T. F. McGUIRE.

CARBURETER.

APPLICATION FILED MAR. 26, 1913.

1,100,679.

Patented June 16, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

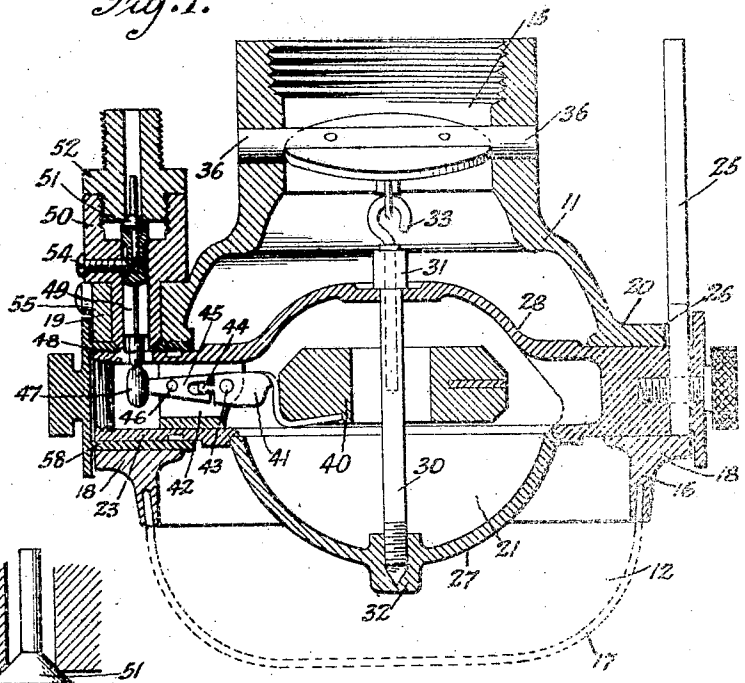


Fig. 3

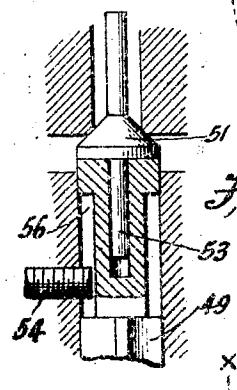
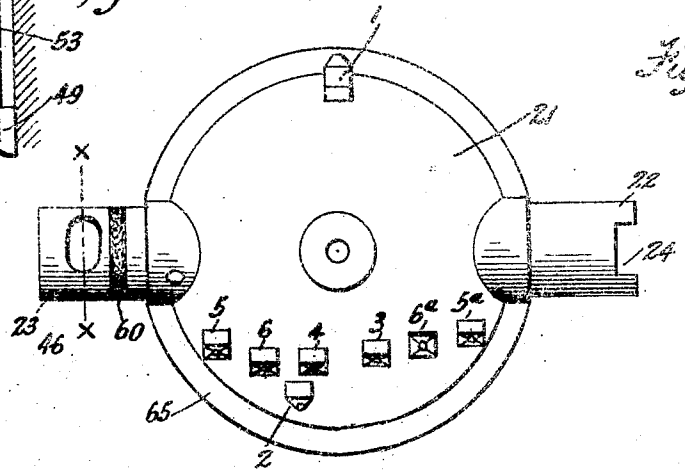


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4.

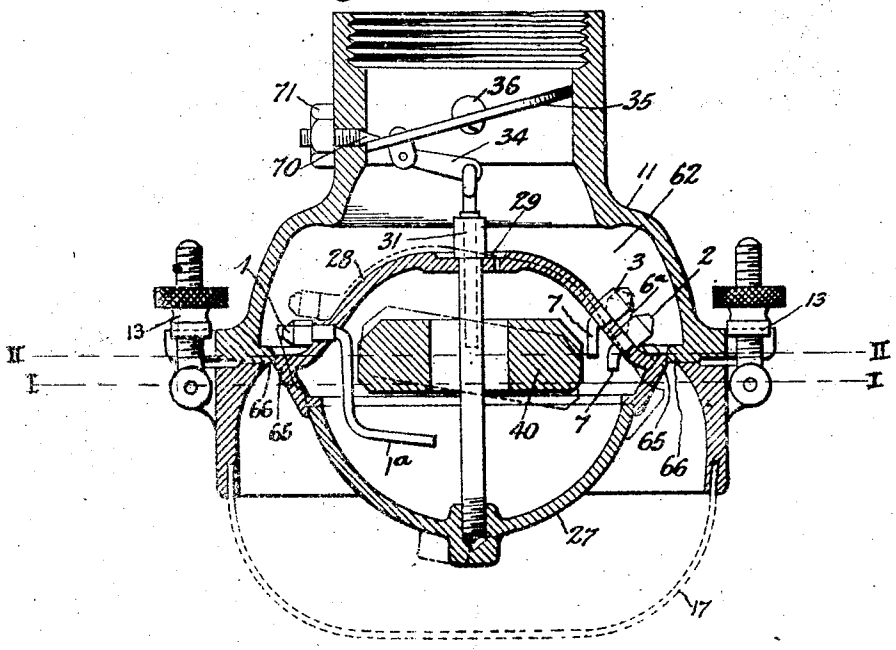


Fig. 8.

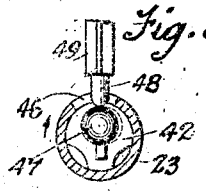


Fig. 5.

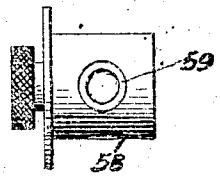


Fig. 6.

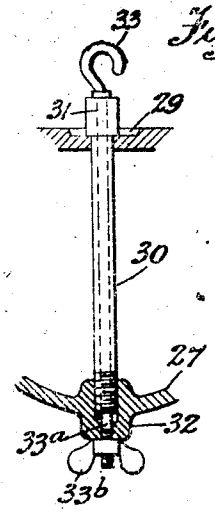
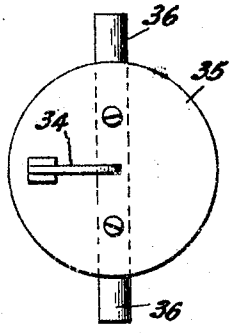


Fig. 7.



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CARBURETER.

1,100,679. Specification of Letters Patent. Patented June 16, 1914.

Application filed March 26, 1913. Serial No. 756,882.

To all whom it may concern:

Be it known that I, THOMAS F. McGUIRE, a citizen of the United States, and residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Carbureters for Hydrocarbon-Engines, of which the following is a full and clear specification, illustrated in the accompanying drawings, the novel features of my invention being more fully pointed out in the annexed claims.

My invention relates in general to carbureters for mixing liquid fuel with air to produce a combustible mixture for use in hydrocarbon engines.

In particular my invention relates to the type of carbureters in which with the increased admission of mixture to the engine the air supply and fuel supply is increased in such proportion that the mixture admitted to the engine always is made of such quality as the engine requires at the particular speed and power intended by such increased admission of mixture.

In particular my invention relates also to the form of carbureters illustrated in a copending application of Elmer S. Smith for carbureters, Serial No. 626,678, filed May 12th, 1911, my invention being an improvement on the form illustrated therein.

The object of my improvement is to make the fuel supply through the jets which are mounted on the rotatable gasolene container, dependent on the operation of the engine, that is to say, to cause the jets to yield fuel only when the engine is running, contrary to the arrangement in the aforesaid application where the jets yield the fuel so long as they are submerged below the gasolene level in the container. The result of my improved construction is that I am able to leave the fuel container tilted in any angular position between the closed and full open position, even after the engine has stopped, without thereby spilling fuel.

My improvements also comprise other constructive features of this type of carbureter, which are set forth more detailed hereinafter.

In the accompanying drawing, Figure 1 is a vertical sectional elevation of the carbureter taken on the axis of rotation of the fuel receptacle. Fig. 2 is a plan view of the fuel receptacle. Fig. 3 is a detailed sectional elevation in larger scale of the fuel admission valve shown in Fig. 1. Fig. 4 is a longitudinal vertical section taken at right angles to the section shown in Fig. 1. Fig. 5 is a detailed illustration of the sleeve which is placed over one of the trunnions of the fuel receptacle. Fig. 6 is a modified form of connecting the fuel container with the throttle valve. Fig. 7 is a bottom view of the throttle valve, and Fig. 8 is a sectional view of trunnion 23 on the line X—X in Fig. 2.

Referring firstly to Figs. 1 and 4 which show the general outline of the carbureter, 11 and 12 are substantially semi-spherical shells, which are fastened together by hinge bolts 13 as shown in Fig. 4. The upper shell which is more closely semi-spherical than the lower shell is provided at its upper portion with the mixture outlet 15, whereas the lower shell 12 is formed by a substantially cylindrical rim 16, which is attached to the upper shell by hinge bolts 13, as previously mentioned, and which has attached to its open end a screen 17 forming the air inlet of the shell. The upper and lower shells are provided at their abutting surfaces with diametrically oppositely arranged trunnion bearings, each of the shells having one half of the bearing integral with it, which when the shells are assembled, registers with the corresponding half of the other shell. In Fig. 1 the trunnion bearings integral with the lower shell are shown at 18, and those integral with the upper shell 11 are shown at 19 and 20. In these bearings is journaled the fuel receptacle 21 by means of trunnions 22 and 23, trunnion 22 being located in the bearing 18—20 and being provided with a transverse slot 24, in which a lever 25 is suitably fastened, the upper half 20 of the trunnion bearing being cut out as shown at 26 in Fig. 1 to permit arm 25 to pass to the outside. The cut out 26 has sufficient angular extension in the wall of the bearing to permit lever 25 to rock through a certain angle, and it thereby serves simultaneously as a limiting stop which determines the angle through which the receptacle can be tilted from the normal position.

The fuel receptacle 21 is of the following construction: As will be noted from Figs. 1 and 4 it consists of two halves joined in a horizontal plane, the lower half 27 being a substantially perfect semi-phere, whereas the upper half 28 is cone shaped with a flat top

and a small recess 29 in the top. The two halves are joined together by means of a screw bolt 30 which rests with its shoulder 31 in recess 29 of the upper half of the receptacle, and which is threaded at its lower end into a central boss 32, provided on the lower portion of bolt 27. As shown in Figs. 1 and 4 bolt 30 is hollow part way from the top to receive the shank of a hook 33 which is connected to a link 34 of throttle valve 35, which is pivoted at 36 in the walls of the mixture outlet 15 of the upper shell. Thus when the receptacle, as shown in Fig. 4, is rotated clockwise, throttle valve 35 is correspondingly opened according to the angle through which the receptacle is rotated.

Inside of the fuel receptacle is located a float 40 which is attached to a float arm 41, which arm in turn is pivoted at 43 in a suitable support 42 located in the hollow trunnion 23. The free end of float arm 41 is comparatively short and terminates in a rounded knob 44, which engages in the forked portion of a second lever 45, likewise pivoted in support 42, as shown at 46. The free end of lever 45 extends close to the outer end of trunnion 23 where it registers with a transverse slot 46, provided in the upper portion of cylindrical trunnion wall, and this free end of lever 45 is provided with a cam 47, as shown in Fig. 1. This cam coöperates with the lower end 48 of fuel admission valve 49 of the usual type employed in carbureters. This valve consists of the main shank 49 which is preferably triangular shaped so that it permits the fuel to pass between its flat sides and the cylindrical wall of the valve housing 50, and its upper portion carries a valve cone 51 loosely attached to it, the cone being seated against the boring of a nipple threaded into valve housing 50. The valve cone and the valve shank are shown in larger scale in Fig. 3. From this detail illustration it will be noted that the cone has a downwardly extending pin 53, which is located in a small boring of valve shank 49, and the boring is preferably dimensioned so that the pin 53 has a few thousandths of an inch lateral play in it, so that the proper seating of cone 51 against its seat is insured even if the longitudinal axes of nipple 52 and of valve housing 50 should not be exactly in alinement. Valve housing 50 is set into a boring provided in the upper shell 11 of the carbureter and it extends through to the trunnion 23 so that its interior forms a communication with the transverse slot 46 provided in the trunnion as previously described. The valve housing 50 is held in place by means of a set screw 55. In order to prevent the valve shank 49 from dropping out of the housing after the latter is removed from its seat in shell 11, I provide the valve shank near its upper end with a wide circular groove 56, as shown in Fig. 3, into which a screw 54 threaded into valve housing 50 protrudes, whereby the dropping out of shank 49 is prevented. By the lever connection of the float with cam 47 I obtain the effect that when the float 40 drops also cam 47 drops and permits fuel valve 51 falling from its seat so that fuel can enter from nipple 52 through the valve housing 50, and through the hollow trunnion 23 into the fuel receptacle 21. When the latter is filled to the desired height, for instance to the level I—I Fig. 4, the float has risen again to a point where it has lifted cam 47 sufficiently to press the latter against foot 48 of the fuel valve, whereby the valve is raised and pressed against its seat as previously described. As shown in Fig. 8 and also in Fig. 1 the foot 48 of the fuel valve rests on top of the cam 47 when the receptacle is in normal position, as shown in Fig. 1, that is to say, in the position in which the throttle is closed and the air supply cut off, as will be described presently hereinafter. If now the receptacle is rotated clockwise, as shown by the arrow in Fig. 8, cam 47 whose center is located above the axis of rotation of trunnion 23, moves to the right, so that the foot 48 of valve 49 slides down on the left hand side of the cam and thereby opens the valve and admits more fuel, so that the fuel level in the receptacle is raised from I—I to II—II, as shown in Fig. 4. The purpose of this expedient will be described hereinafter.

In order to secure a tight joint between trunnion 23 and its bearing, so that leakage of fuel is prevented thereby, I have provided the following means: Trunnion 23 is not directly journaled in the trunnion bearings 18—19, but it is journaled in the sleeve 58, see Figs. 1 and 5, which is closed at its outer end as shown. Trunnion 23 is provided with a groove located between opening 46 and the receptacle body, which contains preferably a felt ring 60 which is slightly compressed when sleeve 58 is slipped over trunnion 23 and thereby forms a sufficiently tight joint against small leakage of fuel, without producing undue friction between the trunnion and the sleeve when the former rotates. Sleeve 58 is provided with a conical boring 59 in which the lower portion of the fuel valve casing 50 seats, as shown in Fig. 1, and which boring also registers with slot 46 provided in the trunnion, so that the fuel can pass unobstructed from the valve casing into the trunnion. By these means I am enabled to tighten the two shells 11 and 12, which form the body of the carbureter, tightly together by means of the hinge bolts, as previously described, without thereby disturbing the fuel tight fitting between trunnion 23 and its bearings. Of course, it must be understood that the normal fuel level in the recep-

tacle is always below the point at which fuel might be spilled through slot 46 when the receptacle is tilted into its extreme angular position, but if sleeve 58 were not provided a considerable leakage between the two halves of the trunnion bearings and trunnion 23 through capillary attraction would occur, since obviously the trunnion cannot be fitted so tight in the two bearing halves to form a fuel tight joint and still permit free rotation of the receptacle, moreover sleeve 58 effectively protects the bearing surface of the trunnion against dust and dirt.

The upper half 28 of the fuel receptacle is provided adjacent to the plane at which it joins the lower half with a rim 65, which is of sufficient diameter to fit with its upper edge into a corresponding rim 66, provided in the upper shell 11, as will be clearly seen from Fig. 4. Adjacent to and above this rim are provided a suitable number of fuel nozzles 2 to 6 which are suitably fastened in the receptacle wall, for instance by threading as shown, and which are provided with a small boring which leads to the inside of the receptacle. These nozzles are distributed over a certain zone adjacent to rim 65, as shown in plan view in Fig. 2, the center of the zone being located substantially in the central vertical plane through the receptacle at right angles to the trunnion axis on which the section through the receptacle shown in Fig. 4 is taken. As will be noted from Fig. 2 this zone extends on either side of said plane circumferentially a suitable distance toward the trunnions, and also as shown in Fig. 4, to a certain height above the fuel level I—I. In the structure of the fuel receptacle illustrated in aforesaid application the nozzles which are similarly arranged in the receptacle wall communicate directly with the interior of the receptacle, such as is for instance indicated in the present drawings with respect to the fuel nozzle 6^a in Fig. 4, which is shown in dotted lines. Another nozzle 5^a Fig. 2 likewise terminates directly in the inner wall of the receptacle, but this nozzle cannot be seen in Fig. 4. The remaining nozzles each have a small tube 7 (Fig. 4) connected to their inner ends which points downward, as shown in this figure, and which tubes according to the position of the nozzles terminate at different heights above the normal fuel level I—I. If now for instance the fuel should be raised in the manner, as will be described hereinafter, to the level II—II, and the receptacle should be slightly tilted clockwise, as in Fig. 4, then the fuel would rise a sufficient distance to the mouth of the lowermost nozzle 2, in Fig. 4, so that when the air which can now enter into the mixing chamber 62, after the rims 65 and 66 have separated through the tilting of the receptacle, is drawn into the mixing chamber, it will strike over the nozzles and according to its velocity it will pick up fuel out of those nozzles in which the fuel stands close to the nozzle mouth. The more the receptacle is tilted clockwise the higher the fuel will rise to the mouth of the nozzles and the more nozzles will come into operation, until when the receptacle has been tilted into its extreme position the fuel stands close to the mouth of the lowermost nozzle, without however being spilled therefrom, for instance in case the engine should be stopped and the receptacle should remain in tilted position. In this case the same as in the structure described in the aforesaid application, the more the receptacle is tilted the more nozzles come into operation. For instance, referring to Fig. 2, first the nozzle 2 comes into operation then 3 and so on until all 7 nozzles are in action. In each particular instance the fuel is not poured out of the nozzles as is the case in aforesaid application, but it is drawn out by the air rushing past the nozzles substantially at right angles thereto. The nozzles are arranged relatively to each other so that they come gradually into operation according to the position of the inner ends of their tubes. In Fig. 4 it will be noted that a nozzle 1 is located in the receptacle wall diametrically opposite to the center of the zone in which the other nozzles are located, so that nozzle 1 is elevated gradually above the fuel level when the receptacle is tilted clockwise to bring the other nozzles into operation. Nozzle 1 points substantially at right angles to the direction of the axis of rotation of the receptacle and it is provided with a tube 1^a at its inner end which extends downward a considerable distance below the fuel level so that it constantly remains in the fuel, even in the extreme angular position of the receptacle. It will be also noted from Fig. 4 that the mouth of nozzle 1 is below that of the lowest nozzle of the entire group at the other side (see nozzle 2). The purpose of this nozzle 1, which I shall call hereinafter the priming nozzle, is the following: When the receptacle is only very slightly tilted, sufficiently to just separate rims 65 and 66 at the right and left hand side (Fig. 4) to admit just enough air to run the engine idle, a very small amount of fuel is necessary which can be amply supplied by one nozzle. The speed of air on the other hand is very low so that a nozzle which is intended to supply fuel in such angular position of the receptacle must have its mouth very close to the fuel level so that the fuel can be drawn out of it in sufficient amount to properly carburet the air. A nozzle thus disposed at the right hand side of the receptacle still below nozzle 2 is, however, placed below the fuel level when the recep-

tacle is tilted to its extreme angular position at wide open throttle. This would again have the disadvantage mentioned with regard to the structure shown in the above mentioned application that, when the throttle should be left wide open and the engine stopped, fuel would be spilled through this submerged nozzle. This disadvantage is overcome by placing the priming nozzle which supplies all the fuel necessary for a small amount of work, on the left hand side of the receptacle. On this side as shown in Fig. 1, with regard to nozzle 1 the rims 65 and 66 separate correspondingly in the other direction when the receptacle is tilted clockwise, and the same amount of air which is admitted at the right hand side is also admitted to the mixing chamber 62 at the left hand side. Nozzle 1 being placed sufficiently low, the low speed air current is capable of drawing out the amount of fuel required to properly carburet this air to supply the desired mixture consisting of this carbureted air and the amount of pure air then drawn through the corresponding opening at the right hand side of the receptacle.

Before further explaining the operation of the nozzles I shall once more refer to the raising of the fuel level from level I—I to II—II, which is obtained by the means (the eccentric movement of cam 47) described hereinbefore. When an engine is started it is desirable to supply an extra heavy mixture. Therefore, before the operator starts the engine it is advisable to open the throttle wide for a moment so that the receptacle is tilted into its extreme angular position in which the foot 48 of the fuel supply valve has descended on the left hand side of cam 47 (see Fig. 8), so that thereby the fuel level is raised from level I to level II. If, now the operator returns the receptacle into the normal position shown in Fig. 2, the fuel level II being close to nozzle 1, a comparatively large amount of fuel will be drawn out when the receptacle is tilted clockwise a small amount to start the engine. This fuel is rapidly consumed without being replenished by the action of the float and the float valve in the position in which the receptacle is then, on account of the float valve now resting again on top of cam 47. Therefore, with the engine running idle the fuel soon drops down to the level I at which, if the engine continues running, the float comes into action and maintains the fuel at that level.

Returning now to the description of the operation of all the nozzles when the receptacle is gradually tilted clockwise, and it being assumed now that the fuel level is again at I, as just described, nozzle 1 is gradually elevated above level I, while nozzle 2 at the other side of the receptacle together with the other nozzles of the same group is being gradually lowered to that level. When the receptacle is thus continued being tilted to admit more air to the mixing chamber, gradually less fuel can be drawn from nozzle 1 on account of its great height above the level, and by the time the amount of mixture admitted by throttle 35 requires more fuel, tube 7 of nozzle 2 has dipped into the fuel and the nozzle has been lowered close enough to the fuel level I to come gradually into action, while nozzle 1 at the other side goes out of action. The number of nozzles on the right hand side of the receptacle which come into action gradually increases, as previously described, as the receptacle is further rotated, until when for instance 2 nozzles are in full action, priming nozzle has entirely gone out of action, it being impossible for the air still rushing past the priming nozzle to draw out fuel. As the number of nozzles which come into action on the right hand side increases, foot 46 of float 49 gradually slides down the left hand side of cam 47, as previously described, so that again the fuel level is gradually raised from I to II as the number of active nozzles is increased. This furnishes more fuel to the air current than would be possible if the level remained at I, and it furnishes just the proper amount of fuel to give the desired mixture for the throttle and the receptacle position. When the receptacle is tilted into its extreme angular position, and also slightly before this occurs, it is desirable to furnish an extra amount of fuel, which can not be furnished by the nozzles already in operation, notwithstanding the fuel level being raised from I to II, because the amount of fuel which can be drawn from the nozzles at the right hand side by an air current running substantially at right angles past the nozzles is limited, and beyond a certain speed of air no more fuel is being drawn out of the nozzles, even if this speed is greatly increased beyond this point. This fact is well known. In this case the mixture would be too lean. Now in order to properly enrich the mixture I make use again of priming nozzle 1, whose tube 1ª still remains in the fuel. The fuel level having been raised from I to II since nozzle 1 went out of operation, as previously described, it has been brought that much nearer to the mouth of the nozzle which stands now high up. At such high engine speed however which causes an air current rushing at high-speed past the right hand group of nozzles to fail drawing more fuel from the latter, also produces a partial vacuum in the mixing chamber, particularly in the left hand portion thereof where nozzle 1 is then located on account of the opening for the air formed by the two rims 66 and 65 on the left hand side being small

comparatively with the opening formed by these rims on the right hand side of the receptacle. This is due to the peculiar form of the receptacle. This partial vacuum in which nozzle 1 is located causes the fuel in tube 1ª of that nozzle to rise to its mouth and emanate therefrom, when it is picked up by the air which passes through that portion of the mixing chamber and added to the otherwise lean mixture produced at the right hand side of the carbureter, so that now the mixture has again the desired quality. Thus nozzle 1 serves two purposes, first at the start in the capacity of a priming nozzle, and second in the extreme open position of the carbureter in the capacity of an auxiliary nozzle. I have found that carbureters constructed in this manner have the superior tendency to furnish a mixture of the desired quality, even at high engine speeds.

The manner in which the receptacle is connected to throttle 35, by means of the shank of hook 33 being loosely fitted in rod 30, may be also modified by attaching the hook 33 to the rod in the manner shown in Fig. 6, in which rod 30 is shown hollow throughout its whole length, with the shank 33ª extending through boss 32 of the receptacle, rod 33ª being held by means of wing nut 33ᵇ. In order to set the throttle at the smallest permissible opening any suitable means may be employed. For instance a screw 70 may be threaded into the wall of the mixture outlet against which the throttle abuts when it is closed. The farther this screw 70 is screwed into the mixture outlet the more the minimum opening of the throttle will be increased. Screw 70 may be locked by means of lock nut 71.

What I claim is:

1. In a carbureter of the character described the combination with a fuel receptacle having a plurality of means for discharging fuel therefrom, and means for throwing said discharging means consecutively into operation; of additional fuel discharge means in said receptacle wall adapted to yield a priming fuel charge while said first named discharge means are out of operation, and adapted to go out of operation as said first named means consecutively come into operation, said additional means adapted to again operate when all said first named means are in operation.

2. In a carbureter of the character described the combination with a fuel receptacle having a group of fuel discharge nozzles disposed in its wall and means for throwing said nozzles consecutively into operation; of an additional nozzle suitably disposed in the receptacle wall and adapted to yield a priming charge of fuel while said first named nozzles are out of operation, and to go itself out of operation when said first named nozzles go into operation, said additional nozzle adapted to again yield an auxiliary fuel charge when all of said first named nozzles are in operation.

3. In a carbureter of the character described the combination with a fuel receptacle having a group of fuel discharge nozzles disposed in its wall and means for throwing said nozzles consecutively into operation; of an additional nozzle suitably disposed in the receptacle wall and having a tube permanently in communication with the fuel in said receptacle, said nozzle adapted to yield a priming charge of fuel while said first named nozzles are out of operation, and to go itself out of operation when said first named nozzles go into operation, said additional nozzle adapted to again yield an auxiliary fuel charge when all of said first named nozzles are in operation.

4. In a carbureter of the character described the combination with a rotatable fuel receptacle having a group of fuel discharge nozzles disposed in its wall and adapted to consecutively yield fuel when the receptacle is rotated; of an additional nozzle suitably disposed in the receptacle wall and adapted to yield a priming charge of fuel before said receptacle is sufficiently rotated to bring said first named nozzle into operation, said additional nozzle adapted to gradually go out of operation as said first named nozzles go into operation, and adapted also to yield an auxiliary fuel charge when the receptacle is rotated into its extreme angular position when all of said first named nozzles are in operation.

5. In a carbureter of the character described the combination with a rotatable fuel receptacle having a group of fuel discharge nozzles disposed in its wall and adapted to consecutively yield fuel when the receptacle is rotated; of an additional nozzle disposed in the receptacle wall diametrically opposite from where said first named nozzles are disposed and having a tube, permanently connected with the fuel in said receptacle, said nozzle adapted to yield a priming charge of fuel before said receptacle is sufficiently rotated to bring said first named nozzles into operation, said additional nozzle adapted to gradually go out of operation as said first named nozzles go into operation and adapted also to yield an auxiliary fuel charge when the receptacle is rotated into its extreme angular position when all of said first named nozzles are in operation.

6. A carbureter of the character described having an outer shell and a rotatable fuel receptacle therein, said receptacle having trunnions on which it is journaled in said shell, one of said trunnions being hollow and having an opening in its cylindrical wall portion to admit fuel to said receptacle,

a sleeve in which said trunnion is rotatable, said sleeve being closed at its outer end and having an opening registering with said trunnion opening said trunnion having an angular groove between said wall opening and the receptacle body and packing in said groove coöperating with said sleeve to prevent leakage of fuel, said sleeve being held fixedly in said shell, and means for admitting fuel through said sleeve and said trunnion opening.

7. In a carbureter of the character described the combination with a rotatable fuel receptacle having a plurality of nozzles disposed in its wall, and means on said nozzles for consecutively connecting said nozzles with the fuel in said receptacle to operate when the latter is rotated, whereby the mouths of all of said nozzles remain above the fuel level even when the receptacle is rotated into its extreme angular position.

8. In a carbureter of the character described the combination with a rotatable fuel receptacle having a plurality of nozzles disposed in its wall, and a tube connected with the inner end of each nozzle of suitable length to consecutively connect said nozzles with the fuel in the receptacle when the latter is rotated, whereby the mouths of all of said nozzles remain above the fuel level even when the receptacle is rotated into its extreme angular position.

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Witnesses:
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