the draft of air produced in the device by suction of the engine to which the carbureter is attached, and when the valve plug is turned until the shoulder 13 engages the side of the screw 14 as in Fig. 6 the valve plug shuts off the air passage 5 and the valve passage 8 communicates with the passage 5 only through the slot 16. One of the nozzles 27, herein termed starting or idling-speed nozzle, discharges into said slot 16 and the discharge end of said

nozzle is at a higher level than the discharge ends of the remaining nozzles so that said discharge end will lie in close proximity to the valve passage 8 when the valve plug is almost closed as in Fig. 5.

In practice, assuming that the float chamber 1 is connected to a suitable source of liquid fuel supply, not shown, the liquid fuel will flow from the float chamber through the port 24 and duct 23 into the annular passages *d*, the level which the liquid fuel assumes in the nozzle ducts and annular passages depending upon the mechanism, not shown, of the float chamber as is well understood. The liquid level will be maintained somewhat below the air duct 25 when the engine, to which the carbureter is assumed to be attached, is not in operation.

When it is desired to start the engine, the arm 11 will be operated to turn the valve plug to the position shown in Fig. 5 and the engine will be started in any suitable manner known in the art.

Suction of the engine, as is well understood, produces a draft of air through the carbureter, the air entering from the atmosphere through the inlet 5 and passing up on both sides of the nozzle support 15 and adjacent the discharge end of the starting nozzle 27, so as to suck liquid hydrocarbons from said nozzle to make a comparatively rich mixture. Said mixture passes into the passage 8, thence through the passage 4 into the manifold of the engine and thence to the engine to operate said engine, as is well understood.

When greater volume of combustible mixture is desired, in order that the engine may be run at greater speed, the arm 11 will be operated to turn the valve plug in the direction of the arrow *e* in Fig. 5 so that the passage 8 will be brought to register with the discharge ends of other of the nozzles and the apertures *a*, *b* will be enlarged, the degree of opening of the valve plug depending upon the speed desired. Whatever nozzles register with the valve passage 8 will be acted on by suction of the air past said nozzles and into the valve passage to suck liquid fuel from said nozzles. Thus a greater supply of liquid fuel enters the passage 8 and, owing to the aperture *a* between the passage 8 and the inlet 5 being increased by the aforesaid turning of the valve plug, a larger volume of air also passes into the valve passage 8. It is clear that the proportion or ratio of the cross sectional area of the valve passage 8, especially at the inlet end of said passage, may be such that a comparatively rich mixture may be produced at lower engine speeds and a comparatively thin or lean mixture produced at higher engine speeds. However, to make a mixture that will be accurate for various engine speeds so as to minimize fuel expenditures, the construction of the nozzle support 15 and nozzles 27 hereinbefore set forth is of great importance and the functioning of our novel nozzle construction will now be made clear.

When the nozzle or nozzles are first exposed to the air draft, the liquid fuel in said nozzle or nozzles is sucked therefrom and said liquid fuel is replaced by the liquid fuel stored in the annular passage or passages *d*. As soon as all of the liquid hydrocarbon has been drawn out of the anuular passages *d*, atmospheric air, which immediately takes the place thereof, passes into the nozzle ducts 29 and is there mixed with the liquid hydrocarbons flowing into the nozzle ducts from the duct 23. It is noted that the air supply duct 25 is at a point removed from the air passages 4, 5, 6 so that suction in the air passage will not lower the pressure of air in the duct 25 below atmospheric pressure. From this it is clear that a change in the quality of the mixture discharged from any given nozzle takes place shortly after the nozzle begins to function, thus at the beginning of the functioning of the nozzle the mixture produced in the passage 8 is comparatively rich in liquid hydrocarbons, and immediately thereafter the mixture is rarefied in hydrocarbons by reason of the disappearance of the liquid hydrocarbons from the annular passage *d* and by reason of the air supplied to the nozzle through said annular passage.

It is clear that by providing the annular passage 26 and the ports 31 near the lower ends of the nozzles suction on the liquid hydrocarbons admitted to said nozzles from the duct 23 is maximized as soon as the air begins to pass through said annular passages into the nozzles.

It is noted that, when the engine is started and when any given nozzle is exposed to the full air draft, the inertia of the stationary liquid fuel in the nozzle is readily overcome by the engine suction because of the atmospheric pressure on the liquid hydrocarbons contained in the annular passage *d*. This feature of the construction enables the engine to "pick up" or accelerate very quickly upon opening of the throttle for the reason that a comparatively large amount of fuel will discharge into the valve passage 8 just as soon as the areas of the apertures *a*, *b* are increased.

The foregoing will enable those skilled in the art to which the invention appertains to make and use said invention.

The head 17 of the nozzle support 15 is fastened by screws 32 or equivalent to the float chamber 1 with the duct 23 in registration with the outlet port 24.

One end wall 33 of the valve chamber 6 is detachable, as shown, and is held in place by screws 34 or equivalent.

We claim:

1. In a carbureter, a body having an inlet and an outlet and a valve chamber between said inlet and outlet, a valve plug rotative in said valve chamber and provided with a passage, said body having a slot opening into said inlet and communicating at one end with the valve chamber, a detachable nozzle support inserted through said slot and extending into said inlet and provided with a fuel duct, and nozzles screw-threaded into said support and communicating with said fuel duct, one of said nozzles having its outlet end projecting into said slot.

2. In a carbureter, a body having an inlet and an outlet and a valve chamber between said inlet and outlet, a valve plug rotative in said valve chamber and provided with a passage, said body having a slot opening into said inlet, a detachable nozzle support inserted through said slot and extending into said inlet and provided with a fuel duct, and nozzles screw-threaded into said support and communicating with said fuel duct and arranged in a plane at right angles to the axis of the valve plug, one of said nozzles having its outlet end projecting into said slot and said slot communicating with the valve chamber.

3. In combination, a body having an air passage therethrough, a nozzle support extending into said air passage and having a longitudinally extending fuel duct and an air duct and having vertical bores communicating near their upper ends with the air duct, and nozzles in said bores communicating with the fuel duct at their lower ends, there being annular air passages between the nozzles and walls of the bores and there being ports in the nozzles opening into said annular passages.

4. In combination, a body having an air passage therethrough, a nozzle support extending into said air passage and having a longitudinally extending fuel duct and an air duct and having vertical bores communicating near their upper ends with the air duct, and nozzles in said bores screw-threaded into the nozzle support between the lower ends of said bores and the fuel duct and communicating with the fuel duct at their lower ends, there being annular air passages between the nozzles and walls of the bores and there being ports in the nozzles opening into said annular passages and said nozzles having enlarged heads engaging the upper edge of the nozzle support and tightly closing the upper ends of the vertical bores.

5. In combination, a body having a valve chamber and having an air inlet passage communicating with said valve chamber and having a slot in its side, a nozzle support inserted in said slot and projecting into the air passage and having a head extending upward to close the upper portion of the slot, a bank of nozzles for the nozzle support, one of said nozzles having its discharge end in said slot above the level of the other nozzles, and a rotary valve in the valve chamber provided with a passage way adapted to be brought into registration with the air inlet passage and with the upper end of the slot when said valve is turned.

6. In combination, a body having a cylindrical inlet and outlet and a valve chamber between said inlet and outlet, a cylindrical valve plug fitting in said valve chamber and having its axis of rotation at right angles to the axes of the inlet and outlet and having a cylindrical passage at right angles to the axis of the valve plug, a nozzle support in the inlet having a fuel duct and an air duct and having a bore communicating with said air duct, and a nozzle in and of less diameter than the bore and provided with a port opening into the space between the nozzle and wall of the bore.

7. A carbureter comprising a float chamber having an outlet port, a body having a passage therethrough and having a slot, a nozzle support projecting through said slot into said passage and provided with a head at its outer end and provided with a duct registering with said outlet port of the float chamber, screws passing from the head of the nozzle support into the float chamber, and a nozzle for the nozzle support communicating with said duct.

8. In combination, an air passage, a nozzle holder in said air passage provided with a horizontal fuel duct near the bottom of said holder and provided with vertical bores, nozzles inserted in said bores and screw-threaded at their lower ends into the nozzle support between the inner ends of the bores and the fuel duct so that the nozzle ducts communicate with the fuel duct, there being an annular space between the nozzles and the walls of the bore, said nozzles having ports near their lower ends communicating with the annular space, the nozzle support being provided near the upper ends of the vertical bores with an air duct communicating with said bores and said nozzles having heads closing the upper ends of the vertical bores, and a valve to control the flow of air through the air passage.

Signed at Los Angeles, California this 21 day of April 1916.

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