Oct. 21, 1952 A. C. RUSSELL 2,614,581

CARBURETOR WITH AUTOMATIC AIR FEED CONTROL

Filed Aug. 2, 1948 2 SHEETS—SHEET 1

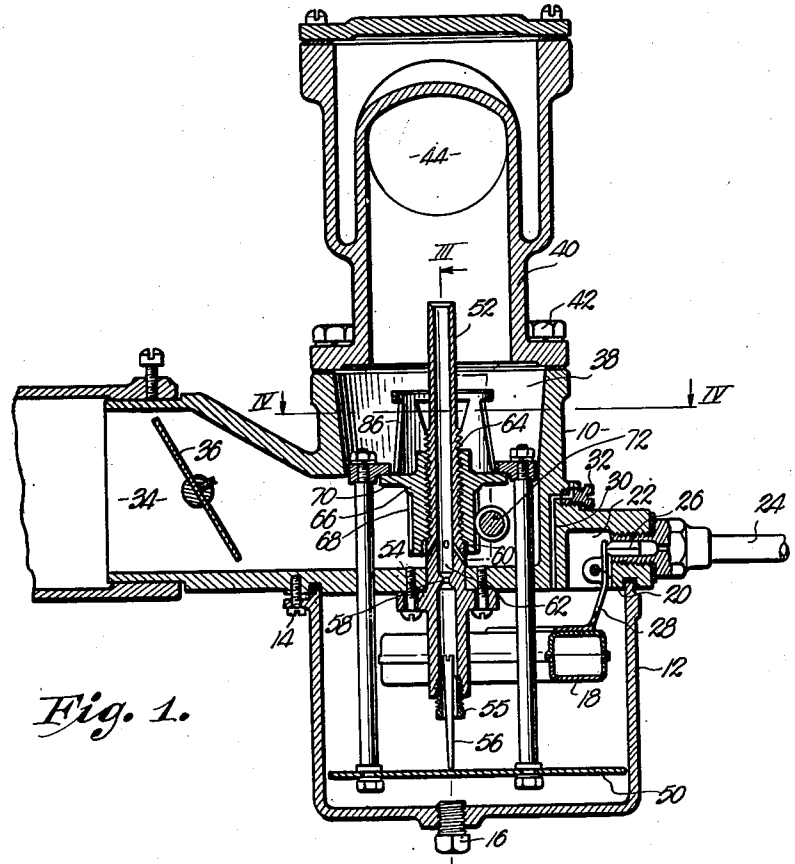


Fig. 1.

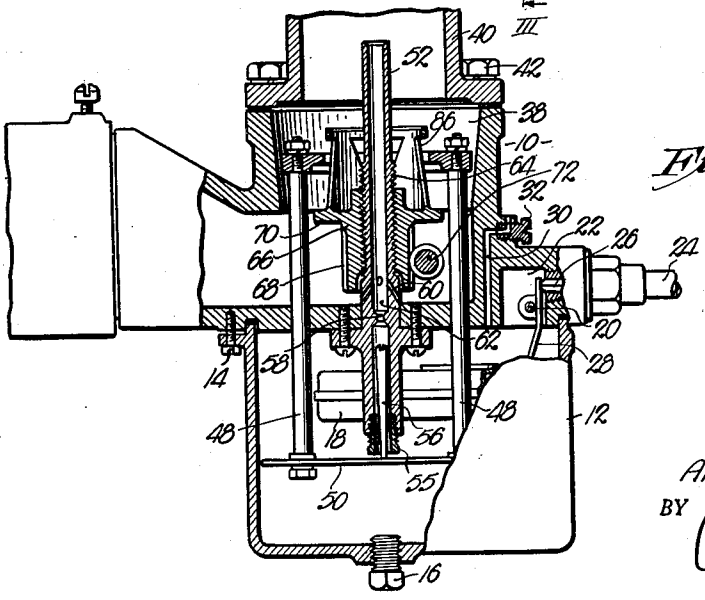


Fig. 2.

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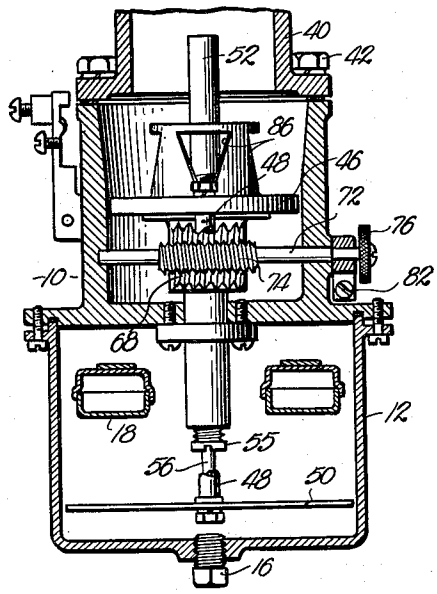


Fig. 3.

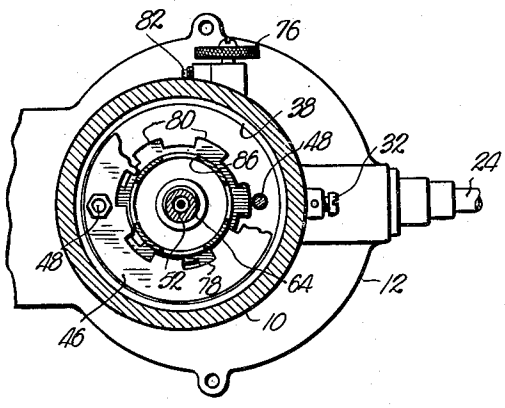
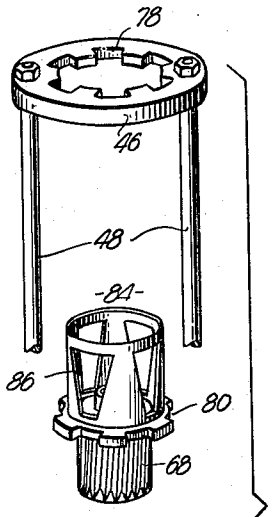


Fig. 4.



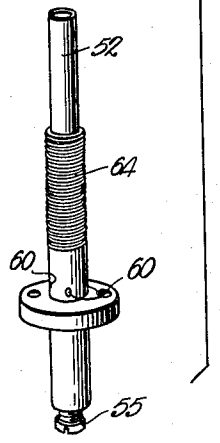


Fig. 5.

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UNITED STATES PATENT OFFICE

2,614,581

CARBURETOR WITH AUTOMATIC AIR FEED CONTROL

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3 Claims. (Cl. 137—481)

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This invention relates to carburetors for internal combustion engines embodying the broad principle of operation of my Patent No. 2,366,056, issued December 26, 1944, the primary aim being to incorporate in a carburetor all of the advantageous features of the aforesaid patent and to improve thereon.

This invention has for its most important object the provision of a carburetor operating on the broad principle of suction created within the internal combustion engine itself with which the carburetor is designed to be used, said suction serving to draw fuel from a bowl therefor to a point where the same mixes with air, and further, to a point where a larger volume of air passing through the carburetor admixes with and causes further vaporization of the fuel prior to the passage of the mixture into the engine.

Another important object of this invention is to provide novel means for controlling the flow of air through the carburetor and particularly to structure that will automatically feed air in progressively increased amounts as fuel is simultaneously fed in progressively increased amounts.

A further object of this invention is to provide a carburetor having a floating type air valve similar in many respects to the aforesaid co-pending applications, said valve controlling the passage of air through the carburetor for mixing with the fuel and being ring-like for slidably circumscribing a tubular element within the carburetor casing, said tubular element being provided with substantially triangular-shaped openings for receiving the air as said valve moves toward the fully open position, the said triangular-shaped openings having their apexes disposed adjacent the opposite end of the path of travel of the valve.

Another object of this invention is to provide a carburetor having a specially-formed chamber that progressively increases in cross-sectional area as the normally uppermost end thereof is approached, the above-mentioned ring-like valve being disposed within the chamber and normally at the lowermost end thereof, all to the end that increased amounts of air are directed to the engine as the valve moves toward the larger end of the chamber.

A still further object of this invention is to provide a support or seat for the aforesaid reciprocable air valve, the valve and the seat being provided with registrable openings and the seat being rotatable with respect to the valve, to the end that the size of passageway provided by the openings can be varied to direct selected amounts of air through the carburetor for idling purposes.

Another object of the present invention is to provide means common to the adjustable valve seat and to the valve itself for selecting the size of the idling openings and, also, for positioning the valve itself at predetermined positions within the above-mentioned frusto conical chamber.

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Many minor objects relating to details of construction will be made clear as the following specification progresses, reference being had to the accompanying drawing, wherein:

Fig. 1 is a vertical, substantially central, cross-sectional view taken through a carburetor having automatic air feed controls made in accordance with my present invention.

Fig. 2 is a sectional view similar to that shown in Fig. 1, but illustrating the carburetor in a substantially fully open condition.

Fig. 3 is a fragmentary, cross-sectional view taken on line III—III of Fig. 1, looking in the direction of the arrows.

Fig. 4 is a transverse cross-sectional view taken on line IV—IV of Fig. 1, looking in the direction of the arrows; and

Fig. 5 is a fragmentary, stretched-out, perspective view of certain of the parts of the carburetor entirely removed therefrom.

A hollow casing broadly designated by the numeral 10 has secured thereto a fuel bowl 12 by means of a plurality of bolts or the like 14. As shown in Figs. 1, 2, and 3, fuel bowl 12 depends from the casing 10 and is provided with a conventional drain plug 16.

A float 18 is disposed within the fuel bowl 12 for determining the level of fuel therein, said float 18 pivotally mounted as at 20 within a cavity 22 forming a part of the casing 10. Cavity 22 communicates at its lowermost end with the fuel bowl 12 and, also, with a conduit 24 having connection with a suitable source of liquid fuel (not shown). Conduit 24 is secured directly to the casing 10 and has interposed therein a valve 26 that is shiftable to and from a closed position by a portion of bracket 28 for mounting float 18, said bracket 28 extending above the pivot point 20 within chamber 22 as clearly illustrated in Figs. 1 and 2 of the drawing.

One wall of the casing 10 has a Z-shaped bore 30 formed therein, placing the bowl 12 above the level of fuel therein into direct communication with the atmosphere. A set screw or the like 32 is threaded into this bore 30 intermediate its ends and is, likewise, provided with an L-shaped opening therethrough that communicates with bore 30. Obviously, the turning of screw 32 determines the amount of air that may pass into the fuel bowl 12 by way of bore 30.

Casing 10 is provided with an air inlet 34 and a conventional butterfly valve 36 is movable to and from a position closing the passage of air through intake opening 34 in the usual manner. This butterfly valve 36 has direct connection with either manually operable or automatic choke elements forming a part of the internal combustion engine and, since such interconnection forms no part of this invention, the same has not been illustrated.

The casing 10 is, also, provided with a frusto conical chamber 38 communicating at its lower-

most end with the intake opening 34 and at its uppermost end with a casting 40 that, in turn, communicates with the intake manifold of the automobile. Casting 40 is secured directly to the casing 10 by means of bolts or the like 42 and presents an air outlet 44 for the carburetor. It is to be noted that the chamber 38 forming a part of the casing 10 is tubular and its cross-sectional area progressively increases as the uppermost end thereof is approached, all for purposes hereinafter more fully set forth.

A ring-like air valve 46 of the nature shown in Fig. 5, having an outside diameter but slightly less than the inside diameter of chamber 38 at its lowermost end, is disposed in such chamber 38 and mounted upon the uppermost ends of a pair of rods 48 that are free for longitudinal and vertical reciprocation within the bottom wall of casing 10 in the manner clearly illustrated in Figs. 1 and 2 of the drawing.

The lowermost ends of the posts 48 receive a flat, preferably circular, plate 50 that is disposed within the fuel bowl 12 and of such diameter as to be freely movable vertically therein. The casing 10 and the bowl 12 are interconnected by an elongated member 52 that is hollow throughout its lengths and rigidly secured to the bottom wall of casing 10 by bolts 54. Obviously, the float 18 will maintain a level of fuel within the bowl 12 at a point substantially midway thereon and, consequently, the lowermost end of the member 52 extends into such liquid fuel.

This lowermost end of the member 52 is provided with a plug 55 having an opening therethrough for receiving a tapered, elongated valve pin 56. The smaller end of this pin 56 rests directly upon the uppermost face of the plate 50, and the entire pin 56 is free for vertical reciprocating in plug 55 as plate 50 moves within the bowl 12.

A restricted opening 58, concentric with the bore through member 52, is disposed intermediate the ends of the latter and above the level of fuel within the bowl 12. A plurality of angular passageways 60 formed in the member 52 place the interior of the member 52 into direct communication with the casing 10 and with the flow of air therethrough from inlet 34 to outlet 44.

It is to be noted that these passageways 60 are disposed at an angle capable of directing the air entering therein in a general direction upwardly and into the member 52 above the level of fuel therein, as will hereinafter be more fully described. Consequently, a fuel chamber 62 is formed in the member 52 above the tapered valve 56 and below the innermost ends of the angular passages 60.

The uppermost end of the member 52 terminates above the chamber 38 of casing 10 and directly within the path of travel of air through the casing 10. External threads 64 are formed on the member 52 between the passages 60 and the uppermost end of member 52. These threads 64 receive a head 66 provided with a tapped bore therethrough, said head 66 being, also, externally threaded as at 68 and having an annular, outturned flange 70 intermediate the ends thereof and directly above the threads 68.

As most clearly illustrated in Fig. 3 of the drawing, a shaft 72 traverses the casing 10 and is journalled within the walls thereof, said shaft 72 being provided with threads 74 that are in mesh with the threads 68 of the head 66. One end of the shaft 72 extends to the exterior of casing 10 and is provided with a knurled grip 76 permitting manual rotation thereof.

The internal diameter of the ring-like air valve 46 is less than the outside diameter of the flange 70 of head 66 and a plurality of notches 78 and 80 are formed in the valve 46 and flange 70, respectively. Thus, as shown in Fig. 1 of the drawing, the valve 46 may rest directly upon the out-turned flange 70 and, as the head 66 is caused to rotate upon the member 52, the notches 80 thereof will be brought into and out of register with the notches 78 of ring 46.

Thus, even with the valve 46 at the lowermost end of its path of travel, air may pass from inlet 45 to outlet 44 to an extent depending upon the selected position of the head 66 as determined by rotation of shaft 72. A locking clamp 82 holds the shaft 72 against rotation when the size of the openings, as defined by notches 78 and 80, are set as desired. It is, also, notable that rotation of the head 66 will raise and lower the valve 46 with respect to the lowermost end of the chamber 38 and the extent of air that may pass around the exterior of valve 46 is thereby varied because of the particular contour of chamber 38.

A tubular member broadly designated by the numeral 84 extends upwardly from the uppermost face of the out-turned flange 70 and is preferably cast integrally with the body 66. This cylindrical member 84 is open at its uppermost end and circumscribing not only that portion of head 66 extending above flange 70 but, also, completely encircles a portion of the member 52 that extends above the head 66.

Cylinder 84 is, also, provided with a plurality of trapezoid openings 86 in the side walls thereof. These openings 86 progressively increase in width as the uppermost end of cylinder 84 is approached, and the angularity of the side edges of these openings 86 is chosen in accordance with the angularity of the walls of chamber 38, all to the end that the amount of air which will pass from inlet opening 34 to outlet opening 44 is progressively increased as the air valve 46 approaches the uppermost end of its path of travel.

In operation, the amount of air that is always free to pass through the casing 10 for idling purposes is initially determined by adjustment of the shaft 72. As above made clear, such air passes not only around the periphery of valve 46 but through the openings provided by bringing notches 78 and 80 of valve 46 and flange 70, respectively, into register.

Such idling air passes directly upwardly into the chamber 38 and thus through the outlet opening 44. Such adjustment of the shaft 72 will, also, determine the extent to which fuel valve 56 is opened to permit passage of fuel from the bowl 12 to mixing chamber 62. Air is, also, always free to flow into the passages 60 from inlet 34 where the same creates a suction at the innermost ends thereof within the member 52. Such suction serves to draw the raw fuel upwardly from valve 56 past restriction 58 and into the mixing chamber 62.

During idling, the air that passes into the chamber 38 and thence upwardly along the member 52 will, also, create a suction at the uppermost end of member 52 to draw the mixed air and fuel therefrom. When such mixture passes outwardly from the member 52, it will, also, mix with the air that is moving upwardly from chamber 38, and further vaporization takes

place prior to passage into the engine by way of outlet 44.

It is apparent that a column of fuel is always present within the member 52 at a point above the level of fuel within the bowl 12, since the moment that suction is created within member 52, additional air will enter the bore 30 and direct itself against the level of fuel within bowl 12. Consequently, the suction that is created within the member 52 adjacent the innermost ends of the passages 60 will always draw raw fuel from such column of fuel in mixing chamber 62.

A butterfly valve (not shown) of conventional character is provided within the passageway from outlet 44 to the inlet manifold of the engine. Such butterfly valve controls the amount of suction that is permitted to pass from the engine to the casing 10 and is connected to any type of control or accelerator as desired.

When such butterfly valve is moved toward the fully opened position, and suction within the engine is permitted to pass to a greater extent toward the casing 10, increased suction within the chamber 38 will cause the valve 46 to raise from its seated position upon the flange 70. Increased amounts of fuel will thereby enter the member 52 around valve 56 and increased amounts of air will pass into chamber 38 around the valve 46.

There will be no "on rush" of air into the chamber 38, however, since the extent of passage of such air is controlled not only by the inclined walls of chamber 38 but by the openings 86 in cylinder 84. The amount of air that can pass directly into chamber 38 progressively increases as the valve 46 approaches the uppermost end of its path of travel. By the same token, the amount of air that can pass into the cylinder 84 by way of openings 86 and around the flange 70 progressively increases as valve 46 approaches the uppermost end of cylinder 84.

Fig. 2 of the drawing clearly illustrated the way in which a gradual increase in combined passageway for the air through the casing 10 is provided when the valve 46 is at the uppermost end of its path of travel. The cylinder 84 cooperates with the chamber 38 in such function and, additionally, serves to channel the incoming air into a column surrounding the chamber 52, thereby creating a more effective suction area at the uppermost end of member 52 for drawing the air and fuel mixture from the mixing chamber 62.

The desired turbulence of air within the chamber 38 is maintained and even certain amounts of such air will be drawn into the cylinder 84 through passages 86 because of the creation of a suction at the openings 86 as air passes upwardly and outwardly from the uppermost open end of cylinder 84.

It is apparent from the foregoing that the carburetor above described operates in the same manner as my above-mentioned patent with respect to admixture of air and fuel and as to control of the floating air valve by suction created within the engine. The improvements, consisting of the way in which the air valve is adjusted for idling, the way in which idling air is provided separate from the air valve 46 itself, and the way in which the passage of air is definitely controlled as it flows from inlet 34 to outlet 44, all combined provide a carburetor that is more efficient in its operation and capable of creating increased performance and tremendous saving in fuel consumption.

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

1. In a carburetor, a case having an air passage therethrough and provided with an inlet end and an outlet end; valve structure within said air passage and including a rotatable, valve-supporting member; means for rotating said member; an elongated cylinder on the member between the latter and said outlet end of the air passage, one end of the cylinder proximal to the said outlet end of the air passage being open and its opposite end being closed by said member and an annular valve circumscribing said cylinder and slidably mounted thereon for reciprocable movement on the longitudinal axis of the cylinder toward and away from a position resting on said member; a plurality of notches formed in said member and in said valve respectively, the notches of the member being registrable with corresponding notches of the valve when the valve is resting on the member and upon rotation of the member to a predetermined position relative to the valve to present a number of ducts for flow of air from said inlet end to said outlet end of the air passage; and a plurality of elongated side openings formed in said cylinder and having their longitudinal axes extending longitudinally of the cylinder, the width of said openings progressively increasing as said open end of the cylinder is approached.

2. In a carburetor as set forth in claim 1 wherein said case is provided with a frusto-conical chamber circumscribing the valve and the cylinder and defining a portion of said air passage, the diameter of the chamber progressively increasing as the outlet end of said air passage is approached, the walls of the case forming the chamber being spaced from the valve when the latter is resting on the member.

3. In a carburetor as set forth in claim 1 wherein said case is provided with a frusto-conical chamber circumscribing the valve and the cylinder and defining a portion of said air passage, the diameter of the chamber progressively increasing as the outlet end of said air passage is approached, the walls of the case forming the chamber being spaced from the valve when the latter is resting on the member, and wherein there is provided an elongated screw-threaded mounting co-axial with said cylinder, said member encircling the mounting and having screw threads in mesh with the threads of said mounting whereby to vary the position of the valve relative to the chamber when the valve is resting on the member and upon rotation of the latter with respect to said mounting.

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