

Aug. 6, 1935.

O. A. ROSS

2,010,563

CARBURETOR

Original Filed July 23, 1927 2 Sheets-Sheet 1

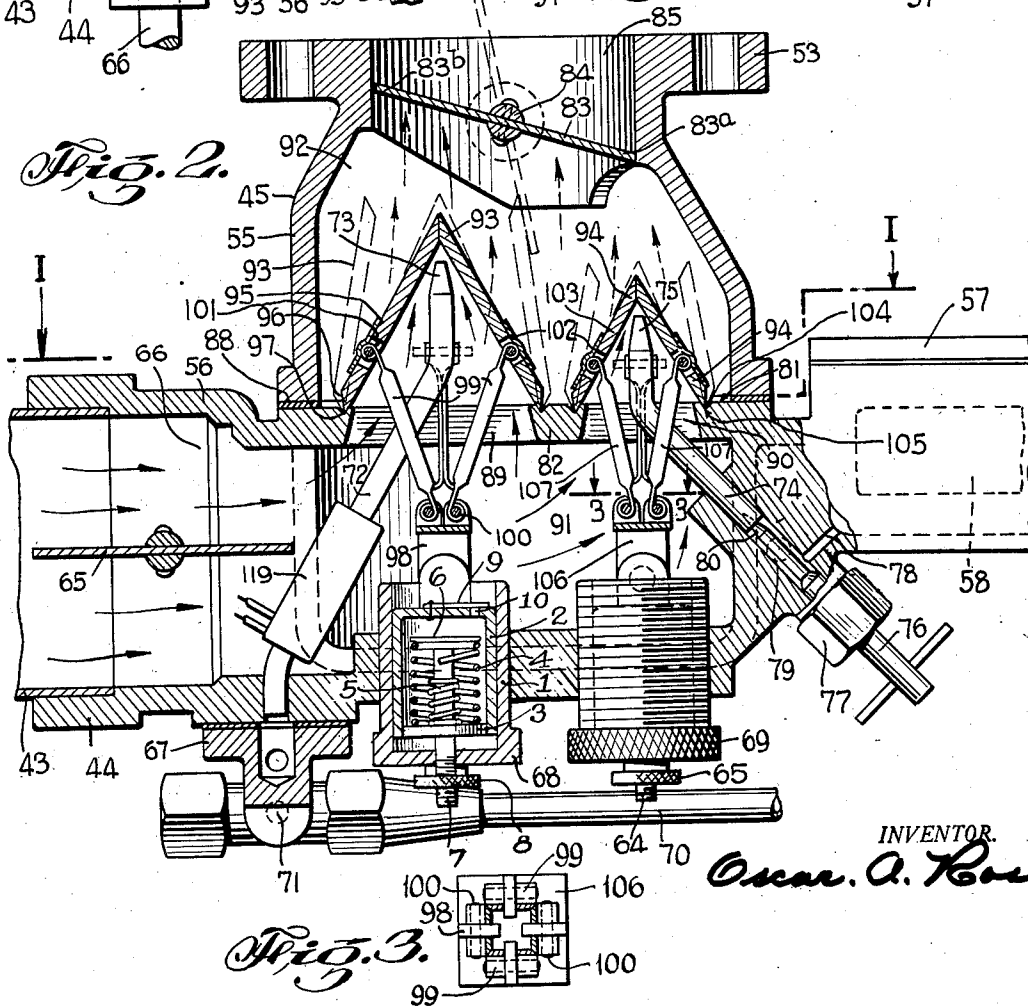
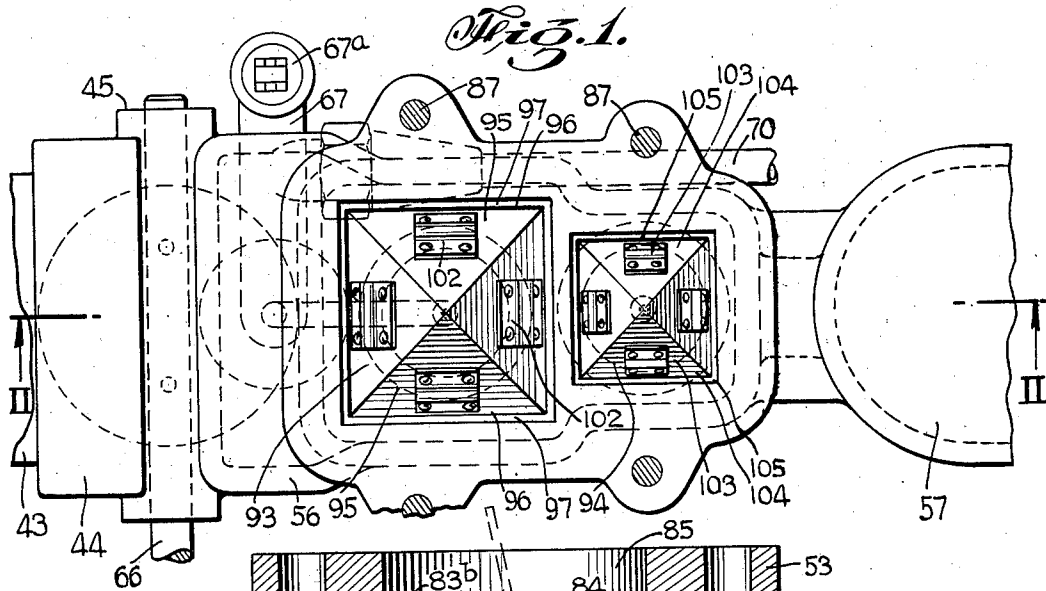
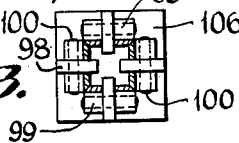


*Fig. 3.*



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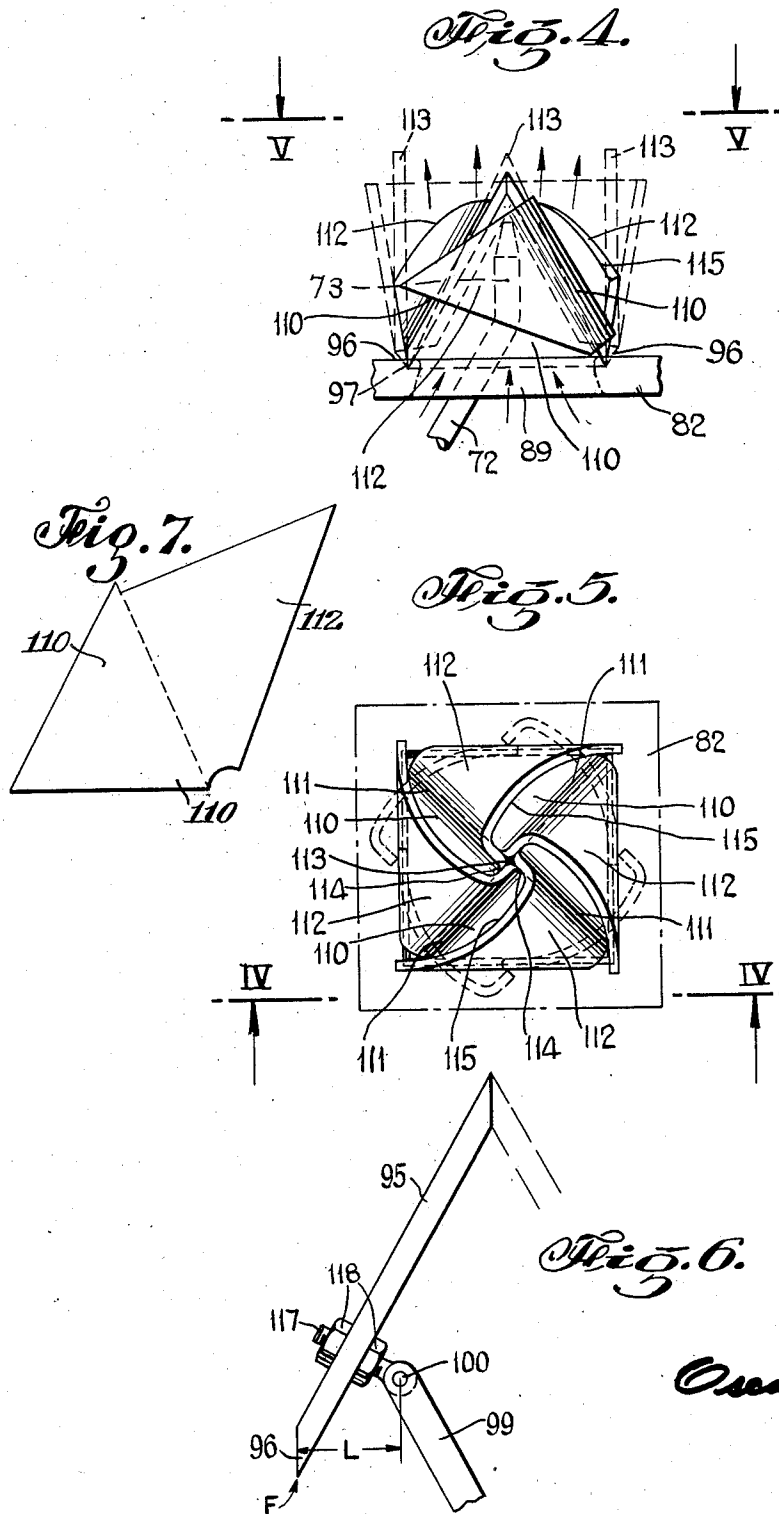
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CARBURETOR

Original Filed July 23, 1927 2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

2,010,563

## CARBURETOR

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Original application July 23, 1927, Serial No.  
207,904. Divided and this application October  
3, 1931, Serial No. 566,755

21 Claims. (Cl. 261—41)

This invention refers to carburetors and more particularly to that class employed for forming combustible mixtures for internal combustion motors.

This instrument forms a divisional application of my co-pending application Serial Number 207,904, filed July 23rd, 1927.

In the conventional form of carburetors employing a fixed opening venturi of sufficient opening to convey the maximum quantity of air therethrough at full throttle valve openings, the comparatively small air flow therethrough as compared to the comparatively large flow at full throttle valve openings, renders it exceedingly difficult to obtain a proper fuel air ratio throughout the entire range of throttle valve openings, especially at the throttle valve openings representing idling, normal and maximum driving ranges of motor vehicles. It is therefore an object of this invention to form a carburetor wherein the fuel air ratio is proportioned to give the maximum economy of operation of internal combustion motors over normal as well as idling throttle valve openings and in addition furnish an ideal fuel air ratio at full throttle valve openings whereby a comparatively rich combustible mixture is furnished for quick get-away, or operation of the motor vehicle at top speed continuously.

Another object of this invention is to furnish a carburetor for internal combustion motors wherein the passageway between the atmosphere and the motor is normally closed or sealed by valves independently of the control of the fuel supplied to form the combustible mixture.

Another object is to furnish a carburetor having an expandible wall venturi arranged to produce a variable Venturi opening immediately adjacent and surrounding the fuel delivery end of the fuel nozzle whereby an ideal fuel air ratio for economical operation of internal combustion motors may be obtained throughout the normal operating ranges thereof.

Another object is to furnish a carburetor having a normally closed expandible wall venturi arranged to produce a momentary comparatively high partial vacuum above the venturi upon opening the throttle valve whereby fuel is immediately supplied by the fuel nozzle as the Venturi walls expand for supplying the air for forming the combustible mixture, thereby preventing hesitating of the motor upon rapid throttle valve opening.

Another object is to furnish a carburetor having a plurality of air valves normally closing the passageway between the atmosphere and the motor

and retarding the opening of said valves upon the rapid opening of the throttle valve for forming a momentary comparatively high partial vacuum whereby auxiliary fuel is supplied by the fuel nozzle during the period of rapid acceleration of the motor, the retarding of the opening movement of the valves being accomplished without the retarding of the closing thereof.

Another object is to furnish a carburetor having an expandible wall venturi normally closing the Venturi passageway, the expandible wall symmetrically surrounding the fuel delivery portion of the fuel nozzle, the expandible wall in expanding forming a substantially annular space surrounding the fuel delivery portion of the nozzle, the space being symmetrical with respect to the axis of the nozzle, the expandible walls surrounding the air column flowing through the venturi whereby a substantially solid air column is directed into the combustible mixture passageway of the carburetor.

Another object of the invention is to furnish an expandible wall venturi for carburetors wherein the expandible walls are symmetrically disposed around the fuel delivery portion of the fuel nozzle whereby the fuel flowing therefrom will be uniformly dispersed into the air column flowing through said venturi.

Another object is to furnish a carburetor wherein the combustible mixture passageway between the atmosphere and the motor is normally sealed or closed by one or more valves, the supply of the fuel to the venturi being independent of the opening or closing movement of said valves.

Another object is to furnish an expandible wall venturi for carburetors wherein the movement of the air passing therethrough determines the size or area of the passageway formed by said walls for acting upon the dispersion of the fuel thereinto for forming the combustible mixture.

Another object is to furnish an expandible wall venturi for carburetors wherein the expansion of the walls is effected by the movement of the air therethrough and for a given flow of air therethrough the size of the Venturi opening is determined by retarding means normally tending to contract said walls to a closed position, in this manner effecting a variable area, the area for any given air flow being proportioned to effect the desired fuel flow from the nozzle whereby the ideal combustible mixture is formed.

Other objects and advantages will appear as the description of the invention progresses and the novel features thereof will be pointed out in the appended claims.

This invention consists in the novel construction and arrangement of parts hereinafter described, delineated in the accompanying drawings, and particularly pointed out in that portion of this instrument wherein patentable novelty is claimed for certain and peculiar features of the invention, it being understood that, within the scope of what hereinafter thus is claimed, divers changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit of, or sacrificing any of the details of the invention.

In describing the invention in detail, reference is had to the accompanying drawings, wherein I have illustrated embodiments of my invention and wherein like characters of reference designate corresponding parts throughout the several views, and in which:—

Figure 1 is a part sectional, part plan view of one embodiment of the invention taken on line 1—1 of Fig. 2, and Fig. 2 is a sectional view thereof taken on line 2—2 of Fig. 1, and Fig. 3 is an enlarged detailed view taken on line 3—3 of Fig. 2, and Fig. 4 is an elevational view of a modified form of expandible wall venturi taken on line 4—4 of Fig. 5, and Fig. 5 is a plan view of the same taken on line 5—5 of Fig. 4, and Fig. 6 is an enlarged part detailed view of one of the expandible walls of the expandible wall venturi, and Fig. 7 is a plan view of a development of one of the Venturi valve members.

Referring to Figs. 1, 2, 3, and 6, carburetor 45 comprises air receiving and nozzle section 56, Venturi or combustible mixture receiving section 55 and float chamber section 57 having float 58 arranged to control the flow of fuel to nozzles 72 and 74, the normal level of the fuel in said nozzles being below the fuel delivery ends 73 and 75 thereof.

Air receiving and nozzle section 56 comprises choke valve 65 controlling air passageway 66, also high speed fuel metering unit 67, high speed Venturi dash-pot unit 68 and normal speed Venturi dash-pot unit 69, the last three named units being more fully described in my copending application Serial Number 185,487, filed April 21st, 1927, which matured to Patent No. 1,961,249 granted Jan. 5, 1934, the fuel to unit 71 being supplied by pipe 70, connected to float chamber 57, the fuel flow to high speed nozzle being controlled by a valve (not shown).

Air receiving and nozzle section 56 also comprises normal speed nozzle 74 having fuel delivery portion 75, the fuel thereto being controlled by valve 76 adjustably supported in boss 77, the fuel flowing from float chamber 57 through passageway 78 to said nozzle. Said section also comprises Venturi portion 82 to which is secure combustible mixture receiving housing 55 supporting throttle valve 83 rotated by shaft 84 arranged to control the flow of combustible mixture to the motor through passageway 85, bolts 87—87 acting to secure housings 55 and 56 together, gasket 88, preferably of caloric insulating material being positioned therebetween.

Venturi portion 82 is formed with fixed area Venturi openings 89 and 90 forming partial communications between air receiving chamber 91 of housing or section 56 and combustible mixture receiving chamber or passageway 92 of housing or section 55.

Accelerated speed expandible wall venturi 93 arranged to normally close Venturi opening 89 comprises preferably four sector shaped wall members 95—95 having knife edges 96 arranged

to pivot in V shaped grooves 97—97 formed on face 31 of Venturi portion 82. Members 95—95 are normally constrained to a closed pyramid formation by dash-pot unit 68 acting to constrain member 98 and links 99—99 pivoted thereto downwardly, said links being pivotally connected by pins 100 and the upper ends thereof being positioned in openings 101—101 sealed by plate members 102—102.

Dashpot 68 comprises cylinder 1 supporting piston 2 sealed by washer 3 engaging one end of main spring 4 and auxiliary spring 5, the head 6 of stud 7 adjustably positioned by nut 8 engages the other ends of said springs, spring 5 only being engaged upon a predetermined movement of piston 2. Piston 2 supports feather valve 9 arranged to prevent escape of air through port 10 upon the upward movement of said piston but permit flow therethrough upon the lowering of said piston. By this arrangement the piston 2 will rise slowly and lower quickly, as more fully described in my copending application Ser. No. 185,487, filed April 21st, 1927.

Normal speed expandible wall venturi 94 is similar to venturi 93, comprising sector shaped members 103—103 having knife edges 104—104 seated in grooves 105—105 also formed in face 31 of Venturi portion 82. Members 103 are also normally constrained to closed position by dash-pot unit 69 acting to constrain members 106 and links 107—107 downwardly.

Referring to Figs. 4 and 5 showing a modified form of expandible wall venturi, when normally closed the sector shaped or flat triangular portions 110—110 of wall sections 111—111 form substantially a pyramid closure as shown by the solid lines of Figs. 4 and 5, the curved or frusto-conical portions 112—112 joined to one vertical edge of portions 110—110 overlapping said sector shaped portions 110—110. As the portions 110—110 are moved outwardly and upwardly the inner faces of curved or frusto-conical portions 112 move in juxtaposition to the free edge 114 of portions 110 thereby maintaining a substantially continuous wall around the fuel delivery portion 73 of nozzle 72.

Figure 6 illustrates a modified form of pivotally connecting links 99 with an expanding wall member, as 95, said member having an eye stud 117 secured thereto by nuts 118—118, the pin 119 passing through said stud and link for the pivotal connection thereof.

#### Operation

When the internal combustion motor with which the applicant's novel form of carburetor is associated, is at rest, the expandible wall venturis 93 and 94 are closed as shown by the full line positions of the drawings thereby forming substantially a seal or closure between the atmosphere and the said motor. Assuming the motor to be warmed up and the throttle valve 83 opened slightly, as said motor is cranked, a partial vacuum is formed in chamber or passageway 92, said vacuum acting to cause walls 103—103 to partially move outwardly and upwardly thereby establishing a comparatively small Venturi opening surrounding the fuel delivery portion 75. Owing to the comparatively slow movement or expansion of said walls due to the dash-pot action of unit 69 and the resulting comparatively high vacuum produced in chamber 92, the initial movement of the air flow through said comparatively small opening will be comparatively rapid, therefore acting to immediately withdraw fuel from

the nozzle tip, or fuel delivery portion 75 of nozzle 74, the quantity of said fuel in proportion to the quantity of air flow being comparatively large whereby a momentary comparatively rich mixture is supplied to the motor cylinders in this manner assuring a ready starting thereof. The final opening formed by the movement of the expandible wall Venturi members 103, will be determined by the throttle valve opening, the downward tension acting to close said members being adjusted by nut 8 whereby the opening formed will produce an air flow therethrough sufficient to withdraw an amount of fuel from the nozzle tip 75 to form a combustible mixture having an air fuel ratio tending to produce a maximum of economy in the operation of the motor for the power produced thereby.

As the throttle valve 83 is further opening to supply additional combustible mixture to the motor, the air flow through venturi 90 is increased thereby acting to further expand wall members 103 outwardly and upwardly as shown by the dotted line positions of venturi 94, in this manner further increasing the Venturi opening surrounding nozzle tip 75, said increase in opening being of the order to maintain the fuel air ratio to produce maximum economy in operation of the motor.

Assume the throttle valve 83 is opened fully for the purpose of operating the motor at maximum power, and in which instance a comparatively richer mixture is required. As said valve is opened the expandible wall members 95 of expandible wall venturi 93 are moved outwardly and upwardly similarly to the operation of venturi 94, the downward tension of dash-pot unit 68 however being proportioned whereby, at least at the final movement of said members the fuel air ratio is of the order to produce a comparatively rich mixture thereby producing a maximum power from said motor however at the sacrifice of more economical operation thereof with respect to fuel consumption thereby. Members 95 are also retarded in their opening similarly to members 103 whereby a momentary comparatively rich mixture is formed as the throttle valve is quickly opened from a normal operating position to an accelerated speed operating position thereby furnishing a comparatively high accelerating torque by said motor.

Whereas two expandible wall venturis as 93 and 94 have been shown, only one of said venturis may be employed, the dash-pot unit 68, 69 being arranged to effect a comparatively greater retarding action during the final movement thereof for producing a comparatively richer combustible mixture during the full open positions of throttle valve 83, in other words during the initial movements of the dash-pot unit, the Venturi openings established will produce a maximum economy of operation of the motor whereas during the final movements thereof the openings formed will produce a fuel air ratio furnishing a comparatively rich combustible mixture.

Owing to proportioning the Venturi opening in proportion to the air flow therethrough as well as establishing said air flow immediately adjacent and surrounding the fuel nozzle, the normal fuel level within said nozzle may be maintained in a comparatively lower plane than in conventional carburetors, thereby preventing any substantial change in the fuel air ratio when the carburetor is angularly displaced, as for example when a motor vehicle is moving up or down a grade.

Whereas the expandible wall venturis, as 93 and

94 are of the "split type venturi" the expandible wall venturis shown in Figs. 4 and 5 have a substantially continuous wall formed therearound during the expansion and contraction thereof for varying the Venturi opening therethrough.

Whereas the expandible wall members 95 and 103 are shown as flat, they may be curved, or concave to form a hollow cone when in the closed position, and if desired the flat walls 110 may be also formed in this manner.

What I claim is:—

1. In a carburetor, a chambered housing, an expandible venturi therein including a plurality of similarly formed adjacently positioned valves arranged symmetrically around the axis of the Venturi passageway, each valve having an overlapping portion overlying a valve adjacent thereto and an overlapped portion surrounded by the overlapping portion of another adjacent valve, and means supported by the housing pivotally supporting the valves for variably opening and closing the Venturi passageway upon the movement of air therethrough, the movement of the overlapping and overlapped portions being in juxtaposition one to the other for forming a substantially continuous wall around the passageway during the variable opening and closing thereof.

2. In a carburetor, a chambered housing, a high speed venturi supported therein having expandible wall portions normally closing the high speed Venturi passageway therethrough, the wall portions being arranged to be moved for opening and closing the passageway upon the movement of air therethrough, a low speed venturi supported by the housing having expandible wall portions normally closing the low speed Venturi passageway therethrough, the wall portions being arranged to be moved for opening and closing the passageway upon the movement of air therethrough, means resiliently urging the high speed Venturi wall portions to closed position arranged to resiliently permit variable opening thereof upon the passage of air therethrough, and means resiliently urging the low speed Venturi wall portions to closed position arranged to resiliently permit variable opening thereof upon the passage of air therethrough, the high speed Venturi resilient means being arranged to restrain opening of the high speed Venturi wall portions until after a predetermined opening of the low speed Venturi wall portions.

3. In a carburetor, a chambered housing, a high speed venturi supported therein having expanding wall portions normally contracted to close the high speed Venturi passageway, the wall portions being arranged to be moved for opening and closing the passageway upon the movement of air therethrough, a low speed Venturi supported by the housing having expanding wall portions normally contracted for closing the low speed Venturi passageway, the wall portions being arranged to be moved for opening and closing the passageway upon the movement of air therethrough, means resiliently urging the high speed Venturi wall portions to closed position arranged to resiliently permit variable opening thereof upon the passage of air therethrough, means resiliently urging the low speed Venturi wall portions to closed position arranged to resiliently permit variable opening thereof upon the movement of air therethrough, and means independently adjusting the high and low speed Venturi resilient means for varying the movement of the wall portions of one venturi with respect to the movement of the wall portions of

the other venturi in response to air flowing there-through.

4. In a carburetor, a chambered housing, a venturi supported therein including a plurality of similarly formed valves arranged symmetrically around the axis of the Venturi passageway normally effecting the closure thereof, the valves being arranged to be moved for effecting a variable opening and closing of the passageway upon the variable movement of air therethrough, and means forming solely a portion of the valves arranged to effect a substantially continuous wall surrounding the Venturi passageway during the opening and closing movement thereof, the wall being continuously formed independently of any fixed portions of the carburetor body.

5. In a carburetor, a chambered housing, a venturi supported therein including a plurality of similarly formed valves arranged symmetrically around the axis of the Venturi passageway normally effecting closure thereof, the valves being arranged to be moved for effecting a variable opening and closing of the passageway upon the variable movement of air therethrough, and overlapping body portions on the valves arranged to effect a substantially continuous wall surrounding the Venturi passageway during the opening and closing movement thereof, the overlapping body portions of the valves forming the sole means for effecting a substantially continuous wall surrounding the Venturi passageway during the opening and closing thereof.

6. In an expandible wall member for expandible Venturi valves, a substantially flat triangular portion, a frusto-conical portion joined to one edge thereof, and a pivotally mounted actuating member supported by the triangular portion spacedly between the edges thereof.

7. In a carburetor, a chambered housing having an air passageway therethrough, an expandible Venturi valve in the passageway having a plurality of similar movable wall members operable in response to the movement of air through the passageway, each wall member comprising an overlapped body portion and an overlapping extension joined to one edge of the overlapped body portion.

8. In a carburetor, a chambered housing, an expandible Venturi valve in the chamber having a plurality of pivotally mounted normally engaged expanding wall members arranged symmetrically around the axis of the Venturi passageway normally effecting closure thereof, the wall members being actuated in response to flow of air through the passageway, connecting members having one end thereof pivotally connected to the wall members spacedly between the pivoted and free ends thereof, and a dash-pot unit supported by the housing having the moving element thereof pivotally connected to the other end of the connecting members, the moving element resiliently urging the wall members to the closed position of the valve.

9. In a carburetor, a chambered housing having air inlet and outlet openings, a chambered Venturi valve housing secured to the air housing, an expandible Venturi valve in the chamber of the Venturi valve housing having normally engaged expanding wall members pivotally supported by the air housing, the members surrounding the air outlet opening therein, a dash-pot unit adjustably supported by the air housing having the moving element thereof linked connected to the Venturi wall members and actuated thereby, means for adjusting the position

of the dash-pot unit by rotation thereof, the axis of rotation of the unit being coaxial with the axis of the Venturi valve.

10. In a carburetor, a housing having a Venturi chamber therein, a Venturi valve in the chamber comprising a plurality of expandible wall members normally closing the Venturi passageway in the chamber, a flat triangular portion on each wall member having a frusto-conical portion joined thereto, the frusto-conical portion of one wall member being moved in juxtaposition to the flat triangular portion of the adjacent wall member as the members are expanded and contracted in response to variable flow of air through the valve, and means supported by the housing for operatively supporting the wall members for expansion and contraction as the valve opens and closes.

11. In a carburetor, a housing having a Venturi chamber therein, a Venturi valve in the chamber comprising a plurality of expandible wall members normally closing the Venturi passageway in the chamber, a flat triangular portion on each wall member having a frusto-conical portion integrally joined thereto, the frusto-conical portion of one wall member being moved in juxtaposition to the flat triangular portion of an adjacent wall member as the members are expanded and contracted in response to variable flow of air through the valve, and means supported by the housing for pivotally supporting the wall members for expansion and contraction as the valve opens and closes.

12. In a carburetor, a housing having a Venturi chamber therein, a Venturi valve in the chamber comprising a plurality of expandible wall members normally closing the Venturi passageway in the chamber, a triangular body portion on each wall member having a frusto-conical extension joined thereto, the frusto-conical extension being moved in juxtaposition to the body portion of an adjacent wall member as the members are expanded and contracted for opening and closing the valve in response to variable flow of air therethrough, and means formed on the housing for positioning the wall members for movement to expand and contract the Venturi opening therethrough.

13. In a carburetor, a housing having a Venturi chamber therein, a Venturi valve in the chamber comprising a plurality of expandible wall members normally closing the Venturi passageway in the chamber, a triangular body portion on each wall member having a frusto-conical extension joined to one edge thereof, the frusto-conical extension being moved in juxtaposition to the body portion of the adjacent wall member as they are expanded and contracted for opening and closing the valve in response to variable flow of air therethrough, a hinge formed on another edge of the body portion, and means formed on the housing for pivotally supporting the wall members at the hinge thereof.

14. In a carburetor, a housing having a Venturi chamber therein, a Venturi valve in the chamber comprising a plurality of expandible wall members normally closing the Venturi passageway therein, a triangular underlying wall portion on each member having an overlying triangular wall portion joined to the underlying portion, the overlying portion of one wall member being moved in juxtaposition to the underlying portion of the adjacent wall member as the valve is expanded and contracted in response to variable flow of air therethrough, and means

formed on the housing for operably supporting the wall members for expansion and contraction thereof.

15. In a carburetor, a housing having a Venturi chamber therein, a Venturi valve in the chamber normally closing the Venturi passageway therein, the valve comprising a plurality of expandible wall members arranged symmetrically around the axis of the Venturi passageway, each wall member comprising an underlying and overlying wall portion, the overlying portion of each member normally overlying the underlying portion of the adjacent member during the expansion and contraction of the members as the valve is opened and closed in response to variable flow of air therethrough, and means formed on the housing for operably supporting the wall members for expansion and contraction.

16. In an expandible wall member for expanding Venturi valves, an isosceles triangle plate portion, and a frusto-conical plate portion having one edge thereof joined to one of the equal edges of the isosceles triangle plate portion.

17. In an expandible wall member for expanding Venturi valves, an isosceles triangle plate portion, and a frusto-conical plate portion hav-

ing one edge thereof integrally joined to one of the equal edges of the isosceles triangle plate portion.

18. In an expandible wall member for expanding Venturi valves, a flat triangular plate portion, and a curved triangular plate portion having one edge portion thereof joined to one edge of the flat triangular plate portion.

19. In an expandible wall member for expanding Venturi valves, an isosceles triangle plate portion, a curved plate portion joined to one of the equal edges of the isosceles triangle plate portion, and means for movably supporting the member formed on the unequal edge of the isosceles triangle plate portion.

20. In an expandible wall member for expanding Venturi valves, triangular male and female plate portions joined together, and a supporting portion for movably supporting the valve formed solely on one of the triangular plate portions.

21. In an expandible wall member for expanding Venturi valves, triangularly shaped overlapping and overlapped portions joined together, and a supporting portion for movably supporting the member formed on the overlapped portion.

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