June 23, 1942. E. W. PUMMILL 2,287,570

CARBURETOR

Filed Jan. 17, 1941

FIG. 5

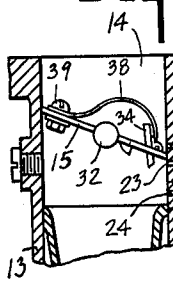


FIG. 1

FIG. 2

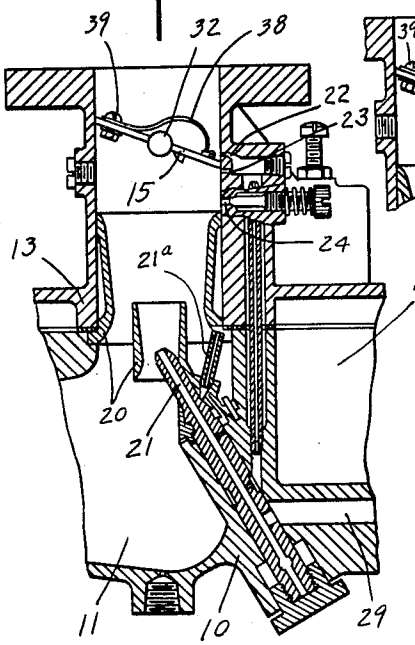


FIG. 6

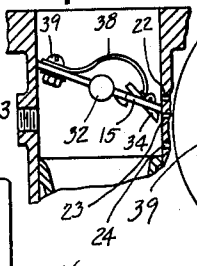


FIG. 3

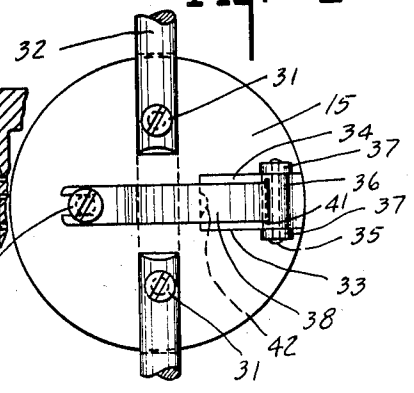
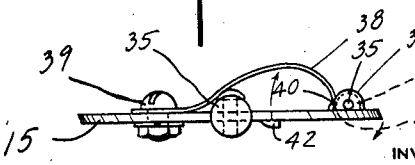


FIG. 4



INVENTOR.

EDWIN W. PUMMILL.

BY Lockwood, Goldsmith & Galt.

ATTORNEYS.

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CARBURETOR

Edwin W. Pummill, Indianapolis, Ind.

Application January 17, 1941, Serial No. 374,869

5 Claims. (Cl. 261—41)

This invention relates to carburetor improvements.

This application is a substitute for or a continuation-in-part of copending application, Serial No. 290,562, filed August 17, 1939, entitled "Decelerating and mixture regulating control valve arrangement."

The chief object of this invention is to improve internal combustion engine performance in aeroplanes and automobiles such as passenger cars, busses, trucks, or the like, increase engine efficiency and secure economy of engine operation.

The chief feature of the invention consists in providing means operable at excessive or extremely high vacuums for relieving the same for attaining the several attending desirable results, hereinafter to be described.

Another feature of this invention is the relief of such region of high vacuum by venting same to a region of atmospheric or substantially atmospheric pressure and holding such first mentioned region to a constant lower vacuum, such as, for example only, say 20 inches of mercury.

A further feature of this invention consists in providing the usual carburetor throttle valve with a relief valve automatically operable by the excessive vacuum resulting from throttle valve closing at high engine speeds, so that a dual valve of said character when positioned relative to the "low idle" and "high idle" fuel supplies in the carburetor attains certain results hereinafter to be more fully described, but which may be briefly set forth as relating to fuel supply control.

The full nature of the invention will be understood from the accompanying drawing and the accompanying specification and claims.

In the drawing,

Fig. 1 is a central sectional view of a conventional updraft carburetor (Stromberg type SF) embodying the invention with the throttle valve in wide open position.

Fig. 2 is a similar view of the invention embodied portion of the carburetor showing the dual valve arrangement in closed throttle position and the dotted lines indicate the high vacuum relief position of the relief valve.

Fig. 3 is a top plan view of the dual valve structure.

Fig. 4 is a side elevation of the dual valve structure.

Figs. 5 and 6 are side elevational views of the combination fuel and relief valve in juxtaposition to the associated fuel, etc., ports and the relief valve being in different positions for fuel control.

In Fig. 1 of the drawing, there is illustrated a "Stromberg type SF" carburetor including a lower body casting 10, having an air passage 11 therein controlled by a choke valve 12 normally constrained to open position. Herein an upper body casting 13 includes a fuel mixture passage 14 controlled by a throttle valve 15 manually controlled by hand and/or foot operable controls, not shown, but of conventional character.

A float chamber 16 in both castings includes the float 17 and connected valve 18 for controlling fuel supply thereto by line 19. Between the choke and throttle valves is a conventional or suitable Venturi structure 20 and in juxtaposition is the supply end of a main fuel supply jet 21.

Herein the carburetor is shown provided with an "idle" or "low idle" fuel supply 22 and an "off idle" or "high idle" fuel supply 23. Also, there may be included an air bleed and idle adjustment 24. These fuel supply arrangements all communicate with float chamber 16.

Normally, a carburetor of this type briefly functions as follows: With the throttle valve open and choke partially closed, the engine suction draws a greater or richer ratio of fuel mixture. After starting, the choker valve is full open and engine performance is governed by throttle valve operation only.

With the throttle valve wide open at low engine speeds, most of the fuel is supplied by jet 21. At higher engine speeds, a bypass fuel supply 29 becomes increasingly effective to supply additional fuel to the mixture through jet 21.

When the throttle valve is fully closed and the engine is idling without load, engine suction draws fuel only from the low idle supply 22 to maintain engine operation, air bleeding thereto through structure 24. When the throttle valve is nearly closed and the engine is operating under high idle conditions, fuel is supplied by both fuel supplies 22 and 23, air bleeding by structure 24 still functioning. A fifth fuel supply is the accelerator or throttle accelerating pump which discharges fuel under pressure upon the accelerating stroke or opening of the throttle valve through jet 21. This supply is partially disclosed and indicated at 21a.

All of the foregoing is the conventional construction and operation of a carburetor of the Stromberg type specified. Of course, it is to be understood that but one main fuel supply and but one "idle" supply may be employed but present

day requirements usually require provision of these five supplies for proper engine performance demanded at this time.

If it be assumed that such a conventional plain tube carburetor is employed and the throttle be closed or nearly closed from a wide open position and in a very short time, as occurs when stopping a car from high speed to a wait for a traffic light to change, then a vacuum of as much as 25 or 26 inches of mercury may be present between the engine and throttle valve 15. Normal vacuum at high engine speed may be 0 to 20 inches, depending on load conditions. Normal idling vacuum at low speeds may be 17 to 20 inches. High-idle, upon vehicle deceleration or coasting, may be in the neighborhood of 25 to 26 inches as stated.

This excessive vacuum or suction over 20 inches consequently draws more fuel from supply 22 or supplies 22 and 23 than is actually required for satisfactory engine operation. This results in incomplete combustion. In the manifold, due to accumulation, turbulence, et cetera, incident to high speed operation, there accumulates pockets of raw fuel. This pocketed fuel under high vacuum is also drawn into the engine, further accentuating the low fuel ratio or incomplete combustion. Carbon formation, crank case dilution, overheating of the engine and wasteful use of fuel, are the consequent ultimate results.

Such high vacuum also increases oil leakage or suction around piston rings resulting in fuming, carbon formation, and wasteful use of oil.

The aforesaid constitutes obvious objections. Another objection resulting from engine operation with a closed throttle while decelerating, incident to the aforesaid conditions, is rough or irregular engine performance.

The present invention seeks to and does eliminate these objections and in addition effects an increase of from 5% to 10% in fuel economy and permits anywhere from 25% to 50% more "coasting." "Coasting" or "free wheeling" is due to complete engine combustion during this deceleration period because, as stated, under usual operating conditions, previously mentioned, rapid deceleration is always accompanied by incomplete combustion. Colloquially, this effect is known as "engine braking," and to this extent, the engine braking effect is reduced.

In other words, this invention checks the decelerating engine speed, as a door check checks a door, with combustible mixture ratios that the motor can consume or burn. Or, this decelerating valve will give the same results as if a car were driven down the highway at a speed of approximately 40 miles an hour and suddenly the accelerator was released to slow down, and then immediately the hand throttle was pulled out to about half the equivalent of this speed and then slowly closed until approximately the normal idling speed of the engine was obtained.

Having thus described a conventional carburetor, its normal operation and construction, together with the objections incident thereto in engine operation, reference now will be had to the solution for said problems by referring more especially to Figs. 2 to 6 inclusive.

In certain of said figures, the numeral 15 indicates the throttle valve mounted centrally at 31 upon the manually rockable throttle shaft 32. The disc valve 15 is cut out at 33, radially and transversely relative to the shaft axis. This aperture is closed by a tiltable plate portion 34 pivoted upon a shaft 35 extending through a bearing 36 near the remote end of said plate portion. Valve 34 is a vacuum relief valve and a fuel control valve when the throttle valve 15 is closed or substantially closed. Also, note in Fig. 3, the outermost lip on said valve 34.

The projecting ends of shaft 35 are mounted in lugs 37 which are provided adjacent the throat of the aperture 33 and may be formed by striking upwardly lips from stock removed to form the aperture 33.

A spring 38, anchored at 39 to the valve 15 and herein on the opposite side thereof, relative to shaft 32 and the aperture 33, arches upwardly and across the valve 15 and has a depending rounded end 40 seated in a curved groove or slot 41 formed in the upper portion of valve plate 33. Herein slot 41 is formed in bearing 36. This spring 38 normally constrains valve 34 to closed position which may be limited by a lip 42 which also may be formed from stock removed or offset to form the aperture 33, see Figs. 3 and 4. Of course, the force of spring 38 may be adjusted, if desired, as indicated at 39.

Normally this spring is sufficient to resist a valve opening pressure or suction of about 20 inches of mercury. Thus, the throttle 15 and relief valve 34 normally operate as a unit and as a standard throttle valve at all times and in all positions except as now noted.

When the throttle valve is closed or very nearly closed and if the vacuum between the same and engine and in the fuel mixture passage 14 exceeds that for which the spring 38 plus the weight of valve 34 is required to elevate said valve, this valve 34 automatically opens and the greater the excess suction or vacuum the greater will be the amount of valve opening until the valve 34 is fully opened.

Assuming the choker valve 12 wide open, this excessive suction is progressively relieved as the valve 34 opens. The result is that, except for a very slight interval (and this might be said to be almost instantaneous), excessive vacuum is relieved to slightly above normal idle vacuum before mentioned.

Port 22 is constant in area and always open and the amount supplied to the intake therefrom is proportional to the vacuum on that port. Port 23 is per se constant but the throttle valve 15 (including relief valve 34) may vary this port opening fuel supply. Hence, fuel supplied by 23 is variable due to variation in suction applied to it as well as the mechanical restriction of these valves as a unit. The air bleed 24 is of fixed area. Now, at closed or substantially closed throttle and normal vacuum, the air in intake 11 enters at 24 and with the fuel discharges from 22. Hole 23 also acts as an air bleed on low idle. The valve controlling port 24 is an adjustable valve and air can and does bleed through port 24 to the chamber from which lead ports 22 and 23.

In such a carburetor where the low and off idle fuel supplies constitute an elongated slot in the intake passage, the relief valve 34 progressively exposes a greater amount or length of said slot and relieves the excessive vacuum accordingly as well as controls fuel supply.

It is to be understood that this relief valve as to size and the pressure at which it functions and rate of operation, must all be designed and calibrated for the various types of internal combustion engines and carburetors used therewith. Normally, for any given type of engine of a

given standard displacement, the spring adjustment shown at 39 would suffice for individualizing this invention to any specific engine of that particular group.

Another objective accomplished by this invention is that in a carburetor having an idle or low and off-idle fuel supply arrangement, the idle or off-idle supply is rendered operative by the relief valve opening when the throttle valve is closed during rapid deceleration which insures smoother engine performance.

While the invention has been illustrated and described in great detail in the drawing and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein, as well as others which will readily suggest themselves to persons skilled in this art, are all considered to be within the broad scope of the invention, reference being had to the appended claims and in this connection it is to be noted that a conventional throttle valve, upon which is supported a relief valve for the relief of high vacuum only, is specifically disclaimed as old in the art and is represented by Reynolds Patent No. 2,035,191, Weber 2,062,260 and Reid British 405,346 of February 8, 1934.

The invention claimed is:

1. A carburetor having a fuel mixture passage and means including a nozzle for supplying liquid fuel thereto, said passage having spaced auxiliary fuel ports communicating therewith, a butterfly throttle valve in said passage interposed between said ports when in closed position to close off one of said ports from the down-stream side of the throttle valve, a normally closed suction relief valve on said throttle valve movable to open position by suction on the down-stream side of said throttle valve, said relief valve comprising a plate pivoted upon said throttle valve adjacent to said ports and adapted when in open position to establish communication between said closed off port and the down-stream side of said throttle valve through the latter.

2. A carburetor having a fuel mixture passage and means including a nozzle for supplying liquid fuel thereto, said passage having its wall provided with a pair of auxiliary fuel ports, a butterfly throttle valve pivoted in said passage and adapted when in closed position to close off one of said ports from the down-stream side of said throttle valve, a relief valve on said throttle valve adapted to open when low pressure of predetermined degree is reached upon the down-stream side of said throttle valve, said relief valve pivoted adjacent to said auxiliary fuel supply ports, whereby communication is established between said closed off port and the down-stream side of said throttle valve when said predetermined low pressure has been reached.

3. A carburetor having a fuel mixture passage and means including a nozzle for supplying liquid fuel thereto, said passage having spaced auxiliary ports communicating therewith and with each other, means for supplying fuel to said ports, a butterfly throttle valve in said passage interposed between said ports when in closed position to close off one of said ports from the down-stream side of said throttle valve and to simultaneously by-pass air through said closed off port to the other of said ports, said relief valve comprising a plate pivoted on said throttle valve adjacent to said ports and adapted when in open position to establish communication between said closed off port and the down-stream side of said throttle valve.

4. A carburetor having a fuel mixture passage and means including a nozzle for supplying liquid fuel thereto, said passage having a pair of spaced auxiliary fuel ports communicating therewith, said ports being in communication with each other and with a common source of liquid fuel supply, a butterfly throttle valve in said passage interposed between said ports when in closed position whereby to close off one of said auxiliary ports from the downstream side of said throttle valve and to simultaneously by-pass air through said closed off port to the down-stream side of said throttle valve, and a suction operated valve pivoted on said throttle valve adjacent to said ports and adapted to open when a predetermined degree of low pressure is reached on the down-stream side of said throttle valve to establish communication between said first named auxiliary fuel port and said down-stream side of said throttle valve through the latter.

5. A carburetor having a fuel mixture passage and means including a nozzle for supplying liquid fuel thereto, said passage having spaced auxiliary fuel ports communicating therewith, a butterfly throttle valve pivoted in said passage and adapted when in closed position to close off one of said ports from the down-stream side of said passage, said throttle valve having an opening therein adjacent to said ports, a plate pivoted on said throttle valve and normally lying within said opening, the pivot of said plate being eccentric of the opening whereby upon tilting of the plate in one direction the opening is uncovered and an edge of said plate is disposed adjacent to and upstream of said closed off port, said plate moved to open position by low pressure of a predetermined degree upon the down-stream side of said throttle valve, and means normally holding said plate in closed position.

EDWIN W. PUMMILL.