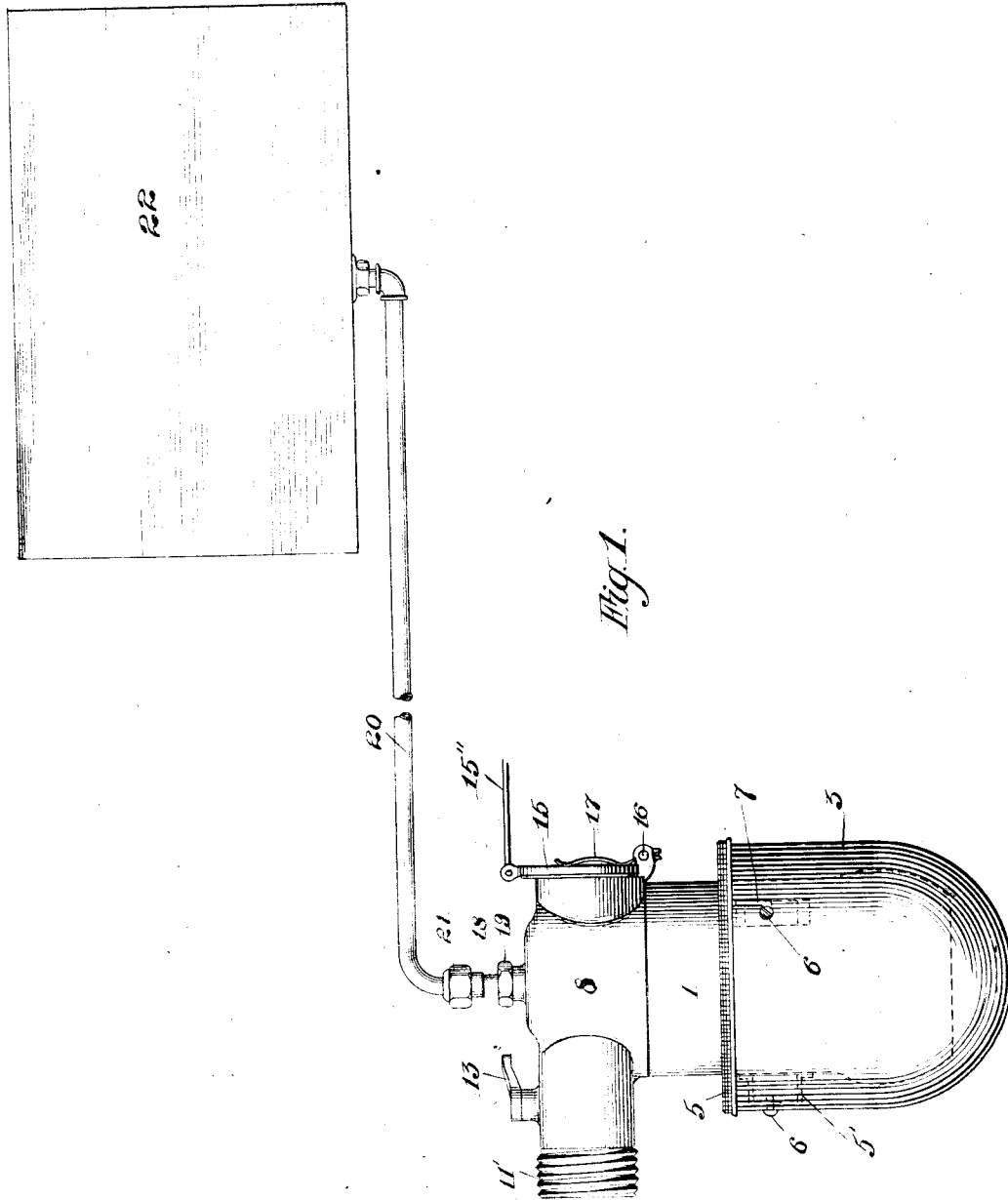


W. J. CANDLISH.
CARBURETER.
APPLICATION FILED MAR. 6, 1908.

Patented Apr. 8, 1913.

4 SHEETS-SHEET 1.

1,058,407.



Witnesses:
All. Nelson
John R. Ferguson

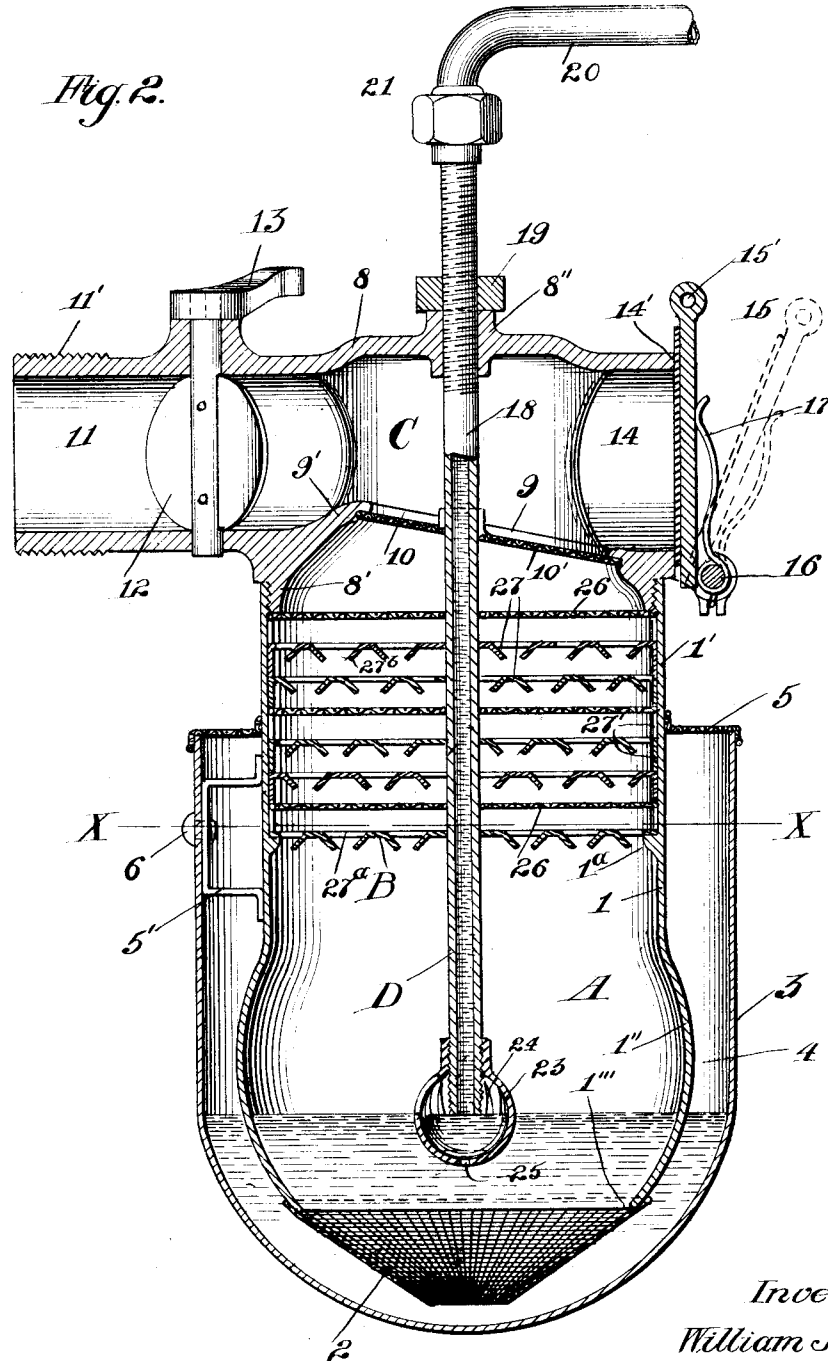
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APPLICATION FILED MAR. 6, 1908.

1,058,407.

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4 SHEETS-SHEET 2



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4 SHEETS—SHEET 3.

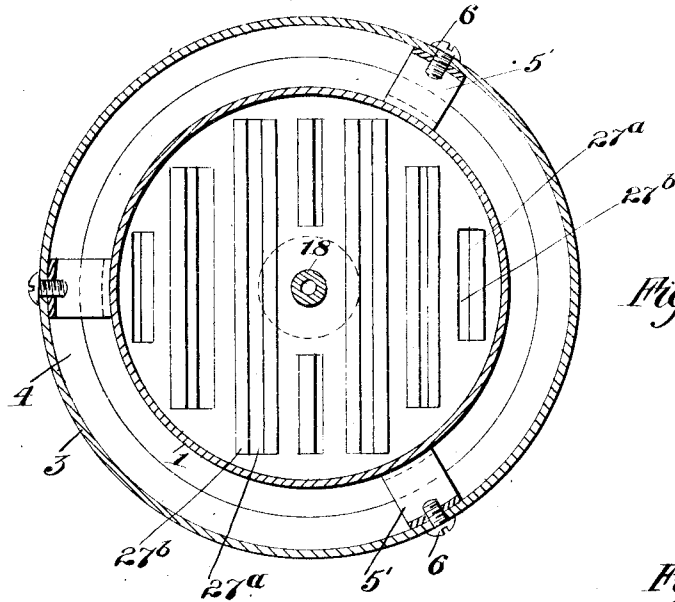


Fig. 3.

Fig. 4.

Fig. 6.

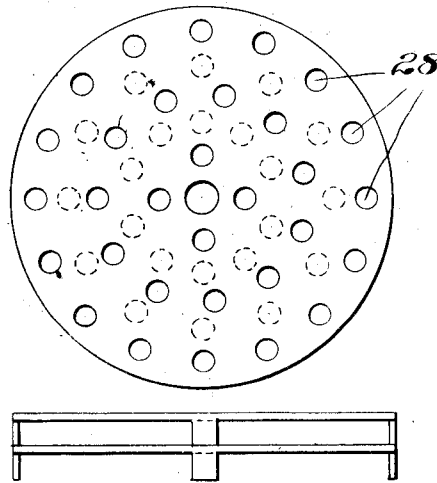


Fig. 5.

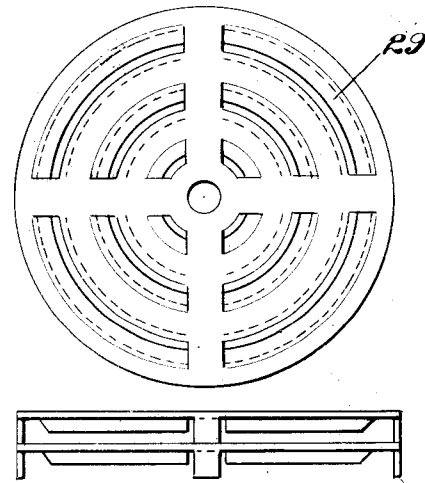


Fig. 7.

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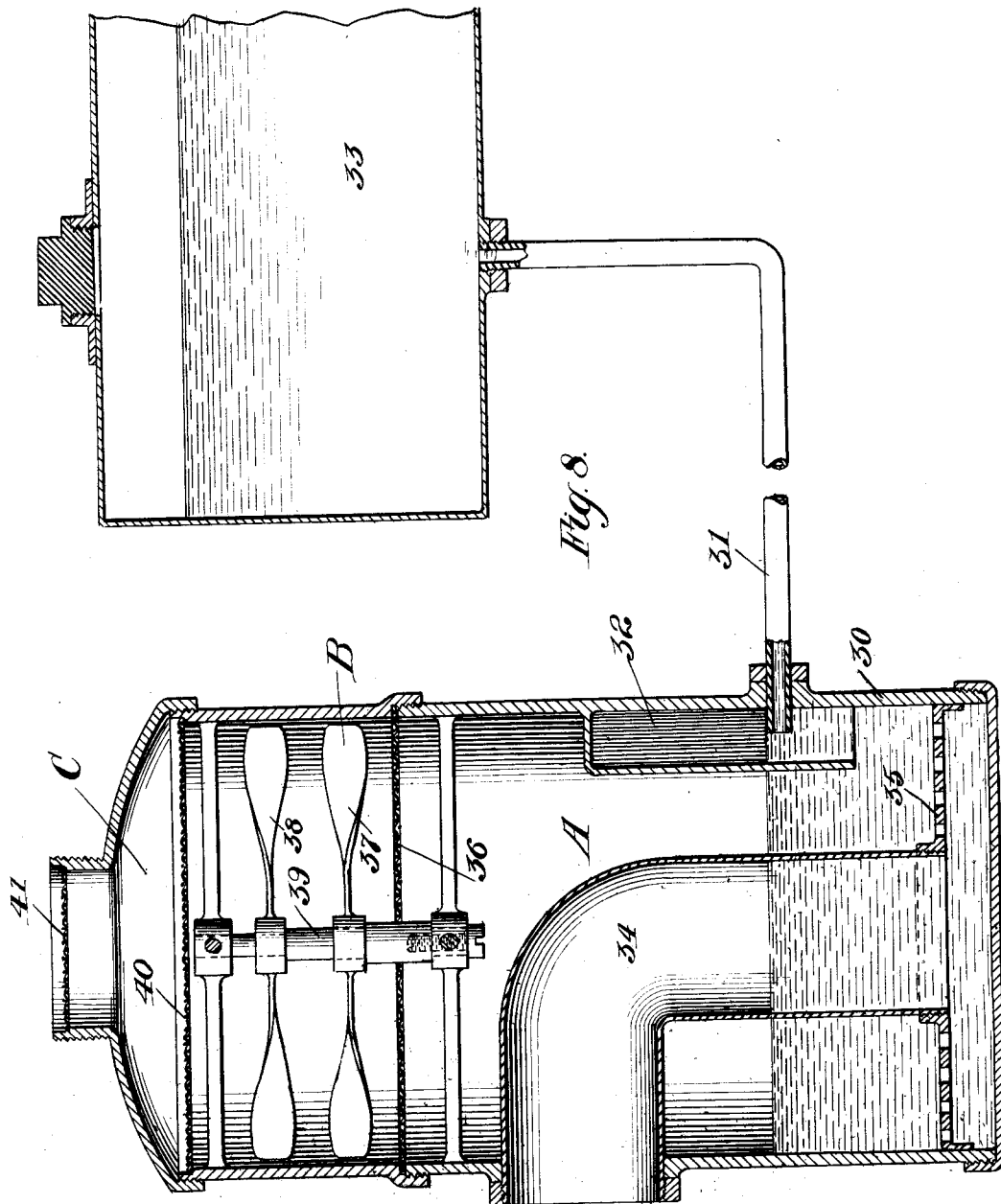
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W. J. CANDLISH.
CARBURETER.
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Patented Apr. 8, 1913.

4 SHEETS-SHEET 4.

1,058,407.



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UNITED STATES PATENT OFFICE.

WILLIAM J. CANDLISH, OF CHICAGO, ILLINOIS.

CARBURETER.

Specification of Letters Patent.

Patented Apr. 8, 1913.

1,058,407.

Application filed March 6, 1908. Serial No. 419,497.

To all whom it may concern:

Be it known that I, WILLIAM J. CANDLISH, a citizen of the United States, and resident of Chicago, Cook county, Illinois, have invented a certain new and Improved Carbureter, of which the following is a specification.

My invention relates to improved means for carbureting air and forming an explosive mixture for hydro-carbon explosion and internal combustion engines, commonly known as gas or gasoline engines. The quantity of explosive mixture required by such an engine varies with the speed of the engine and to accomplish the best results the mixture must be the same throughout the entire range of speed variation. In the case of the carbureters that are now in general use, an air pipe or duct is connected to the intake port or ports of the engine and, by means differing slightly in different devices, a small jet or spray of gasoline is injected into the passage at the moment that air is drawn through it by the down or suction stroke of the engine piston. Except in carbureters which have automatic auxiliary air inlet valves, which allow the freer entrance of air as the engine speed increases; and to a great extent, even in such, the proportions of liquid and air are changed by every speed variation, so that the engine yields its maximum efficiency at only one speed; that for which the carbureter is adjusted. The reason for this is that the liquid is less responsive to vacuum variations in the admission or mixture duct than is the air. Other objections to the carbureters of the present day are incident to the use of various valves and adjusting devices which often fail to work as intended.

The primary object of my invention is to provide a carbureter for gas engines which shall reliably and automatically supply a constant mixture, of unvarying quality, at all times, notwithstanding sudden and marked changes of engine speed.

Another object of the invention is to dispense with or avoid the use of the several movable and adjustable parts and valves now so commonly met with in the make up of carbureters, and the disorder of any one of which, prevents the proper working of the engine.

Still further objects of the invention will appear hereinafter.

My invention consists, generally, in a con-

tainer or chamber wherein the mixture is made, in combination with means for maintaining a substantially constant body of liquid in said chamber, an air duct or ducts for directing many small streams of air into the body of liquid to be carbureted thereby, and an outlet chamber or duct communicating with the container for carrying away the carbureted air or mixture.

The invention also consists in various novel constructions, arrangements and combinations of parts all as hereinafter described and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying drawings forming a part of this specification and in which;

Figure 1 is a side elevation of a carbureter embodying my invention; Fig. 2 is an enlarged vertical section of the carbureter shown in Fig. 1. Fig. 3 is a horizontal section on the line $x-x$ of Fig. 2; Figs. 4 and 5 are plan and edge views of mechanical mixers or disks of a modified form; Figs. 6 and 7 illustrate still another form of the mixers; and Fig. 8 illustrates a modified form of the carbureter.

As shown in the drawings, my carbureter in its preferred form comprises four principal portions, namely, the main chamber, A, in which the air is charged with hydrocarbon vapor; the mechanical mixer, B, preferably located in the main chamber, an outlet chamber, C, and means, D, for feeding hydrocarbon liquid to the main chamber, in such manner as to maintain the liquid level therein. These principal features or portions of the carbureter persist or appear in all of the forms in which my invention may be most advantageously embodied, of which only two are shown herein.

My carbureter is particularly designed for furnishing explosive mixture to gasoline engines and while the carbureter is adapted for use with various readily vaporizable hydrocarbon liquids, including alcohol, its chief use at the present time is in connection with gasoline engines, and in describing the carbureter, such use will be chiefly referred to. The chamber, A, as herein shown contains a body of gasoline and is provided with an air admission duct or ducts which communicate with the interior of the chamber through a great number of small openings or ducts, in which the main stream of

air is broken up or subdivided into many small streams. These small streams of air rise or bubble upward through the body of liquid and the air in passing through the liquid is saturated with gasoline. An advantage, which is at once evident, is that as the air will take up only a given quantity of the liquid and becomes saturated at the instant of contact with the liquid, the degree of saturation is but slightly, if at all, altered by variations in the velocity of the air, due to changes in the speed of the engine. Therefore my carbureter works with substantially constant effectiveness at all speeds of the engine to which it is attached. At times when the engine is operating at high speeds and the velocity of the air which forces its way through the liquid is great, in proportion to the body of liquid, the liquid is thrown into violent ebullition. The mechanical mixer, B, whatever its form, constitutes an obstruction between the main chamber, A, and the outlet chamber, C. The many currents or streams of liquid laden air are broken up and mixed together in passing through the mixer, B. In this manner the mixture is made homogeneous or uniform throughout. The mixer also serves to intercept the small quantities of liquid not taken up by the air and return them to the main body of liquid. The outlet chamber, C, receives the mixture which rises from the mixer and is connected with the inlet port or ports of the engine. Various devices may be employed for maintaining the body of liquid in the main chamber, but as one of the objects of my invention is to avoid the employment of moving parts and valves, I prefer to use for the purpose, a simple pipe, D, which opens near the bottom of the main chamber. This pipe is connected with an air tight reservoir arranged above the carbureter. Liquid will flow from the reservoir only when air is admitted to the reservoir through the pipe, D, hence liquid will be added to the body of liquid in the carbureter, only when the level of the latter falls below the end of the pipe, D. As soon as the liquid rises above the open end of the pipe further entrance of air thereto is obstructed and the flow ceases. The liquid feeding device thus provided is entirely automatic in its action and through its employment, I am able to dispense with the usual float and float valve, the disadvantages of which are well known.

Having now described in a general way the nature and operation of my carbureter, reference will be made to the details of that form thereof shown in Figs. 1 to 7. As therein shown; 1, represents the main wall of the mixing chamber. The upper portion, 1', of the chamber is cylindrical; the lower portion, 1'', is preferably globular or spherical in form and contains an opening, 1''', at

the bottom. This opening is partially closed by a screen or gauze netting, 2, which provides the large number of small perforations or ducts, hitherto referred to. The main chamber is inclosed by a cup, 3, the bottom of which is preferably hemispherical in form. The cup extends well up upon the sides of the main chamber and the different diameters of the two parts provide an annular duct, 4. The top of the cup is closed by an insect or dust excluding screen, 5, but otherwise is open to atmosphere. The area of the duct, 4, preferably equals the total area of the perforations or small ducts in the screen, 2. The cup, 3, is supported by brackets, 5', on the side of the part, 1, together with screws, 6, which pass through bayonet slots, 7, in the cup. Upon loosening the screws and slightly turning the cup, the latter may be readily detached from the remainder of the carbureter. When so detached it serves as a temporary container for gasoline. The screen remains on the body of the carbureter at such times, being supported by the brackets, 5', thereon; its loss is thus prevented. The parts thus far described constitute the main chamber hereinbefore alluded to. The outlet chamber, C, is contained within the casing, 8, and has a floor, 9, which contains the opening 10. An outlet duct, 11, contains a throttle valve, 12, the operation of which by means of the lever or arm, 13, is well understood. A duct, 14, is formed in the casing, 8, diametrically opposite the duct, 11, and is closed by a valve or leaf, 15, hinged at 16. A light spring, 17, serves to hold the valve against the seat, 14', formed by finishing the end of the portion, 14. The valve is provided with an eye, 15', to which an operating rod, 15'', may be connected, as shown in Fig. 1. The lower part of the casing is provided with a shouldered extension, 8' upon which the body part, 1, is secured by threads or other convenient means, as indicated in Fig. 2. The upper part, 8, of the carbureter is connected with the admission or intake pipe of the engine (not shown) in the usual way, the outlet duct, 11, being provided with usual threads, 11', for the purpose. It will be noted that the floor, 9, is inclined toward the valve, 15, and that the part thereof adjacent to the duct, 11, is raised to form the inclined shoulder or deflector, 9'. The opening, 10, contains the gauze or screen, 10'. The upper portion of the casing, 8, contains a central boss, 8'', which is threaded to receive the pipe, 18, which is the principal member of the liquid feeding device, D. The pipe is adjustable in the boss, 8'', and after being adjusted is secured by the lock nut, 19. 20 represents the liquid pipe joined to the pipe, 18, by a union connection, 21, and arranged to conduct liquid from the air tight reservoir or tank, 22, (see Fig. 1). The pipe de-

scends into the chamber, A, and is concentric therewith. Its lower end is open and preferably extends slightly below the center of the spherical portion of the liquid chamber. As before stated the up-draft of air through the liquid violently agitates the latter and to preserve a quiet zone at the lower end of the feed pipe, 18, I preferably equip the same with a hollow ball or sphere, 23, having a plurality of slots, 24, in its upper part and closed in the lower part, except for a small opening, 25. The cylindrical portion of the body, 1, contains a plurality of gauze screens, 26, and a plurality of perforated disks or deflectors, 27. The lower disk rests upon a shoulder, 1^a, formed on the part, 1, and the disks are provided with depending flanges, 27', so that one rests upon the other. The disk or gauze, 26, at the top of the body is preferably held by the shoulder, 8', of the casing, 8. The disks, 27, may be of various forms. As shown in Figs. 2 and 3 each disk is provided with a plurality of slots, 27^a, formed by cutting and bending down portions of the sheet. The bent down portions, 27^b, form deflectors. The slots in the superimposed disk in each case are alternated or staggered with reference to the openings in the disk below. In this manner a tortuous passage is provided between the lower and the upper parts of the main chamber. In lieu of the disks, 27, shown in Figs. 2 and 3, I may employ a plurality of disks containing a large number of round holes, 28, as shown in Figs. 4 and 5; or such as contain curved slots and deflectors, 29, as illustrated in Figs. 6 and 7. Whatever the form of the disks, the sum of the areas of the openings therein approximates and preferably exceeds the area of the opening at the lower end of the chamber.

The operation of the carbureter shown in Figs. 1 to 7 is as follows: The carbureter is connected with the intake duct and port of the engine. The admission valve of the engine opens at the moment that the piston starts its down stroke and the latter operating in the cylinder creates a vacuum in the duct and hence in the carbureter connected therewith. This causes air to pass down through the annular duct, 4, of the carbureter. When the engine is not in operation the whole lower part of the carbureter fills with gasoline, as shown in Fig. 2, but at other times the pressure of the air upon the liquid in the duct, 4, forces the liquid down and inwardly and the air passes up through the screen, 2, divided into many small streams as it passes through the multiplicity of openings or ducts and which streams find their way upward through the body of gasoline in the mixing chamber. The bubbles of air are thoroughly carbureted through contact with the liquid and the carbureted air rises into the upper part

of the carbureting chamber. At this point the streams of air encounter the obstructions offered by the several parts of the mixer, B, and in passing through the mixer the air is robbed of such portions of liquid as may have been elevated thereby and have not been vaporized and the process of admixing the air and vapor is completed. The particles or globules of liquid that are arrested by the disks and screens, 26 and 27, fall back into the lower part of the chamber, though a portion of the liquid is doubtless taken up by the air not already fully saturated at the time it reaches the mixer. From the upper part of the chamber the explosive mixture passes through the screen, 10', and into the outlet chamber, C, whence it is drawn off through the duct, 11, by the suction of the engine as explained. The quantity of mixture admitted to the engine is controlled by means of the throttle valve, 12. In event of a premature or back explosion in the admission duct of the engine, the ignited and expanding gases drive back through the duct and force open the relief valve, 15, thus finding an immediate escape to the atmosphere. The screen or gauze, 10, prevents communication of the flame to the body of gas in the lower part of the carbureter and this action of the screen is assisted by the deflector, 9', which tends to divert the stream of flame into the upper part of the chamber, C, and away from the opening, 10. The flow of gas or mixture from the carbureter may be interrupted at any time by opening the valve, 15, and thus admitting air directly to the chamber, C, and short circuiting the carbureter. This is of use in clearing the cylinders by admitting currents of fresh air thereto. The valve, 15, may also be employed for admitting a small quantity of air at times when it is desired to lessen or dilute the richness of the mixture. Evaporation of the liquid in the carbureter proceeds rapidly during the operation above described and within a short space of time the level of the liquid falls below the lower end of the pipe, 18. Immediately a bubble of air will start through the pipe toward the closed reservoir and a drop of gasoline will fall or flow from the pipe. Succeeding bubbles liberate further quantities of liquid and in this manner the liquid level is restored, such action being repeated automatically as long as any liquid remains in the tank or reservoir. The small inclosure or globe at the lower end of the liquid pipe, as shown, contains a small quantity of the liquid and the level therein is at all times the same as the mean level in the surrounding chamber. The advantage of the closure is that the liquid directly at the mouth of the pipe is kept substantially quiescent and this results in the more uniform feeding of

the liquid, than would be the case if the closure was not used. The pipe, D, being threaded in the part, 8 is vertically adjustable and by raising or lowering it, the depth of the body of liquid in the carbureter may be varied at will. It will be noted that the slopping or lateral agitation of the body of liquid in the carbureter is minimized by the spherical form of the latter and further by the cone, 2, which breaks up and prevents the swaying of the liquid in the chamber. When only a small volume of air is passing through the carbureter, the liquid will not be wholly displaced from the air inlet duct, 4, but when the engine is operating at high speed and the throttle is fully open, the body of liquid is driven upward in the carbureting chamber by atmospheric pressure. The parts are so proportioned that the maximum force of the stream of air is less than the weight of the liquid and the overcharging of the air is thus prevented.

In Fig. 8 of the drawings, I have illustrated my invention in modified form. My purpose in so doing, being to show that the invention is not limited to a precise or specific construction or assemblage of parts. In Fig. 8 the liquid chamber, 30, is supplied with liquid from a pipe, 31, which leads into a pocket or bell, 32, within the chamber, 30. Air enters the pipe, 31, and flows thence to the air tight tank, 33, in the same manner as before described and the liquid ceases to flow from pipe, 31, as soon as the level of liquid in the container rises above the open end of the pipe. The air is admitted to the chamber, 30, through the intake pipe or duct, 34, and passing to the bottom of the chamber, flows upwardly through the perforated false bottom, 35, therein. The carbureted air on rising into the upper part of the chamber encounters the screen, 36, and above this are the oppositely rotating blades, 37 and 38. These are journaled on the upright shaft, 39, and being propelled by the upward moving currents rotate at high speed. The liquid laden air upon striking the blades is further broken up and rendered homogeneous. Screens, 40 and 41, partially close the upper end of the carbureter fulfilling the offices of mixing devices and also preventing the back firing of the mixture within the carbureter.

As various modifications of my invention will readily suggest themselves to one skilled in the art, I do not confine the invention to the specific structures herein shown and described.

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

1. A carbureter comprising a carbureting chamber wherein the mixture is made, in combination with means for supplying the

carbureting liquid to the chamber, an air duct for directing many small streams of air into the body of the liquid in the chamber to be carbureted thereby, an outlet duct or chamber to receive the mixture from the carbureting chamber, an inclined floor, containing an opening, interposed between said carbureting chamber and outlet duct and forming a deflecting shoulder adjacent the outlet duct, and a perforated screen arranged in the opening thereof, as and for the purpose specified.

2. A carbureter comprising a carbureting chamber, in combination with means for supplying the carbureting liquid to the chamber, an air duct above said chamber for admitting air thereto to be carbureted by passage through the liquid therein, a mixer in the upper portion of said chamber and an outlet chamber or duct to receive the mixture from said mixer, an open floor or ledge inclined in the manner to make the highest portion adjacent the outlet duct, to form therewith a combined baffle for intercepting the liquid laden air, and a deflector for back fire, and a screen arranged in the opening of the inclined floor, as and for the purpose specified.

3. A carbureter comprising a carbureting chamber, in combination with means for supplying carbureting liquid to the chamber, a plurality of air ducts in said liquid chamber for directing many streams of air into the body of liquid therein, an outlet duct or chamber to receive the mixture from the carbureting chamber and a relief valve in said outlet chamber or duct being adapted for use as an auxiliary air valve, substantially as described.

4. A carbureter comprising a carbureting chamber, in combination with means for supplying liquid thereto, means for directing streams of air into said body of liquid to be carbureted thereby, an outlet duct or chamber to receive the mixture from the carbureting chamber, a plurality of mixing elements having screen members alternately interposed for preventing the passage of liquid therethrough, a screen or gauze interposed between said chamber and said outlet, and a relief valve in said outlet duct or chamber, said relief valve being operable as an auxiliary air valve, substantially as described.

5. A carbureter comprising a carbureting chamber, in combination with means for supplying liquid thereto, means for directing a plurality of streams of air into said body of liquid, an outlet duct or chamber to receive the mixture from said carbureting chamber, and an obstruction or mixer interposed between said chambers, a relief valve in the outlet duct or chamber operable also as an auxiliary air valve, substantially as described.

6. A carbureter comprising a carbureting chamber having a perforated bottom and an air duct communicating therewith, the lower part of said chamber being spherical, in combination with a liquid supply pipe concentric with said chamber and open at its lower end, an outlet duct leading from the upper part of said chamber, and a receptacle disposed concentrically outside of and spaced from the spherical part of said chamber to form an air intake duct and to prevent lateral agitation of the liquid, substantially as described.

7. A carbureter comprising a carbureting chamber the lower part of which is spherical and having a perforated bottom, and an air intake duct disposed concentrically outside of said spherical part and communicating with said perforated bottom to prevent lateral agitation of the liquid, in combination with a liquid supply pipe concentric with said chamber and open at its lower end, an outlet duct leading from the upper part of said chamber and a mixer interposed between said chamber and outlet duct, substantially as described.

8. A carbureter comprising a carbureting chamber having a perforated bottom, and a cup open at the top but inclosing the bottom of said chamber, forming therewith an air duct communicating therewith, a liquid supply pipe arranged in said chamber and open at its lower end, a plurality of perforated members and mixing elements arranged in

the upper part of said chamber and constituting a mixer, and an outlet duct or chamber communicating with the upper part of the mixing chamber, substantially as described.

9. A carbureter comprising a carbureting chamber having a perforated bottom and provided with an air duct communicating therewith, in combination with a liquid supply pipe connected with said chamber, a horizontal outlet duct at the top of said carbureting chamber, a relief valve therein, said duct having a floor inclined toward said valve and containing an opening for communication between said chamber and duct and gauze in said opening, as and for the purpose specified.

10. A carbureter comprising, in combination, a carbureting chamber adapted to contain a body of liquid, means for directing a plurality of streams of air into the body of liquid, an outlet duct leading from the top of said chamber, a liquid supply pipe arranged in said chamber and open at its lower end and a perforated closure inclosing the end of the pipe, substantially as and for the purpose specified.

In testimony whereof, I have hereunto set my hand, this 4th day of March, 1908, in the presence of two subscribing witnesses.

WILLIAM J. CANDLISH.

Witnesses:

A. W. NELSON,
JOHN R. LEFEVRE.