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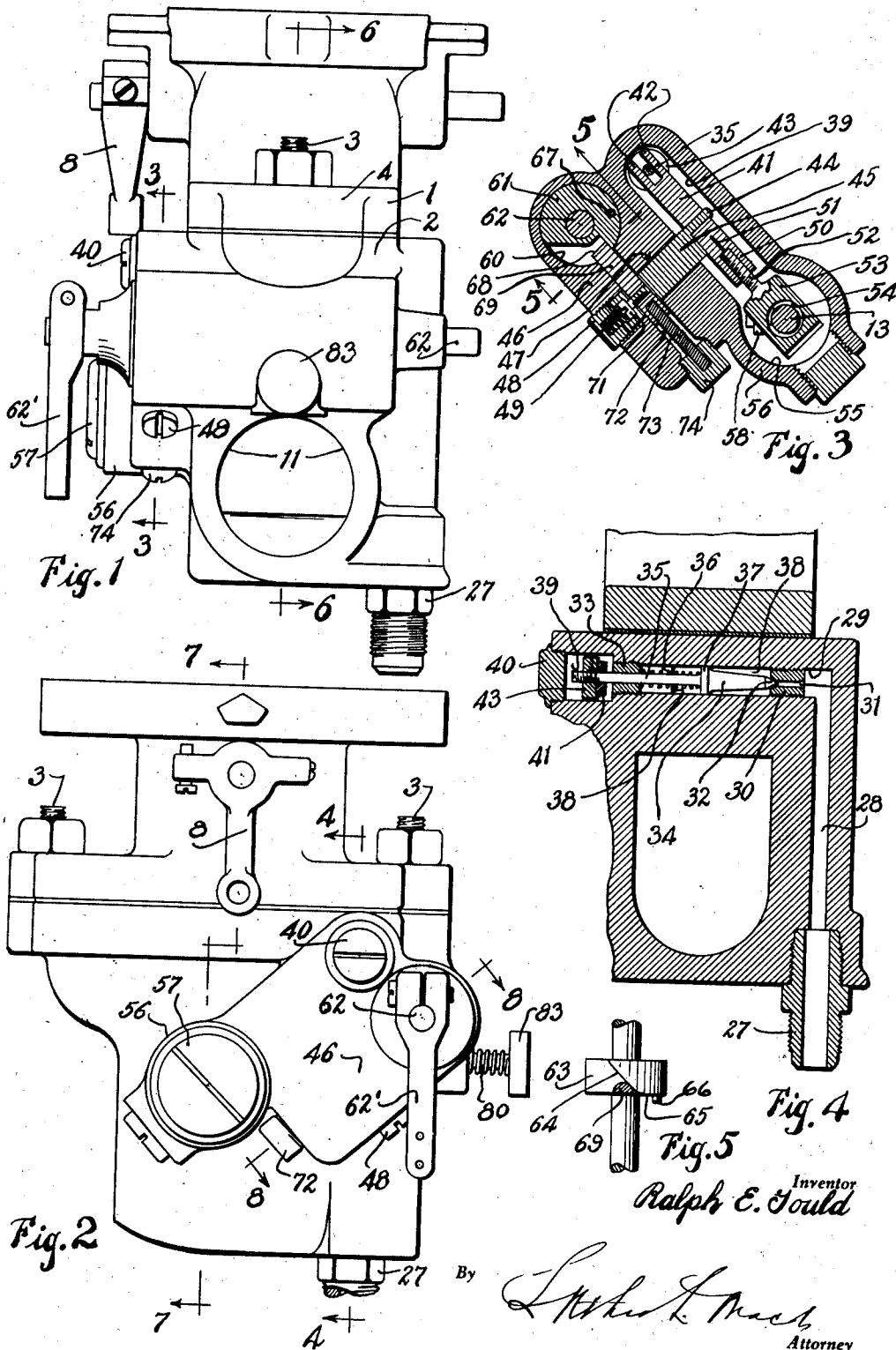
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1,982,291

CARBURETOR

Filed April 8, 1932

2 Sheets-Sheet 1



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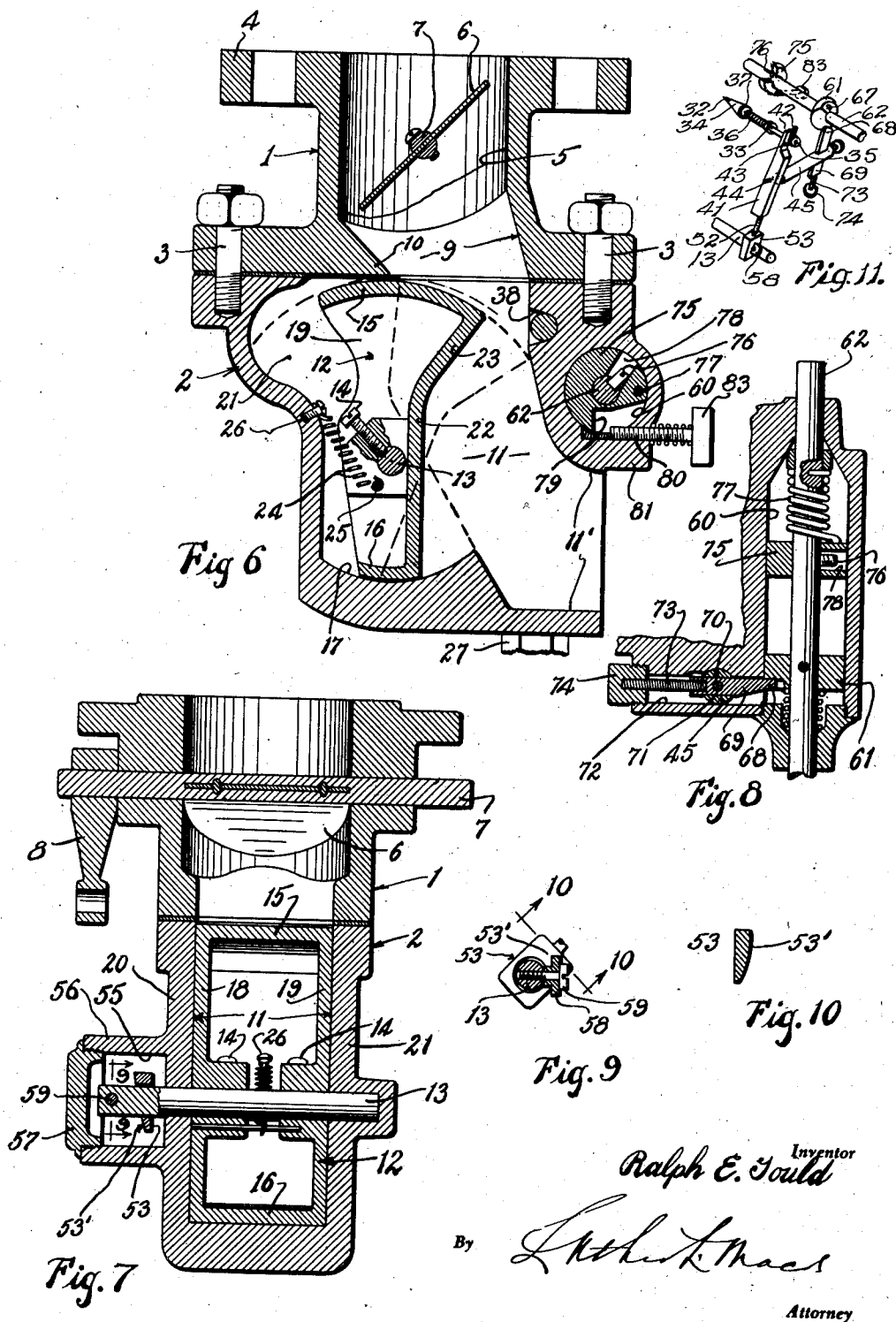
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UNITED STATES PATENT OFFICE

1,982,291

CARBURETOR

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Application April 8, 1932, Serial No. 604,019

14 Claims. (Cl. 261—50)

This invention relates to and has for an object the provision of an improved type of carburetor of simple and economical design, and of a floatless type so as to reduce the number of parts to a minimum and at the same time provide for adequate vaporization of the fuel and the control of the air and fuel discharged therefrom.

A particular object of this invention is to provide a novel and efficient form of gate or valve disposed in the Venturi tube of the carburetor and counter-balanced in its operation in such a manner that the valve will be substantially vibrationless and accurate in its operation.

As distinguished from other valves of the butterfly type such as are used in carburetors, my improved type of valve has an axis off set from the axis of the mixing chamber, is partially counter-balanced as to weight, and almost, if not quite completely, counter-balanced as to pressure or suction within the mixing chamber.

The valve is disposed relative to the throat of the carburetor in such a manner that it will be readily responsive to the vacuum created in the mixing chamber and is deflected adjacent said throat so that the in-rushing air will impinge against such deflected portion for effectively opening the throat in the carburetor to meet the demands of use.

The valve is of such a form that the volume of air induced into the mixing chamber passes by one side of the valve but the valve is so mounted that leakage to the opposite side of the valve occurs so as to reduce the vacuum or air pressure on its reverse side in order to minimize friction and resistance to the operation of the valve.

Other objects include the provision of suitable adjustments for regulating the mixture under different operating conditions and will be explained hereinafter.

I have shown a preferred form of carburetor embodying my improvements in the accompanying drawings, in which

Fig. 1 is an external side elevation.

Fig. 2 is an elevation of the same at right angles to Fig. 1.

Fig. 3 is a sectional view of the same on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary section of the same on line 4—4 of Fig. 2.

Fig. 5 is a side elevation of a cam as seen on line 5—5 of Fig. 3, designed for the purpose of adjusting the fuel mixture to meet varying conditions.

Fig. 6 is a sectional elevation of the carburetor on line 6—6 of Fig. 1.

Fig. 7 is a sectional elevation of the same on line 7—7 of Fig. 2.

Fig. 8 is a fragmentary section on line 8—8 of Fig. 2.

Fig. 9 is a detailed section on line 9—9 of Fig. 7 of means associated with the gate valve and controlled thereby for operating a fuel intake valve corresponding to the movement of the gate valve.

Fig. 10 is a transverse section of the means shown in Fig. 9 on line 10—10.

Fig. 11 is a perspective view of the fuel valve operating means.

Briefly described, my carburetor includes an upper section 1 and a lower section 2 constituting a separable housing attached together by means of screws or bolts 3—3. The section 1 has a flange 4 for connection with the intake manifold of an internal combustion motor and a central passage 5 wherein is mounted a throttle valve 6 of usual form on a shaft 7 extended diametrically thru said passage and provided with an operating arm 8 externally of the member 1 adapted for connection with the throttle operating member of an internal combustion motor.

It will be noted that the lower portion of passage 5 is slightly restricted in area and peculiarly shaped by the provision of a throat 9 at one side of which (left side in Fig. 6) a tongue 10 is integrally formed on the member 1 and projects substantially beneath the passage 5. The member 2 has an irregularly shaped mixing chamber 11 formed therein with an opening 11' at its lower end and preferably at the side which communicates with the passage 5 in member 1 thru throat 9.

The chamber 11, however, is substantially larger than the throat 9 and a gate valve 12 is pivotally mounted therein with its axis off-set with respect to the axis of throttle valve 7, as shown in Fig. 6. Said gate valve is suitably fixed to a shaft 13 which is journaled in the opposite walls of member 2 and is fixed to said shaft by means of a set screw 14 or otherwise.

As shown in Fig. 6, said valve is only partially open and the walls of the recess 11 are so formed that the valve will completely close the throat 9 when the valve is moved in a clockwise direction to its extreme right hand position, and when moved in a counterclockwise direction to its extreme left hand position said valve will completely open the throat 9. The extreme right hand and left hand positions of said valve are indicated by broken lines in Fig. 6. Valve 12 has an arcuate upper segment 15 which underlies the tongue 10 and serves as a closure for throat 9. A substan-

tially smaller arcuate portion 16 is provided at the bottom of the valve and on the opposite side of its axis from the portion 15 which loosely engages an arcuate portion 17 at the bottom of chamber 11, said portion 17 being concentric with the axis of valve 12. Valve 12 has webs 18 and 19 which loosely engage the opposite sides of the chamber 11 adjacent the side walls 20 and 21 of the member 2.

The inner side of the valve has a transverse wall 22 with a relatively angularly disposed portion 23 at the top. Thus when the valve is operatively positioned in the member 2 the chamber 11 is subdivided into two main portions, one of said portions being at the right of wall 22, as seen in Fig. 6, adjacent opening 11', and the other portion being at the left of wall 22.

The upper segment 15 is slightly eccentric on its upper face and gradually increases in radius from right to left, as seen in Fig. 6, so that the left hand end of the segment 15 will more nearly engage the bottom of tongue 10 when valve 12 is moved to its extreme right hand position than when the valve is moved to its extreme left hand position. Due to this peculiarity of form, when valve 12 is closed during the operation of the motor a maximum vacuum will be created in the passage 5 and a minimum vacuum within the left hand portion of chamber 11. On the other hand, when valve 12 is completely open the clearance between segment 15 and tongue 10 will be substantially increased so that the vacuum in the left hand portion of chamber 11 behind valve 12 will be correspondingly increased.

It must be understood at this point that the segment 16 permits a sufficient leakage of air between it and the portion 17 of the housing member 2 so as to eliminate all friction which would resist the operation of the valve. The segment 15 is substantially longer and of slightly greater radius than the segment 16, but the lower portion of valve 12 is sufficiently heavy so as to partially counter-balance the operation of the valve with respect to weight. The form of the valve, however, is such as to almost, if not quite completely, counterbalance the operation of the valve as to the effect of vacuum on its operation.

This is particularly due to the form and disposition of the valve with respect to the throat 9. The valve 12 is normally urged to closing position by means of a spring 24 which is fixed at a point 25 to the valve and at a point 26 to the wall of member 2. Said spring is tensioned so as to constantly urge the valve into closing position, but its tension is so slight that it will be overcome by suction created in passage 5 and chamber 11.

Referring to Fig. 4, it will be noted that fuel is admitted thru a fitting 27 attached to the bottom of member 2 and connected with a fuel feed line from which the fuel is delivered to a vertical passage 28 in member 2. Passage 28 communicates at the top of member 2 with a horizontal passage 29 in which a plug 30 with a passage 31 therein may be fitted and provided with a valve seat 32.

The outer end of passage 29 is closed by means of a plug 33 and a needle valve 34 is slidably held in said passage 29 with its stem 35 slidably held in plug 33 so that the point of the valve will engage the seat 32.

A compression spring 36 is held on the stem 35 and compresses between plug 33 and a flange 37 on valve 34 for normally holding the valve seated in the plug 30. Passage 29 has an orifice 38 by means of which continuous communication

is established between mixing chamber 11 and passage 29 so that when valve 34 is opened fuel will flow thru said orifice into recess 11 for mixture with air admitted thru opening 11'. Valve stem 35 projects into a recess 39 in member 2 which is closed by means of a cap 40, and said recess is elongated, as shown in Fig. 3, and serves to house a valve operating lever 41.

Member 41 has a forked end 42, the furcations of which straddle the projecting portion of stem 35 adjacent a nut 43 carried on the stem. The member 41 is adjustably and pivotally held on a trunnion 44 which is eccentrically formed on the inner end of an adjusting pin 45 which is disposed at right angles to the member 41 in a portion 46 of the housing member 2 in a bore 47 which is closed at its end by means of a plug 48. Plug 48 carries a compression spring 49 which bears against the outer end of member 45 so as to urge said pin 45 inwardly.

For purposes hereinafter described, the rotation of pin 45 in its bearing will adjust the axis 44 of lever 41 for correspondingly varying the operation of needle valve 34. The end 50 of lever 41 is slit at 51 and threaded to receive a stem 52 of a wedge shaped cam 53 which has an aperture 54 therein thru which the shaft 13 of valve 12 is extended. Member 53 is housed in a recess 55 of a boss 56 formed on a side of housing member 2, and said recess is closed by a suitable cap 57. The end of shaft 13 carries a roller 58 rotatably held on a screw 59 secured to shaft 13 and having its periphery engageable with the inclined outer face 53' of member 53, as shown in Figs. 7 and 9.

Thus, the roller 58 being fixed in its position will engage the inclined face 53' of member 53 as gate valve 12 is oscillated together with shaft 13, thereby forcing member 53 inwardly, as seen in Fig. 7, to an extent corresponding to the extent of the opening movement of valve 12. Accordingly the opening of needle valve 34 is directly proportionate to the opening of gate valve 12 so as to properly maintain the proportionate volumes of air and fuel.

Referring again to Fig. 3, it will be observed that the portion 46 of member 2 is provided with a bore 60 in which is mounted a circular cam 61 fixed to a transverse shaft 62. (See also Fig. 8.) Said cam, as shown in Fig. 5, is cut away at 63 so as to provide an inclined facet 64 which gradually merges into a dwell 65 and has a hump or button 66 formed adjacent said dwell on or attached to said cam as by means of a pin 67 of which the portion 66 forms a head. Said cam is engageable with the inwardly extended end 68 of an arm 69 which is held in a diametrical slot 70 formed in adjusting pin 45 and is secured to said pin by means of a screw 71. The member 69 is operative in a diagonal slot 72 formed in portion 46 of member 2 and is held in operative engagement with cam 61 by means of a pin 73, as shown in Fig. 3. Said spring is closely wound and has its inner end seated in the heel of arm 69 and its outer end seated in a plug 74 which closes the end of slot 72. Thus the arm 69 oscillates on screw 71 against the tension of spring 73.

Within bore 60 a stop collar 75 is provided on shaft 62 and a coil spring 77 is carried on shaft 62 and has one end thereof fixed to said shaft and the other end secured to collar 75 so that said collar may turn slightly on said shaft against the tension of said spring. To this end a set screw 76 is secured to shaft 62 within a 150

radial bore 78 of larger size than the set screw. (See Fig. 6.)

The member 75 has a shoulder 79 disposed opposite an adjusting screw 80 which is threaded into a boss 81 on member 2 and has a head 83 by means of which the inner end of the screw may be adjusted in the direction of and for engagement with the shoulder 79.

In operation, the passage 5 in the upper portion of member 1 and throttle valve 6 mounted in said passage operate as in other types of carburetors to regulate the flow of the fuel mixture from the carburetor to a motor, except that in my carburetor the throttle is mounted at the top rather than at the bottom, as in the chamber 11. In other types of carburetors the throttle valve is the sole means within the mixing chamber 5 for regulating the flow of the fuel mixture to the motor, whereas in my carburetor I provide the valve 12 which in no way affects the operation of but is entirely supplemental to the usual throttle valve 6 so that the volume of fuel admitted to the carburetor is accurately controlled to correspond to the exact requirements of use under all operating conditions.

While valve 12 is shown, as in Fig. 6, with its axis off-set from that of throttle valve 6, it is conceivable that valve 12 may be otherwise disposed relative to the throttle valve by varying the form of the housing and the passages therein without affecting the operation of the valve. It is important, however, that the arcuate closure segment 15 of said valve be disposed substantially as shown in Fig. 6 relative to the throat 9 which affords communication between passage 5 and chamber 11.

The form of valve 12 as shown is important and the operation of said valve can only be effected when the valve is so disposed in the chamber 11 as to provide on the rear side of the valve a vacuum chamber as shown and described. It may be noted at this point that the fuel inlet 38 is necessarily disposed above valve 12 so that the constant vacuum created in throat 9 by valve 12 will be effective for ejecting the necessary amount of fuel supplied to passage 5 for operating a motor under all conditions. With the valve 12 in nearly closed position as shown by the broken lines at the right of the valve in Fig. 6, and the motor operating at idling speed, the closure 15 of said valve will be almost but not quite in engagement with the tongue 10 at the left hand side of throat 9. Sufficient clearance is provided at such point so that suction in passage 5 will be effective in that portion of chamber 11 back of valve 12 for the purpose of creating a partial vacuum.

When valve 12 is in closed position a minimum vacuum is maintained in that portion of chamber 11 back of the valve and when the valve is in open position a maximum vacuum is created therein. The portion 16 of the valve being only loosely engaged with the portion 17 of the housing air will at all times leak into the space back of the valve.

With the motor at idling speed and valve 12 closed, or nearly closed, the suction in passage 5 is sufficient to overcome the tension of spring 24 for opening valve 12. As the throttle 6, however, is opened, suction in passage 5 is correspondingly increased and thru the clearance between the portion 15 of valve 12 and tongue 10 this suction is effective for partially evacuating the portion of chamber 11 behind valve 12 of air, thereby reducing resistance to the opening move-

ment of the valve and actually utilizing the suction for further opening the valve.

As the valve 12 is opened the in-rushing air thru opening 11' impinges against the diagonal wall 23 of valve 12 and assists in the further opening of the valve. It will be readily apparent that the suction in passage 5, which is effective for operating a valve of the butterfly type such as the valve 6, is not at all effective for opening valve 12, as the suction is applied to the arcuate portion 15 of the valve, and unless the vacuum chamber behind the valve is provided with a valve of the type shown, will not function.

As the valve 6 is opened to a substantial extent and valve 12 is opened correspondingly, the throat 9 becomes less restricted in area and the vacuum at the back of valve 12 is correspondingly increased while the tension of spring 24 due to its peculiar hook-up is correspondingly decreased and the vacuum behind the valve is effective to a certain extent for holding the valve 12 open, thereby reducing the requisite vacuum in the right hand portion of chamber 11 and in passage 5.

It is, of course, essential that the volume of fuel supplied to the mixing chamber shall correspond at all times to the volume of air admitted thereto under varying operating conditions. To this end the needle valve 34 is positively connected with the control valve 12 as shown in Figs. 3, 4 and 7 so that the needle valve, by the means hereinbefore described, is opened and closed proportionately to the opening and closing of valve 12. Said needle valve is adjusted for varying the relative proportions of fuel and air by the means shown in Fig. 3, including the pin 73, or by other suitable means.

The cam 61 shown in Figs. 3, 5 and 8 is so formed that the follower arm 69 engaging the said cam is operative for oscillating the pin 73 so that trunnion 44 will be varied in its position, whereby the engagement of lever 41 with the nut 43 associated with valve 34 will be varied proportionately to the movement of said cam.

Shaft 62 is provided with an operating lever 62' externally of the housing for adjusting cam 61 relative to arm 69. When said arm 69 engages the inclined facet 64 of said cam, as shown in Fig. 5, arm 41 will be completely disengaged from the needle valve 34 so that the operation of valve 12 will not effect the corresponding operation of valve 34. This is particularly advantageous as when descending hills so that the supply of fuel may be completely shut off for the sake of economy.

The normal position of arm 69 on cam 61 is attained when arm 69 engages the flat portion 65 of the cam, and said portion may be slightly inclined so that the position of the cam may be adjusted for variations in temperature or climatic changes.

For the purpose of readily starting a motor, cam 61 may be adjusted so that arm 69 will engage the hump 66 for opening valve 34 to a maximum extent and thereby correspondingly increasing the fuel sprayed into the passage 5. The adjustment of cam 61 is controlled by the stop collar 75 and the adjusting screw 80 so that the engagement of the inner end of said screw with the shoulder 79 on said collar will limit the movement of cam 61 to its normally adjusted position of rest.

In the operation of a carburetor it is very desirable to draw the fuel thru the fuel inlet valve as forcibly as possible at all times in order to

produce a complete vaporization, especially of the comparatively heavy fuel now in general use. The process of vaporization and the mixing of the vapor and air is perfected and more efficiently accomplished by producing and maintaining an extremely high and uniform velocity at the mixing point as the mixture passes to the motor from its lowest idling speed to the maximum speed and power output. This high velocity of the fuel greatly facilitates the cracking up or vaporization of the fuel in a manner which is not possible in other types of carburetor.

My carburetor is so designed that when a motor to which the carburetor is attached is operating at very slow speed, especially at idling speed, control valve 12 will produce and maintain a still greater degree of vacuum than when operating at or approaching its maximum output, thus increasing the efficiency in cracking up and vaporizing the fuel.

Moreover my carburetor is designed to reduce the vacuum produced by the control valve as the carburetor approaches its maximum output, thus inducing a maximum volume of air to the carburetor.

Other advantages will be obvious to those skilled in the manufacture and use of carburetors.

What I claim is:

1. A carburetor comprising a housing having a passage therethru with an inlet and an outlet at opposite extremities thereof, a throttle valve adjacent said inlet, a mixing chamber adjacent said passage and having an air inlet, a control valve in said mixing chamber, means for introducing fuel to said passage at a point intermediate said valves, a vacuum chamber adjacent and separated from said passage by said control valve, said control valve having diametrically opposite arcuate portions movably disposed adjacent portions of said housing, one of said arcuate portions forming a closure for and movable transversely of the inlet to said passage for opening and closing said inlet, means normally urging said control valve to closing position, said closure formed so as to gradually increase the clearance between the closure and the portion of said housing around said inlet as said control valve is moved from closed to open position and to decrease the clearance when the valve is reversely moved, for varying the vacuum in said vacuum chamber during the operation of the control valve, as described.

2. A carburetor comprising a housing with a fuel mixing chamber therein, a throttle valve in said chamber, a control valve also in said chamber spaced from said throttle valve, fuel inlet means for introducing fuel to said chamber intermediate said valves, said chamber having a restricted throat adjacent said control valve, a vacuum chamber adjacent and separated from said passage by said control valve, said control valve having a closure transversely disposed across said passage and an inclined wall diagonally closing said passage when the valve is in closing position, said control valve arranged to regulate communication between said vacuum chamber and said mixing chamber at a point above said closure whereby the vacuum in said vacuum chamber is varied corresponding to the opening and closing of the control valve.

3. A carburetor as characterized in claim 1, including means connecting said control valve with said fuel supply means for correspondingly operating said valve and said fuel supply means.

4. A carburetor as characterized in claim 1, including means connecting said control valve

with said fuel supply means for correspondingly operating said valve and said fuel supply means, and means for adjusting the connection between said fuel supply means and said control valve to vary the fuel mixture to meet varying requirements of use.

5. A carburetor as characterized in claim 2, including means connecting said control valve with said fuel supply means for correspondingly operating said valve and said fuel supply means.

6. A carburetor as characterized in claim 2, including means connecting said control valve with said fuel supply means for correspondingly operating said valve and said fuel supply means, and means for adjusting the connection between said fuel supply means and said control valve to vary the fuel mixture to meet varying requirements of use.

7. A carburetor comprising a housing formed of two sections superposed one on the other and detachably secured together, one of said sections having a passage therein provided with an outlet at one end and a restricted throat at its other end forming an inlet, a throttle valve mounted in said passage, said other section having a chamber provided with an air inlet and in communication with the throat of said passage, means for introducing fuel to said chamber, a counter-balanced control valve oscillatably mounted in said chamber and provided with a wall disposed opposite said air inlet, and an arcuate extension from said wall transversely disposed in said chamber relative to said throat, said valve forming a vacuum space in the rear portion of said chamber, and the extension on said valve forming a closure for said throat whereby to regulate the volume of air from the atmosphere to said passage, said extension formed eccentrically with respect to the axis of said valve for varying the clearance between said extension and the periphery of said throat so as to increase said clearance from a minimum to a maximum as said control valve is moved from closed to open position, and vice versa.

8. A carburetor as characterized in claim 7, including adjustable means connecting said control valve with said fuel supply means for correspondingly operating said valve and said fuel supply means.

9. In a carburetor, the combination of a housing having a chamber therein provided with an air inlet and an outlet, a valve oscillatably mounted in said chamber and having an axis fixed at a point intermediate said inlet and said outlet, said valve being provided with a wall subdividing said chamber into air and vacuum compartments and an arcuate extension forming a closure for and movable transversely relative to said outlet when the valve is opened and closed for increasing and decreasing the space of said vacuum compartment respectively, said vacuum compartment being in communication with said outlet and said closure being formed so as to vary the extent of such communication from a minimum to a maximum as the valve is opened and from a maximum to a minimum as the valve is closed.

10. In a carburetor the combination of a housing having a chamber therein provided with an inlet and an outlet, of a valve oscillatably mounted in said chamber and provided with diametrically opposite arcuate portions and a connecting wall between said portions for forming an air passage on one side of said valve and a vacuum space on the other side thereof, one of said arcuate

portions forming a closure of said outlet and transversely movable across said air passage for increasing and decreasing the area thereof and for correspondingly decreasing and increasing the area of said vacuum space respectively, clearance being provided between said closure and said outlet, and said closure being formed for varying said clearance to correspondingly increase and decrease the vacuum in said vacuum space as the valve is opened and closed respectively.

11. A carburetor as characterized in claim 10, including a passage communicating with said outlet, a throttle valve mounted in said passage, and means intermediate said throttle valve and said other valve for introducing fuel to and for mixture with air in said passage.

12. A carburetor as characterized in claim 10, including a passage communicating with said outlet, a throttle valve mounted in said passage, means intermediate said throttle valve and said other valve for introducing fuel to and for mixture with air in said passage, and means for adjustably connecting said valve with said fuel supply means for correspondingly operating the fuel supply means and said valve as the suction in said passage is varied.

13. A carburetor provided with a chamber therein having an air inlet at one extremity and an outlet for the fuel mixture at the other extremity, a throttle valve therein adjacent said outlet, a restricted throat being formed between said inlet and said outlet, a control valve mounted in said chamber adjacent said throat and forming an air inlet space on one side thereof for communication with that portion of the chamber on the

opposite side of said throat, and a vacuum space on the other side of said valve communicating at spaced points with said throat and said air inlet space, said control valve being movable relative to and for regulating the effective area of said throat and formed so that variable clearance between said throttle valve and said vacuum chamber will be provided corresponding to the operation of said control valve as it is opened and closed.

14. A carburetor provided with a chamber therein having an air inlet at one extremity and an outlet for the fuel mixture at the other extremity, a throttle valve therein adjacent said outlet, a restricted throat being formed between said inlet and said outlet, a control valve mounted in said chamber adjacent said throat and forming an air inlet space on one side thereof for communication with that portion of the chamber on the opposite side of said throat, a vacuum space on the other side of said valve communicating at spaced points with said throat and said air inlet space, said control valve being movable relative to and for regulating the effective area of said throat and formed so that variable clearance between said throttle valve and said vacuum chamber will be provided corresponding to the operation of said control valve as it is opened and closed, means for introducing fuel to said chamber including a fuel inlet valve, and means connecting said control valve with said fuel inlet valve to regulate the quantity of fuel introduced to said chamber to correspond to the effective area of said throat.

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