W. H. C. HIGGINS, Jr.

CARBURETER.

APPLICATION FILED APR. 1, 1912.

1,154,630.

Patented Sept. 28, 1915.

3 SHEETS—SHEET 1.

Fig. 4.

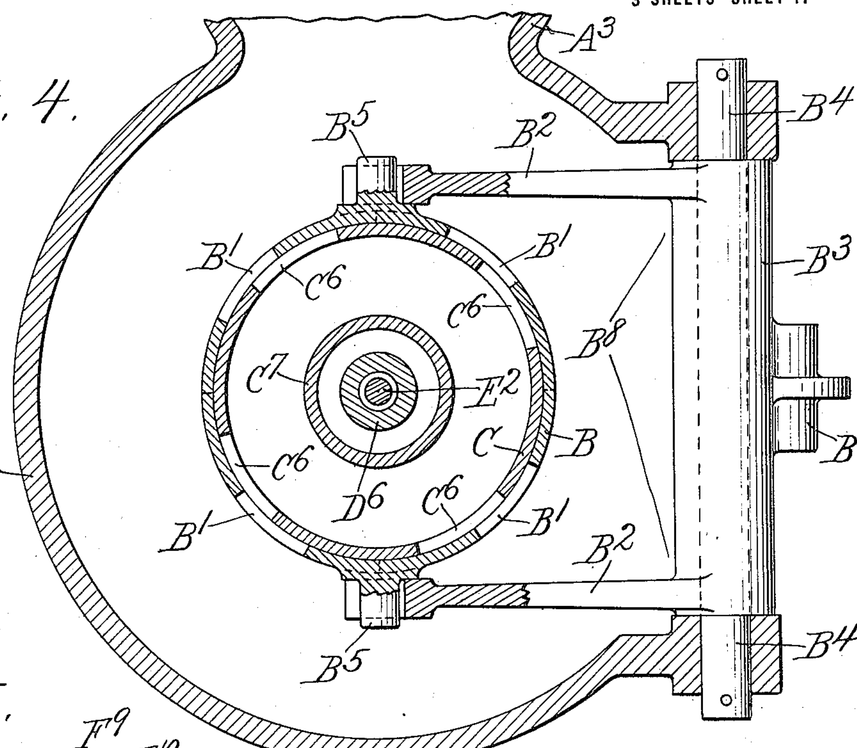


Fig. 5.

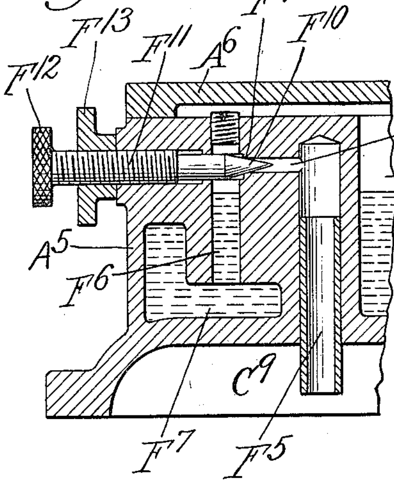
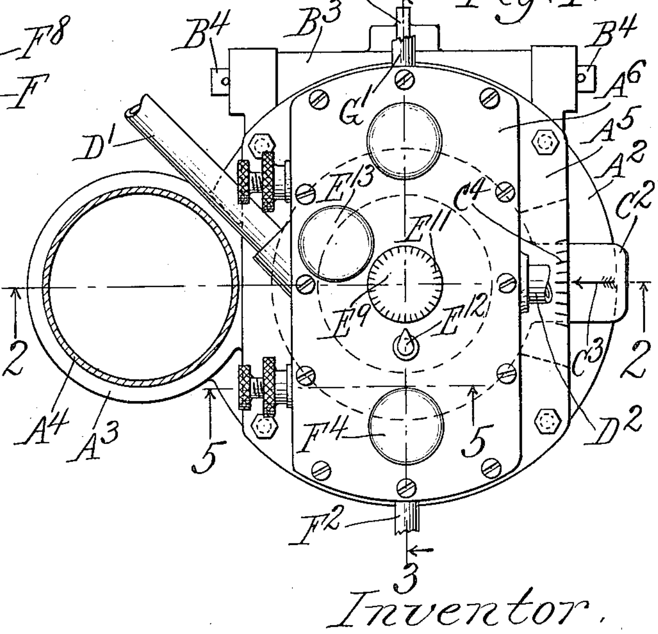


Fig. 1.



Witnesses.

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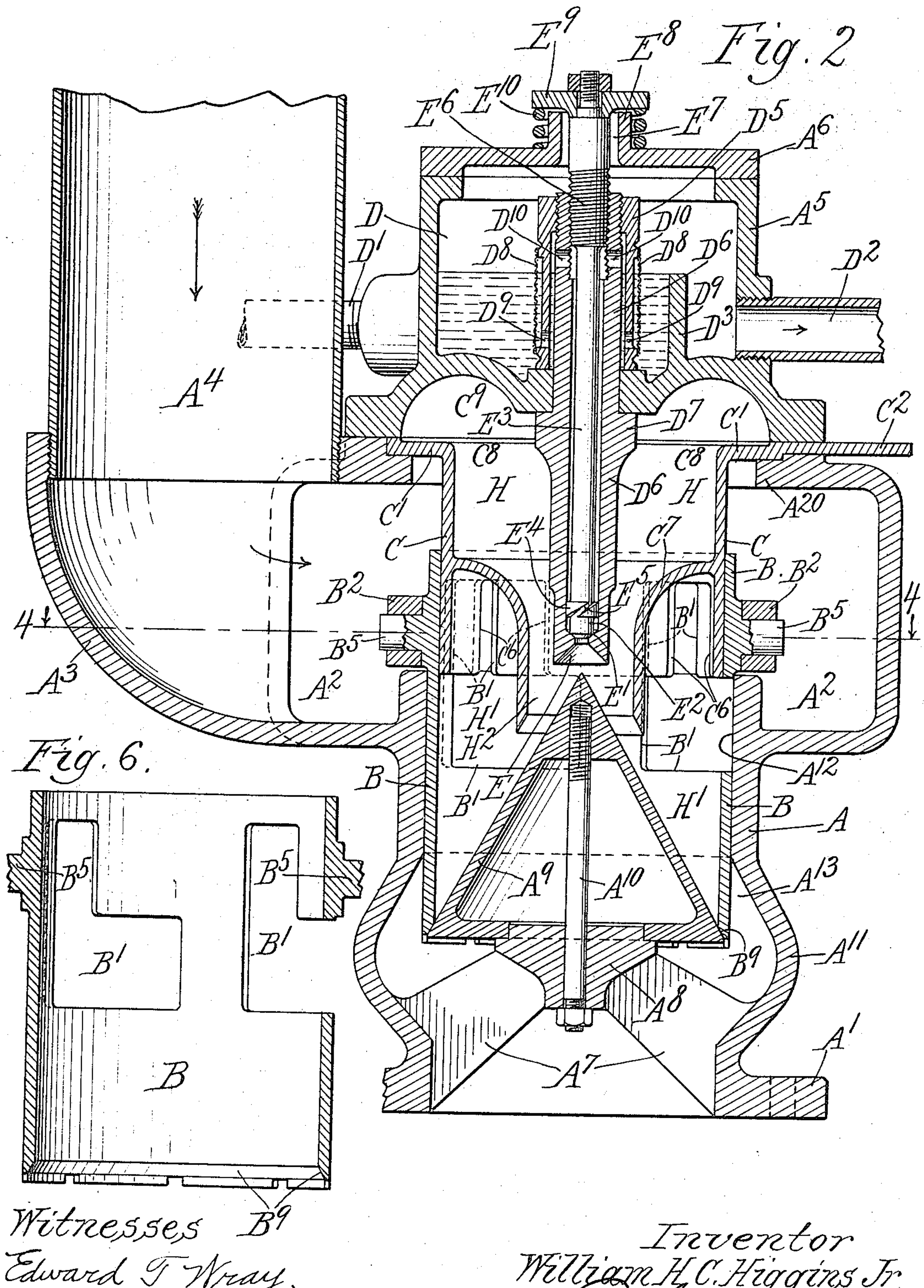
3 SHEETS—SHEET 2.

Fig. 2



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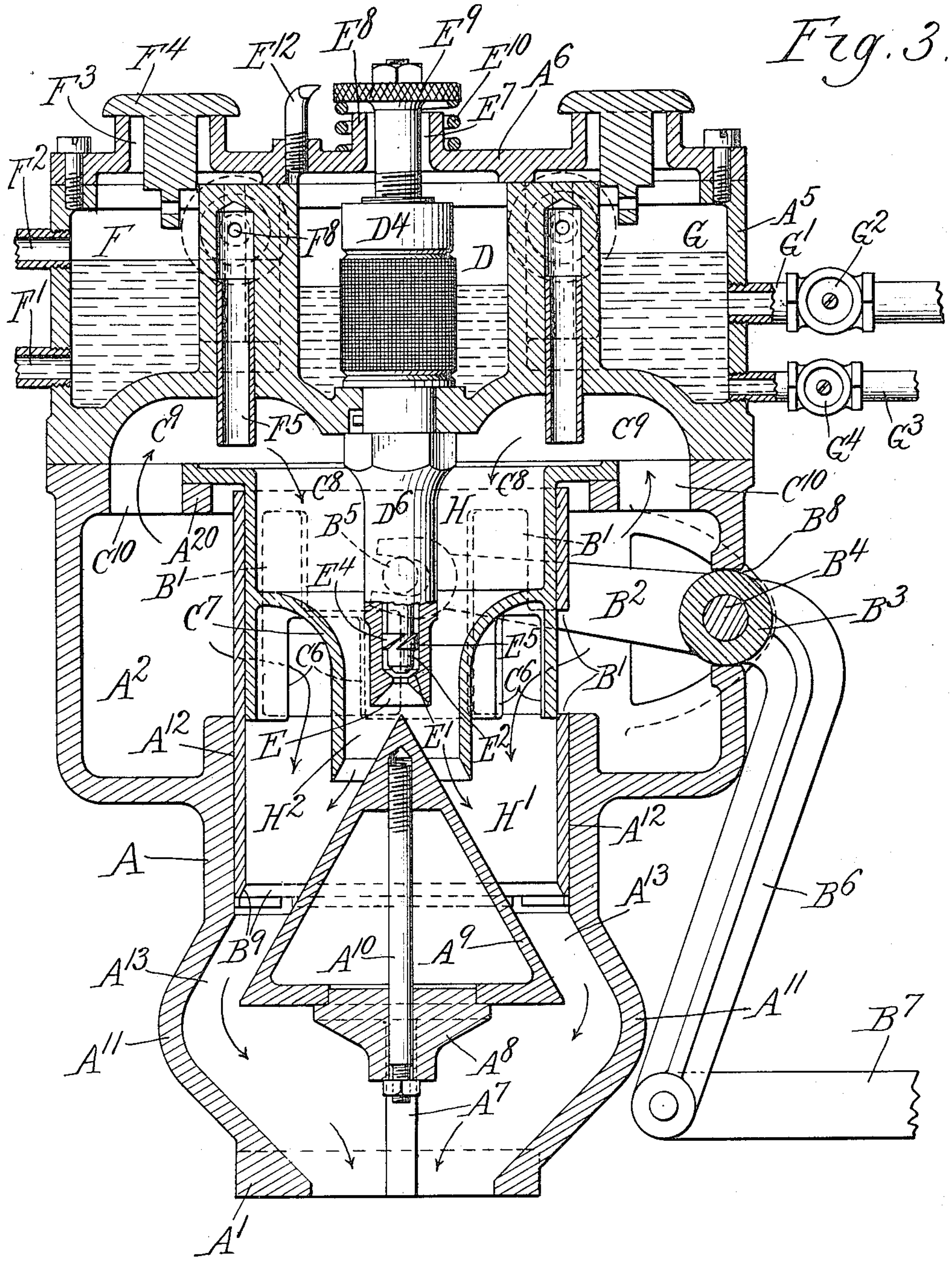
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM H. C. HIGGINS, JR., OF LAPORTE, INDIANA, ASSIGNOR TO M. RUMELY COMPANY, OF LAPORTE, INDIANA, A CORPORATION OF INDIANA.

CARBURETER.

1,154,630. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed April 1, 1912. Serial No. 687,722.

To all whom it may concern:

Be it known that I, WILLIAM H. C. HIGGINS, Jr., a citizen of the United States, residing at Laporte, in the county of Laporte and State of Indiana, have invented a certain new and useful Improvement in Carbureters, of which the following is a specification.

My invention relates to improvements in carbureters and is illustrated diagrammatically in one form in the accompanying drawing, wherein—

Figure 1 is a plan view; Fig. 2 is a section along the line 2—2 of Fig. 1; Fig. 3 is a section along the line 3—3 of Fig. 1; Fig. 4 is a section along the line 4—4 of Fig. 2; Fig. 5 is a section along the line 5—5 of Fig. 1; Fig. 6 is a detail elevation in part section of the sliding sleeve.

Like parts are indicated by like letters throughout the several figures.

The housing A is provided at its bottom with the flange A^1 whereby it may be attached to the intake manifold, contains the annular air passage or chamber A^2 from which projects the elbow A^3 to engage the air pipe A^4, and carries on its upper side the reservoir containing housing A^5, having the cover A^6. The spider arm structure A^7 which projects inwardly from the housing A immediately above the flange A^1 carries the hub A^8 on which is mounted the upwardly extending conical deflector A^9 held in position by the stud A^{10}. The casing A is enlarged as indicated at A^{11} about the base of the deflector A^9 and contains the vertically disposed cylindrical bearing surface A^{12} located above, concentric with, and slightly removed from the deflector A^9.

The sleeve B which is slidably mounted in the bearing A^{12} is provided with the L shaped ports B^1 which have their larger portion below, and is actuated by the forked levers B^2, which project from the sleeve B^3 on the shaft B^4 and engage the lugs B^5 projecting from the sleeve. The lever B^6 which projects outwardly from the sleeve B^3 is actuated by the link B^7 which operates in response to the engine or to any any other suitable controlling means. The port B^8 in the outer wall of the chamber A^2 is substantially closed by the sleeve B^3, although it is not necessary that there be in any sense an air-tight joint here. The conical seat B^9 at the bottom of the sleeve B is in opposition to and parallel with the surface of the deflector A^9, and the sleeve when in the lower position rests upon this deflector to close the annular mixture discharge port A^{13} between the deflector A^{10} and the bottom edge of the bearing surface A^{12}.

The sleeve C which is rotatably mounted in the sleeve B, which sleeve is itself slidably mounted thereon, is provided at its upper end with the annular horizontally extended flange C^1 rotatably mounted in the casing A, is held in position by the casing A^5 and is provided with the operating arm or lever C^2 which projects above the chamber A^2 and carries the indicator C^3 in opposition to the scale C^4 on the housing A^5. The sleeve C extends downwardly only as far as the upper edge of the bearing A^{12} and is provided with the ports C^6 in register with the ports B^1 and contains the inwardly and downwardly extending curved deflector C^7 located above and to one side of the ports C^6.

The sleeves B and C thus form a two part mixing and carbureting chamber C^8, which is provided with the mixture discharge port A^{13} as above indicated, the controllable and adjustable auxiliary air intake ports B^1, and which has an open upper end or port C^9 into which discharge the fixed and unvarying air intake passages C^{10} which extend across the flange A^{20} and communicate with the annular chamber A^2.

The housing A^5 contains the fuel reservoir D which is provided with the oil supply pipe D^1 and the overflow pipe D^2. The partition or overflow wall D^3 located in the chamber D adjacent the overflow pipe D^2 limits the height of the liquid therein. The fuel valve D^4 is centrally located within the reservoir D and discharges downwardly therefrom into the vacuum chamber at a point immediately above the deflector A^9. The valve D^4 is held in position in the bottom of the reservoir D by the sleeve D^5 which is screw threaded at its upper end on the upper end of the nipple D^6, is out of contact therewith except at the screw-threaded connection and draws the shoulder D^7 on the nipple firmly against the bottom of the casing A^5 to hold the valve nozzle in position. The sleeve D^5 is surrounded toward its base with the wire screen or netting D^8 and is provided with the passages

D^9 guarded by the netting D^8 and leading from the chamber D adjacent its base to the space between the nipple D^6 and the sleeve D^5. The nipple D^6 is provided with the passages D^{10} located adjacent its top and leading from the space between the nipple and the sleeve to the interior of the nipple.

The nipple D^6 itself is provided at its lower end with the downwardly extending conical discharge nozzle E, above which is the conical valve seat E^1. The valve E^2 in opposition to the valve seat E^1 is carried by the valve stem E^3, which stem is guided at its lower end in the tubular interior of the nipple by the flange or shoulder E^4 having the feed slots E^5 therein. The stem E^3 is provided at its upper end with the enlarged screw threaded portion E^6 in screw threaded engagement with the upper end of the nipple. The cover A^6 is provided with the aperture E^7 surrounded by the upwardly extending flange E^8 through which passes the screw threaded portion E^6. The thumb screw E^9, which presses against the spring E^{10} and is provided with the index marks E^{11} in opposition to the pointer E^{12}, is provided for the purpose of adjusting the position of the valve to control the fuel supply.

The interior of the reservoir D may be inspected through the port or passage covered by the cap E^{13}. The housing A^5 contains on one side of the reservoir D the water reservoir F provided with the supply pipe F^1 and the overflow pipe F^2 and the manhole F^3 covered by the cap F^4. The discharge nozzle or tube F^5 discharges downwardly into the passage C^9. The passage F^6, which communicates at its base by means of the passage F^7 with the interior reservoir F, communicates at its upper end with the tube F^5 by means of the cross passage F^8 containing at one end the conical valve seat F^9 in opposition to which is the needle valve F^{10} carried by the screw threaded valve stem F^{11} which may be controlled by the thumb screw F^{12} and held in position by the lock nut F^{13}.

The gasolene or priming fluid reservoir G on the opposed side of the housing A^5 may be filled with gasolene or priming fluid through the pipe G^1 controlled by the valve G^2 and may be drained through the pipe G^3 controlled by the valve G^4. This reservoir discharges by means of a valve and nozzle, exactly the same as the water valve and nozzle, into the passage C^9 above the mixing chamber. The two part mixing and carbureting chamber C^8 is divided by the curved deflector C^7 into the upper and lower chambers H, H^1 connected by the fixed more or less cylindrical passage H^2 through the deflector in which is located the fuel nozzle. The chamber H^1 is a true valve controlled vacuum chamber. It is provided with the constant fixed air inlet port H^2, the variable opening and closing mixture discharge port A^{13}, and the variable opening and closing auxiliary air intake port C^6, which latter ports may also be adjusted by the rotating sleeve so that the mixture discharge and auxiliary air intake ports respond unequally to the movement of the sliding sleeve. This movement of the sliding sleeve together with the position of the rotary adjusting sleeve controls the vacuum in this chamber, and it is this vacuum which controls the flow of air from the chamber H^1. The chamber H^1 operatively includes the passages C^9 leading from the annular passage A^2, and therefore the water and gasolene or priming supplies and the fuel supply are all located in this mixing vacuum chamber H^1. I have called this chamber H^1 a vacuum chamber, because it is positively and absolutely controlled by the vacuum, although there is not necessarily any controllable vacuum in the chamber itself, because this chamber is not provided with any adjustable or controllable ports. It is of course evident that under some circumstances and for some fuels and operating conditions, the deflector C^7 may be dispensed with without in any way changing the operation of the device, since then there would be but a single vacuum chamber in which the vacuum would be controlled by the adjustable air intake, the fixed air intake ports and the relation which their total effective area at one time bore to the total effective area of the mixture discharge port. For the sake of convenience, however, and under some circumstances, for the purpose of protecting the oil nozzle from cross currents which might be set up throughout the auxiliary air intake ports to discharge against it, I have provided the deflector C^7 which cuts the vacuum chamber into two parts.

It will be evident that while I have shown in my drawings an operative device, still many changes might be made in the particular mechanical arrangement and structure without departing materially from the spirit of my invention, since many forms of carbureter having different mechanical arrangement and movement might be produced which would operate exactly as does this device.

The use and operation of my invention are as follows: As the engine operates it draws its adjustable fuel charge from and through the carbureter, the suction of the engine causing the air to flow through the carbureter, carrying with it the combustible fluids. The air enters the carbureter, passes down through the upwardly projecting air tube into the annular air chamber surrounding the vacuum or carbureting chamber proper. Here the air is divided, part of it going up through the top of the rotatable sleeve and thus down into the vacuum chamber, another portion going in through the walls of the vacuum chamber through the registering ports in the sleeves and thus into the vacuum chamber. Here the air currents again unite and pass down across the conical deflector through the mixture discharge port and the enlarged portion of the carbureter and down into the intake manifold not shown. The air which passes through the fixed passages and ports surrounds the lower end of the water nozzle and is supplied with a suitable amount of water. It then goes on down into the vacuum chamber, passing the fuel nozzle, the vacuum in the chamber, or the induced suction of the air current as the case may be, drawing the fuel out of the nozzle, and it is downwardly discharged in a finely atomized condition into the mixing chamber. It then accompanies the air down along the conical deflector, being mixed with the free air which enters the auxiliary controllable air intake ports and passes out in a finely atomized condition to the engine.

The vacuum in the carbureting chamber draws the fuel positively down the fuel nozzle. The fuel as it leaves the reservoir first enters the base of the outer sleeve of the cylindrical valve, is drawn up to the top of the sleeve and at that point enters the interior of the nipple. It then passes down the nipple to the nozzle. It will be noted that the screw threaded connections at the top of the nipple and between the nipple and the sleeve and between the nipple and the needle valve will be more or less loose and open and therefore the siphon cannot be marked, although the air which will enter at these points will not be of sufficient quantity to prevent the drawing out of the fuel by the positive suction caused by the static vacuum of the vacuum in the mixing chamber. The same is true of the priming and water supplies. While the tubes or passages through which these liquids pass, discharge into the carbureter at a point below the bottom of the reservoir and might at first glance seem to act as a siphon, still that action is absent, since the parts are carefully made so as not to be absolutely air tight. The suction is sufficient to draw fuel up and out, but the weight of the fuel itself, acting as a siphon, is not. The fuel and water supplies, it will be noted, discharge downwardly and the passage to the air which carries the fuel and water is also in a downward direction, thus as the velocity of the air current varies in response to the demands of the engine and pulsates with each stroke, there will never be any tendency for the finely divided particles of water and fuel to assume a velocity in the direction opposed to the direction in which they must be carried by the air column to reach the engine, and during the intervals between the intake strokes of the engine when the air column is substantially at rest, all that will happen will be that the finely divided particles will pass downwardly under the action of gravity in the direction in which they ought normally to go. The deflector arranged about the fuel nozzle and above the auxiliary air intake ports, separates them from the nozzle and thus prevents their too freely upsetting and reducing the static vacuum which must be found about the nozzle in order to draw out the fuel with the required accuracy.

The function of the conical deflector at the base of the vacuum chamber is to gradually deflect the air currents in order to prevent the presence of eddy currents and in order to prevent any violent change in the direction of motion of the fuel-laden air, since owing to the varying specific gravities of water, oil and air, such eddy currents and such violent changes in direction would cause the air to throw down the water and oil, owing to their greater density, and thus a poorer mixture would be discharged to the engine. This is important, in view of the fact that this carbureter is designed primarily for use of the heavier grades of fuel oils which are not vaporized at ordinary varying temperatures, but which are merely atomized in the vacuum chamber and carried from the carbureter to the engine as finely divided mist borne upon the air current.

The sliding sleeve or valve, which may as indicated be controlled from the engine or from any other suitable means, when raised, opens the mixture discharge port and when lowered closes it, thus shutting off the supply of air and fuel. It will be further noted that when the sleeve is raised, the ports therein are brought into register with the ports in the rotatable sleeve, and thus the auxiliary air intake ports are open. The amount of their opening, however, is controlled by the position of the rotatable sleeve. This sleeve is rotated by means of the lever projecting outwardly therefrom, and set at such a position that for any position of the sliding sleeve a suitable mixture will be produced.

When the engine is running light, the sliding or throttling sleeve will be lowered to almost close the mixture discharge port. This will operate to very materially decrease the auxiliary air intake opening and therefore most of the air which enters the carbureting chamber will come in through the fixed air intake port. This port, however, will be made so small that the auxiliary air intake ports must be slightly open to permit sufficient air to enter the carbureter. This auxiliary air intake port will be adjusted until the vacuum in the carbureter in response to the demands of the engine will feed a comparatively rich mixture to the carbureter, because when but small quantities of mixture are admitted to the engine, the depression will decrease and therefore a richer mixture is needed to ignite. As the demands of the engine increase, the reciprocating sliding throttling sleeve will be raised, thus opening the mixture discharge port and permitting an increased amount of mixture to reach the engine. This will increase the compression in the engine and therefore a leaner mixture may be used. Therefore the proportion of fuel with respect to the amount of air may be decreased, but the amount of air being increased, the fuel supply also will have to be increased, but not so rapidly as the air supply, and this may be done by increasing the vacuum.

When once the rotatable adjusting sleeve has been positioned in any certain engine, the movement of the slidable throttling sleeve will control the actual effective openings of the adjustable air intake and mixture discharge ports both with respect to each other and with respect to the fixed passage through the deflector so as to produce in response to the suction of the engine a suitable vacuum in the lower vacuum chamber. This vacuum will control the inflow of air, oil and water to and through the upper vacuum or mixing chamber, so as to give a suitable and satisfactory combustible mixture. Under some circumstances, and preferably, there will be a positive static vacuum in the upper chamber and this static vacuum will operate to suck out of the oil and water supply nozzles a suitable amount of liquid, which when mixed with the air entering the fixed port, and also in the lower vacuum chamber the air entering the adjustable port, will give a suitable proportion of oil and water so that a combustible charge will be fed to the engine cylinder. It will be evident, however, that such a static vacuum need not necessarily be had in the upper chamber, and in fact, under some circumstances and conditions, the static vacuum in the upper chamber might be negligible, and it is conceivable that the velocity of the air alone might be relied upon to draw out a suitable quantity of oil and water. In any event, however, it is the vacuum which controls, for if there is a vacuum in the entire two part chamber, it will operate to draw out a suitable amount of liquid. If, however, there is only a vacuum in the lower chamber, this vacuum will so adjust and control the air current that still a suitable quantity of liquid will be fed, and I have called the whole chamber a vacuum chamber, because in any event, whether vacuum prevails throughout with the same intensity, or not, it is a vacuum controlled chamber and the fuel and water feeds are controlled by the vacuum and by the vacuum alone, whether indirectly or directly.

I claim:

1. A carbureter comprising a cylindrical mixing chamber, air intake and mixture discharge ports surrounding either end thereof, an auxiliary air intake port intermediate them, and a conical deflector closing one end of said chamber and forming one side of the mixture discharge port.

2. A carbureter comprising a mixing chamber made up of a plurality of cylinders mounted one upon the other, one of them slidable, the other rotatable, registering ports in said cylinders controlled by their respective movements, and a mixture discharge port controlled only by said slidable cylinder.

3. A carbureter comprising a vacuum chamber made up of a plurality of movable cylinders mounted one upon the other, one rotatable, the other slidable each with respect to the other, a fixed air intake port at one end of one of said cylinders, a mixture discharge port at the opposed end of the other cylinder, auxiliary registering intake ports in the walls of said cylinders.

4. A carbureter comprising a cylindrical mixing chamber, an annular air supply passage surrounding the upper end thereof, fixed air intake ports leading from said passage and discharging axially into said chamber, auxiliary air intake ports leading from said passage and discharging radially into said chamber, a mixture discharge port at the other end of the chamber, and a water supply located above said fixed air intake port.

5. A carbureter comprising a cylindrical mixing chamber, an annular air supply passage surrounding the upper end thereof, fixed air intake ports leading from said passage and discharging axially into said chamber, auxiliary air intake ports leading from said passage and discharging radially into said chamber, a mixture discharge port at the other end of the chamber, and a priming fluid supply located above said fixed air intake port.

6. A carbureter comprising a two part vacuum chamber, a fixed intake port connected with one part of said chamber, a fixed discharge leading from said part to the other part of said chamber, adjustable auxiliary air intake and mixture discharge ports in the other part of said vacuum chamber, a fuel supply discharging into the first part of said vacuum chamber adjacent the port discharging to the second part of the chamber and a water supply connecting with the first part of said chamber adjacent the intake port.

7. A carbureter comprising a two part vacuum chamber, a fixed intake port connected with one part of said chamber, a fixed discharge leading from said part to the other part of said chamber, adjustable

auxiliary air intake and mixture discharge ports in the other part of said vacuum chamber, a fuel supply discharging into the first part of said vacuum chamber adjacent the port discharging to the second part of the chamber, a water supply connecting with the first part of said chamber adjacent the intake port and means for controlling said mixture discharge and said auxiliary air intake port in unison together with a separate adjusting means for said auxiliary port.

Signed at Laporte, Indiana, this 19th day of March, 1912.

WILLIAM H. C. HIGGINS, Jr.

Witnesses:

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JOHN N. HAYN.