C. L. STOKES.

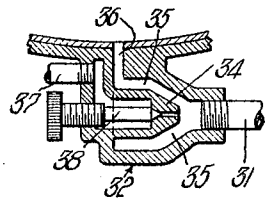
CARBURETOR AND FUEL FEED.

APPLICATION FILED JAN. 23, 1917. RENEWED JAN. 17, 1922.

1,420,886. **Patented June 27, 1922.**

2 SHEETS—SHEET 1.

Fig. 2.



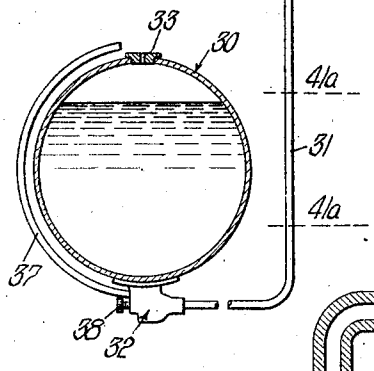


Fig. 1.

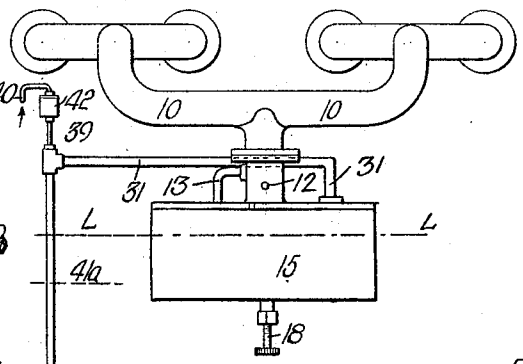


Fig. 3.

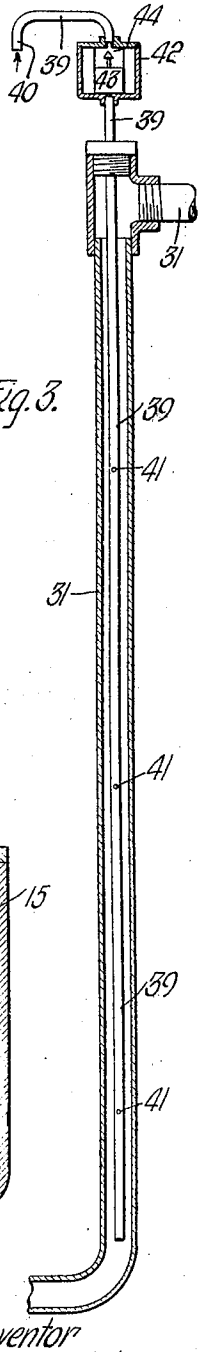
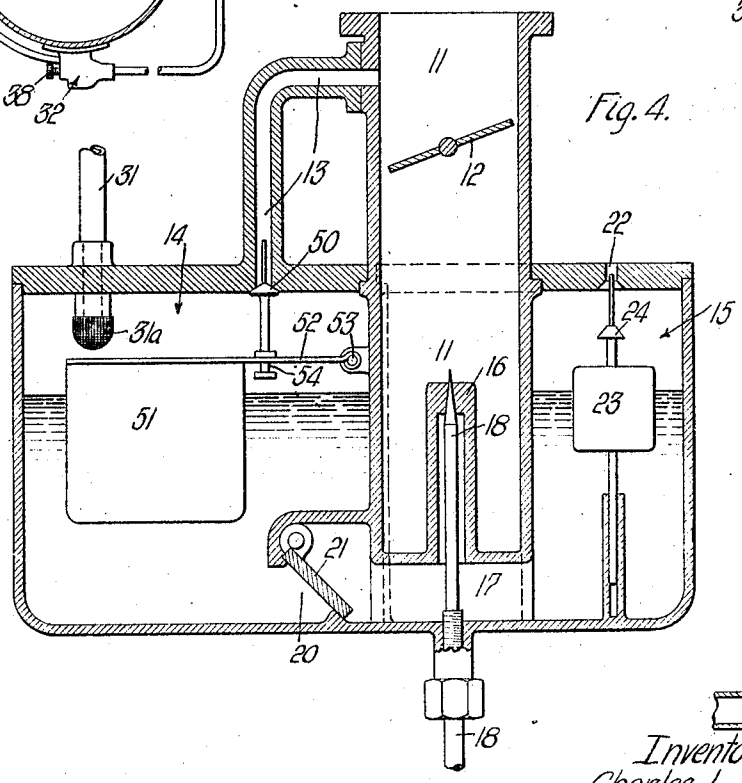


Fig. 4.



Inventor
Charles L. Stokes,
by James T. Chamberlain
His Attorney.

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2 SHEETS—SHEET 2.

Fig. 5.

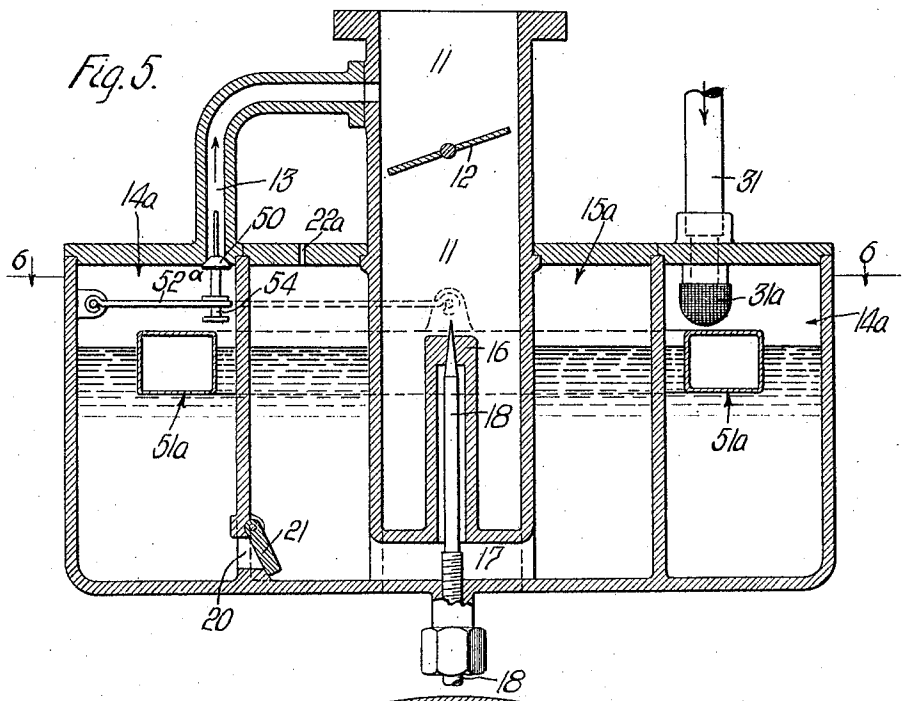
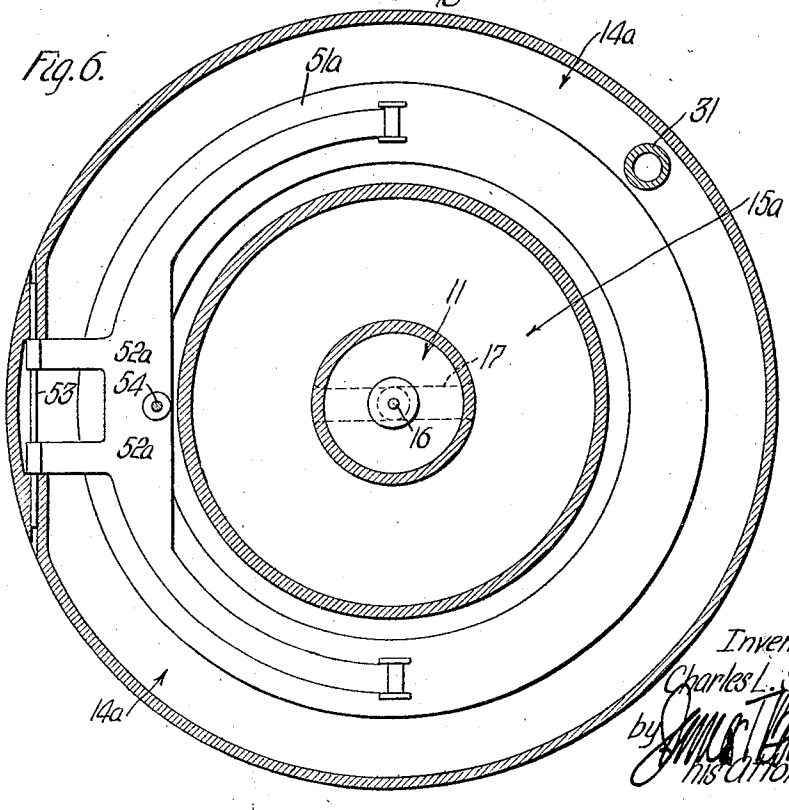


Fig. 6.



Inventor
Charles L. Stokes,
by James T. Lawless
his Attorney.

UNITED STATES PATENT OFFICE.

CHARLES L. STOKES, OF LOS ANGELES, CALIFORNIA.

CARBURETOR AND FUEL FEED.

1,420,886. Specification of Letters Patent. Patented June 27, 1922.

Application filed January 23, 1917, Serial No. 143,924. Renewed January 17, 1922. Serial No. 529,999.

To all whom it may concern:

Be it known that I, CHARLES L. STOKES, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Carburetors and Fuel Feeds, of which the following is a specification.

This invention relates to a combination of carburetor and a fuel system therefor, for internal combustion engines and the like. In my Patents 1,230,537, 1,230,596, and 1,230,832 issued June 19, 1917 and Patent No. 1,319,913, issued October 28th, 1919, I have explained my apparatus and system for elevating and supplying fuel to a carburetor and to an internal combustion engine, while in my Patent 1,230,832 and application S. N. 141946, filed Jan. 12th, 1917, I have particularly explained and claimed the method involved. It is the particular object of the present invention to provide means for combining the system with the carburetor in such a manner that essential parts of the system become integral parts of the carburetor itself, the whole arrangement being thereby simplified and being made capable of inexpensive manufacture.

It is an object of this invention to provide such a combination as herein described, in such a manner as to make maximum simplicity of construction and operation, and in such a manner as to preserve the maximum efficiency of my liquid fuel lifting system. In the accompanying drawings I show such a combination, embodying my preferred system; but it will be understood that the combination is not limited to this particular lifting system herein illustrated and described. I have described several different forms of lifting systems in my said co-pending applications; and the system herein described, in combination with the carburetor, may be taken as typical of the others.

In the accompanying drawings I accordingly illustrate a preferred combination; and in these drawings Fig. 1 is a view illustrating the essential parts of my apparatus; Fig. 2 is an enlarged detail section showing the connection of the fuel lifting pipe with the main tank; Fig. 3 is an enlarged section showing the construction and arrangement of the fuel lifting pipe; Fig. 4 is an enlarged vertical section showing one form of carburetor unit; Fig. 5 is a vertical central section showing another form of carburetor unit; and Fig. 6 is a horizontal section taken as indicated by line 6—6 on Fig. 5.

In the drawings I illustrate an engine intake manifold at 10, to which manifold the suction air passage 11 of the carburetor makes connection. Throttle valve 12 is provided in this suction air passage; and a suction port 13 connects into the air passage 11 at some point above the throttle 12, so as to obtain the full benefit of the engine suction. Suction port 13 connects with a service reservoir 14. This service reservoir 14 is built integrally into the carburetor unit. In Fig. 4 I show this service reservoir 14 being arranged at one side of the suction air passage 11; while in Fig. 5 I show the service reservoir 14^a in the form of an annular chamber concentrically arranged with respect to the suction air passage 11. In Fig. 4 the fuel chamber 15 is arranged on the other side of the suction air passage 11; while in Fig. 5 the fuel chamber 15^a is concentrically arranged around the passage 11, within the annular reservoir 14^a. In either case the fuel chamber feeds the fuel nozzle 16 directly; that is, fuel passes directly from the chamber 15 or 15^a into the nozzle 16, where it is drawn into the passage 11 by the suction of the engine. Fuel nozzle 16 connects with a short passage 17, which passage 17 is open to the chamber 15. The nozzle 16 is controlled by a suitable needle valve 18. The means for feeding fuel into the suction passage and the means for controlling that feed may be varied to suit circumstances. In fact, the carburetor details herein illustrated, may be merely taken as typical of well known carburetor construction, for the reason that the details of such structure are not directly concerned in my invention. It is only necessary for my invention that some carburetion means be employed and, specifically, that the carburetion means be fed directly from chamber 15.

The reservoir 14 and chamber 15 are in communication with each other at a passage 20; and I provide a check valve 21 for the purpose of preventing back flow of liquid fuel from the chamber 15 to the reservoir 14. Chamber 15, or 15^a, is preferably open to atmosphere through a port 22 or 22^a. In the form of device shown in Fig. 4, the chamber may be provided with a small float

23, carrying a valve 24 adapted to close the air port 22 should the fuel level rise so high in the chamber 15 as to cause liability of the fuel to flow out through the air port 22. This float operated valve, however, has nothing to do with maintaining a level of fuel in the chamber 15, as this is accomplished by other means hereinafter explained; but is provided for the sole purpose of preventing overflow of fuel if the carburetor is tipped so that the fuel might reach the opening 22. Such provision is unnecessary in the form shown in Figs. 5 and 6, for the reason that the reservoir and chamber and fuel outlet nozzle 16 are all concentric with each other, and any tipping of the carburetor will not alter the relative amounts of fuel in the reservoir and chamber and will not change the level of liquid with relation to the central nozzle 16. The particular utility of the form shown in Figs. 5 and 6 is that, no matter what tipping of the carburetor may occur, such tipping will not cause a flow of fuel from the reservoir to the chamber, or from the chamber to and through the nozzle 16.

I employ suction operated means for lifting fuel into the reservoir 14 from the main low-level tank 30; said suction means being so controlled and applied as to keep a fairly uniform level of fuel in the reservoir 14, and therefore in the chamber 15, the chamber and reservoir being so relatively situated that the fuel may always stand in hydrostatic balance between them. The valve 21 is not for the purpose of allowing the fuel in the chamber 15 to stand at higher level therein than in reservoir 14, but is for the purpose of preventing the movement of fuel from the chamber back into the reservoir when the suction is applied to the reservoir through the suction port 13. My method of raising fuel to the reservoir includes broadly the application of suction to the reservoir to draw fuel up through the fuel lifting pipe 31, the use of some control means to keep a fairly uniform amount of fuel in the reservoir, and the equalization of the superincumbent pressure on the fluid in the reservoir and in the chamber so that the fuel may flow from the reservoir to the chamber to replenish the supply in the chamber as that supply is used at the nozzle 16.

While various forms of apparatus may be used for raising the fuel, I prefer to apply a system wherein the suction is intermittently applied; the application of suction being specifically under control of a valve mechanism operated by a float in the reservoir; and atmospheric pressure being admitted to the surface of the liquid in the reservoir during the intervals between applications of suction, so as to allow gravity flow of the liquid from the reservoir to the chamber with the chamber 15 open to atmospheric pressure. The preferred arrangement is thus as described in the following:

I employ a liquid lifting pipe 31, which connects at 32 with the main tank 30. The main tank 30 is open to atmosphere at 33, and the connection fitting at 32 includes a nozzle 34 through which air may be drawn into the fuel passing through the passage 35 around the nozzle. This passage 35 connects at 36 with the interior of tank 30; and air is supplied through the pipe 37 under control of a small valve 38; the upper end of pipe 37 being above the uppermost liquid level in tank 30. Valve 38 may be adjusted to admit any desired restricted amount of air into the fuel as it enters the pipe 31; this air having the effect of lightening the column of fluid moving upwardly through the pipe. I also provide means for introducing air at vertically spaced points along the pipe 31; this means preferably embodying a small air tube 39 open to atmosphere at its upper end at 40 and having a plurality of air ports 41 through which air may enter the interior of pipe 31. The air ports are relatively small, as it is only necessary to admit a restricted quantity of air. At the upper end of pipe 39 I may provide a chamber 42 containing a small float 43 with a valve 44 adapted to close the pipe 39 in case the system should be tipped up to such an angle that the fuel level should rise so high in pipes 31 and 39 as to cause the fuel to flow out at the upper end of pipe 39. However, this check valve 44 may be done away with by making the upper end 40 of pipe 39 high enough above the tank 30 so that no ordinary amount of tipping of the system can flow fuel out through that upper end. I preferably arrange air ports 41 at such points that at least one of them is above the normal level of fuel in tank 30 and in pipe 31. For instance, I arrange these ports on levels indicated by the dotted lines 41^a in Fig. 1; and I also preferably arrange all of these ports below the level indicated by the dotted line L—L in Fig. 1, representing the normal level of liquid in the chamber 14. When suction is not being applied to chamber 14, it will be seen that atmospheric pressure may enter the pipe 31 through at least one of the ports 41, and thus atmospheric pressure is in communication with the reservoir 14, so as to allow the entry of air to replace the fuel which flows from the reservoir to the chamber 15. Reservoir 14 is thus effectually as much open to atmosphere at one time as at another; atmosphere is always entering it through at least the uppermost one of ports 41.

My preferred mechanism for controlling the application of suction comprises a simple valve 50 raised and lowered by a float 51 to close and open the suction port 13. In the

form shown in Fig. 4, this float 51 is of the ordinary form, while in the form shown in Fig. 5 the float 51ª is annular in form, to conform to the annular shape of the reservoir 14ª. The float is connected to an arm 52, or 52ª, which is pivoted at 53 to a wall of the reservoir; and the valve 50 loosely connects with the arm 52 at the point 54. The looseness of connection at the point 54 allows the float 51 or 51ª a certain amount of freedom of movement without moving the valve 50. When the valve 50 is closed, it is held closed by the suction of the engine. When the liquid level in the reservoir has fallen a small distance, and the float 51 has also fallen that distance, then the float will place its weight upon the valve 50 and will pull it open, whereupon the valve 50 will drop down, leaving the suction port open. The application of suction will immediately draw through the pipe 31 a mixed column of liquid fuel and air; and this liquid fuel and air will enter the reservoir 14. A suitable baffle at 31ª prevents the suction of the fluid immediately toward the suction port 13, allowing the fluid and air to separate, so that the fluid may accumulate in the reservoir and the air may be drawn out of the reservoir through the suction port 13 and into the engine intake. This air is of course carbureted by reason of its intimate mixture with the liquid fuel during the passage up pipe 31; and this carbureted air forms a part of the final fuel mixture going to the engine. The amount of air admitted is sufficient to substantially lighten the rising column of fluid, so that a comparatively slight amount of vacuum will raise the fuel through a considerable vertical distance. Thus, the system is very efficient in raising the fuel required by the engine.

I point particularly to the simplicity of mechanical arrangement in my system, and the simplicity of the carbureter unit, both in construction and operation. And it is the mechanical features which make this simplicity that I wish to particularly secure to myself in the following claims, without limiting myself to the specific details herein shown and described.

Having described a preferred form of my invention, I claim:

1. In combination, a carburetor having a suction air passage, a liquid fuel chamber open to atmosphere and in direct communication with the air passage to supply it with fuel, a liquid fuel reservoir integrally included within the carburetor and in communication with said chamber to supply it with fuel, said reservoir being located in the same horizontal plane as the chamber so that liquid fuel may stand in hydrostatic balance between the reservoir and chamber, means to prevent passage of liquid from the chamber to the reservoir, a low level main fuel tank, a communication between the tank and reservoir, means to admit atmosphere to said communication, means to intermittently apply to the reservoir the same suction that is applied to the carburetor suction passage, and means to admit atmospheric pressure to the reservoir to the surface of the liquid therein in the intervals between the applications of suction.

2. In combination, a carburetor having a suction air passage, a liquid fuel chamber surrounding the air passage and in communication with the air passage to supply it with fuel, the point of discharge of the communication into the air passage being concentric with the chamber, a liquid fuel reservoir around the chamber and concentric therewith and in communication with the chamber, and suction operated means to introduce liquid fuel into the reservoir.

3. In combination, a carburetor having a suction air passage, a liquid fuel chamber surrounding the air passage and in direct communication with the air passage to supply it with fuel, the point of discharge of the communication into the air passage being concentric with the chamber, a liquid fuel reservoir around the chamber and concentric therewith and in communication with the chamber, means to prevent flow of liquid from the chamber to the reservoir, a low level main fuel tank, a communication between the tank and reservoir, means to admit atmosphere to said communication, means to intermittently apply suction to the reservoir, and means to admit atmospheric pressure to the reservoir to the surface of the liquid therein in the intervals between the applications of suction.

4. In combination, a carburetor having a suction air passage, a liquid fuel chamber surrounding the air passage and in direct communication with the air passage to supply it with fuel, the point of discharge of the communication into the air passage being concentric with the chamber, a liquid fuel reservoir around the chamber and concentric therewith and in communication with the chamber, means to prevent flow of liquid from the chamber to the reservoir, a low level main liquid fuel tank, a communication between the tank and reservoir, means to restrictedly admit atmosphere to said communication at a point above the normal level of liquid in the tank, and means to intermittently apply suction to the reservoir.

5. In combination, a carburetor having a suction air passage, a liquid fuel chamber surrounding the air passage and in direct communication with the air passage to supply it with fuel, the point of discharge of the communication into the air passage being concentric with the chamber, a liquid fuel reservoir around the chamber and con-

centric therewith and in communication with the chamber, means to prevent flow of liquid from the chamber to the reservoir, a low level main liquid fuel tank, a communication between the tank and reservoir, means to restrictedly admit atmosphere to said communication at a point above the normal level of liquid in the tank, and means to intermittently apply to the reservoir the same suction that is applied to the suction air passage.

6. In a carburetor apparatus of the character described, a carburetor having a suction air passage, a liquid fuel chamber around said passage open to atmosphere and in direct communication with the air passage to supply it with fuel, the point of discharge of the communication into the air passage being concentric with the chamber, a liquid fuel reservoir concentrically surrounding the chamber and in communication therewith, a check valve in said communication, said chamber and reservoir being in substantially the same horizontal plane so that liquid fuel may stand in hydrostatic balance between them, a fuel inlet port for said reservoir, a suction port leading from the upper part of the reservoir to the suction air passage, and a float operated valve in the reservoir adapted to close said suction port when the liquid reaches a pre-determined level in the reservoir.

In witness that I claim the foregoing I have hereunto subscribed my name this 22nd day of January, 1917.

CHARLES L. STOKES.

Witnesses:

ALBERT E. PARKER,

WINIFRED LAWRENCE.