Jan. 12, 1932. H. W. LINKERT 1,840,727

DOWN DRAFT CARBURETOR

Filed July 11, 1929 2 Sheets-Sheet 1

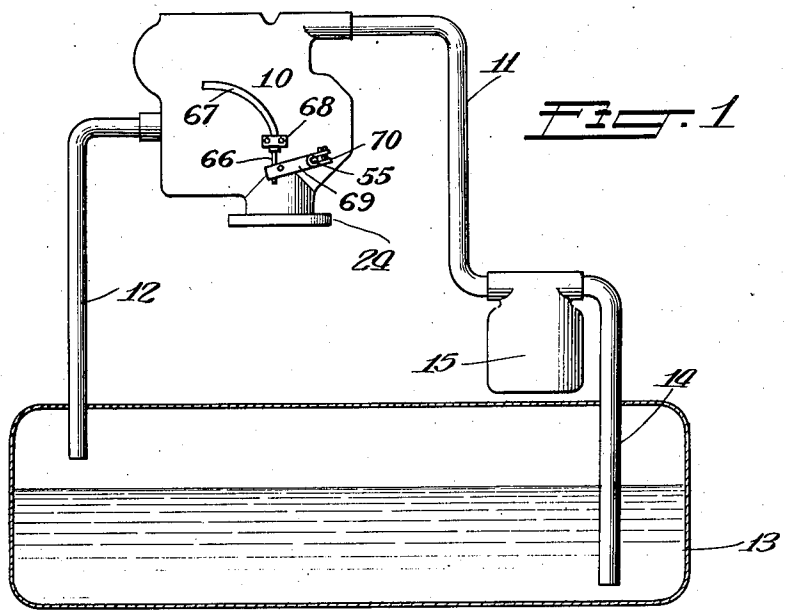


Fig. 1

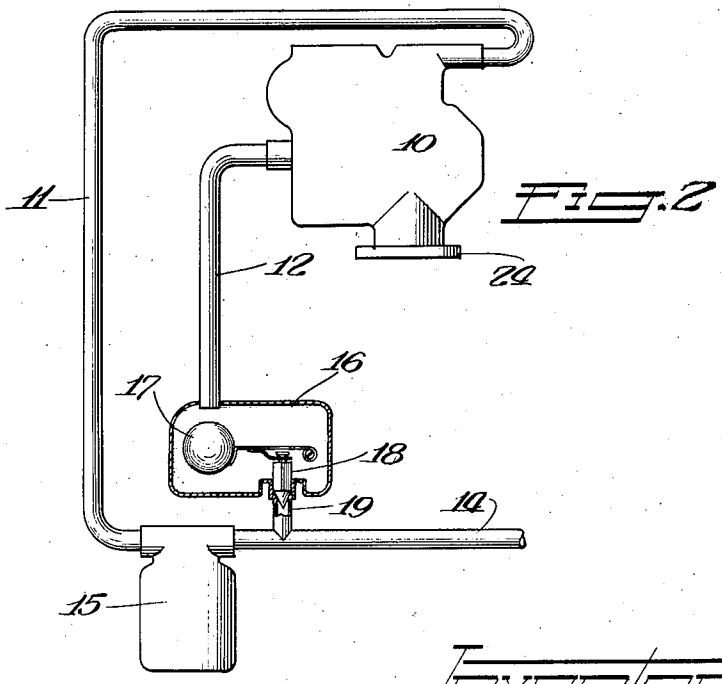


Fig. 2

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Fig. 3

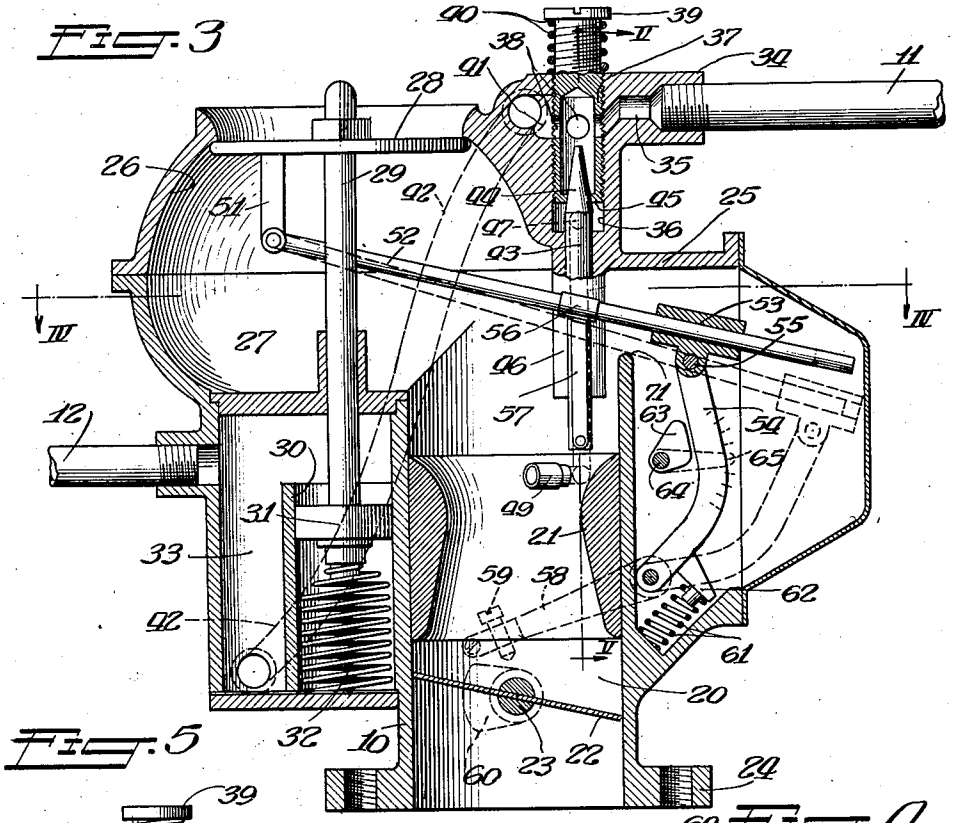


Fig. 5

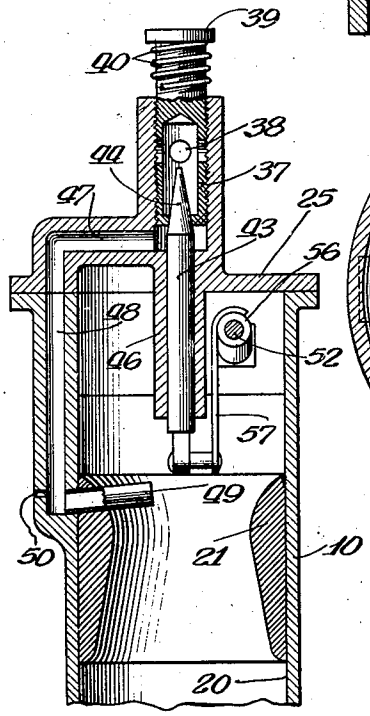
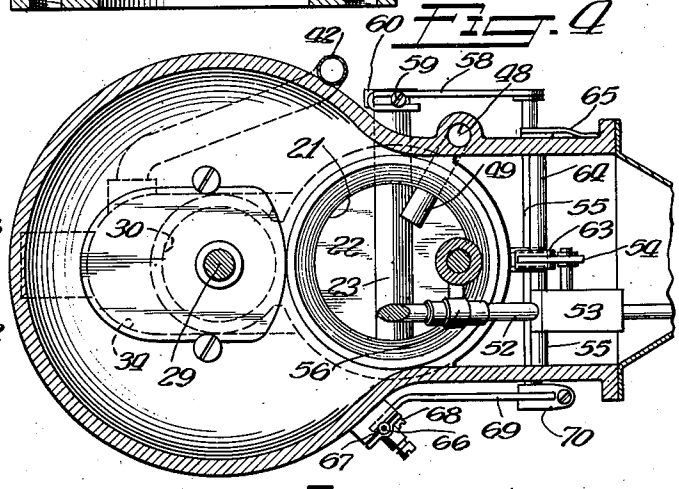


Fig. 4



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Patented Jan. 12, 1932 1,840,727

UNITED STATES PATENT OFFICE

HOWARD W. LINKERT, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO THE WHEELER-SCHEBLER CARBURETOR COMPANY, OF INDIANAPOLIS, INDIANA, A CORPORATION OF INDIANA

DOWN DRAFT CARBURETOR

Application filed July 11, 1929. Serial No. 377,355.

This invention relates to down draft carburetors for internal combustion engines and has special reference to a carburetor fed directly from a fuel pump without the complication of a constant level fuel supply chamber with its attendant float operated mechanism.

It is one of the objects of this invention to provide a simple and improved fuel supply arrangement for downdraft carburetors wherein the elimination of the usual float bowl precludes troubles from bowl flooding, which in the case of a down draft carburetor would cause an overflow of fuel into the manifold and engine cylinders.

It is another object of this invention to provide a down draft air valve carburetor without the customary primary venturi and air supply therefor, controlling the entire air supply by means of an air valve. Such an arrangement permits an increase in the capacity of the carburetor because even at low air flows a certain amount of vacuum can be maintained by the air valve and its spring to promote breaking up of the metered fuel, especially with an air bleed into the fuel nozzle. This arrangement provides good idling and low speed operation while the high air flow capacity of the carburetor is limited only by the throttle chamber because the venturi, mixture passageway and air valve size can be made larger. The capacity can also be increased in a downdraft carburetor because even with large air passageways no body loading or deposition of liquid fuel can occur at low air velocities as would be the case in an upright carburetor.

It is also an object of this invention to provide an air valve carburetor without a primary venturi or air supply therefor and to incorporate a starting or choker control acting to increase the fuel metering opening and to simultaneously lock the air valve against its seat to facilitate starting, as by this arrangement all air will be shut off except leakage about the valve and an air bleed to the fuel nozzle while the fuel metering valve will be opened so that a plentiful supply of fuel will be delivered.

It is a further object of this invention to provide an improved fuel supply system for carburetors, embodying a fuel pump delivering directly to the carburetor fuel metering mechanism and of a capacity sufficient to meet the maximum demands, the surplus fuel at part load or idling being returned to the suction side of the fuel pump or the fuel tank. Such an arrangement calls for only a simple pump not limited to work under narrow pressure limits. In the case of a fuel return to the suction side of the pump a simple float bowl may be used which needs only a small float and a large valve because the float does not have to hold against pressure. This makes the float bowl, float and mechanism smaller and cheaper for large carburetors as compared to the usual carburetor float chamber.

Other and further important objects of this invention will be apparent from the disclosures in the specification and accompanying drawings.

The invention (in a preferred form) is illustrated on the drawings and hereinafter more full described.

On the drawings:

Figure 1 is a carburetor set-up showing a simple arrangement for fuel supply suitable for installations where the fuel tank is close to the carburetor.

Figure 2 is a modified set-up embodying a fuel return to the suction side of the fuel pump to eliminate a long fuel return in the case of a distant fuel tank, as when the tank is at the rear of a vehicle.

Figure 3 is a central section of a carburetor embodying the features of the invention.

Figure 4 is a section on the line IV—IV of Figure 3.

Figure 5 is a section on the line V—V of Figure 3.

As shown on the drawings:

The carburetor of this invention will be referred to generally by the reference numeral 10 representing the body thereof. In Figures 1 and 2, fuel is supplied to the carburetor by a pipe 11 shown attached at the upper right corner thereof, and overflow fuel is conducted away from the carburetor by a pipe 12 on the left side thereof. The

main fuel supply tank 13 is shown in Figure 1 and a suction pipe 14 extends from near the bottom thereof to the suction side of a fuel pump 15 which discharges through the pipe 11. In this figure the overflow pipe 12 discharges back into the main fuel tank.

The fuel pump 15 referred to is not shown in detail as a number of types are commercially available, such as mechanically or electrically operated pumps, for example. The fuel pump is not limited to work under narrow pressure limits but is chosen of a capacity to deliver enough fuel for maximum engine speed and power, and may be steadily operated at this capacity because of the overflow return pipe 12.

Figure 2 is a variation of Figure 1 in that the return pipe 12 discharges into a float bowl chamber 16 having a float 17 controlling an outlet valve 18, the outlet 19 being coupled into the suction pipe 14, just ahead of the fuel pump. This float mechanism is provided as a substitute for a long return over flow pipe 12 in installations where the fuel tank 13 is at some distance from the carburetor. The float mechanism serves to prevent the entrance of air into the suction line 14 when only a small part of the fuel delivered by the pump actually overflows into the return pipe 12, as occurs when the engine is operated close to its maximum capacity range. The float mechanism also serves to return any excess fuel delivered into the float chamber back into the fuel line between the fuel pump and supply tank, thus acting as a return trap between the carburetor and fuel supply tank. At low motor demand the float mechanism returns most of the fuel pumped to the carburetor and at high motor demands returns very little, most of the pumped fuel being used by the motor. This float bowl can be made small, with a small float but large float needle valve because the float does not need to hold the valve against pressure, so that the mechanism as a whole can be made smaller and cheaper than the usual carburetor float bowl especially for the large sizes of carburetors.

The carburetor body 10 is formed with a downwardly discharging mixing chamber 20, containing a verturi 21 and a throttle valve 22 on a shaft 23, the bottom end or outlet of the passage 20 having a mounting flange 24 for attachment to the manifold. The body 10 is provided with a top member 25 containing a formed air valve seat 26 which opens into a chamber 27 communicating with the mixing chamber 20. A disc air valve 28 engages the seat and is normally held there against by being mounted on a rod 29 extending into a dash pot 30 and having a piston 31 therein, a spring 32 being positioned between the piston and the bottom of the dashpot. The dashpot is formed in a fuel chamber 33 to which the outlet or drain pipe 12 is connected at a point high enough to maintain the dashpot filled with liquid in order to damp out fluttering of the air valve due to the suction impulses in the carburetor.

The pipe 11 from the fuel pump enters a passaged boss 34 on the top member, the passage 35 in the boss opening into a threaded vertical passage 36 containing a hollow shell 37 with ports 38 aligning with the passage 35. The upper end of the shell 37 projects above the top member and is closed by a head 39 bearing on a spring 40 which maintains the shell in its adjusted position. This shell forms the idling adjustment in connection with fuel metering mechanism to be later described. The ports 38 also align with a chamber 41 in the boss opposite the passage 35 which chamber is connected by a pipe 42 with the fuel and dashpot chamber 33. This arrangement provides an overflow for fuel delivered by the fuel pump which is in excess of that required by the engine. This overflow relieves the metering mechanism from undesirable variations of pressure which would otherwise occur with a constant capacity fuel pump.

A fuel metering valve stem 43, has a tapered valve end 44 cooperatively engaging a partial bottom closure 45 on the shell 37. The valve stem is guided in a depending boss 46 coaxial with the vertical passage 36, so that when the valve stem is pushed upwardly to its limit it closes the metering orifice in the bottom 45 of the sleeve and thus cuts off the flow of fuel. When opened to a greater or less extent fuel is permitted to flow from inside the shell 37 to the passage 36 below the bottom of the shell and is thence conducted by the passages 47 and 48, best shown in Figure 5, to a simple nozzle 49 projecting into the venturi 21 at approximately the throat position thereof. An air bleed aperture 50 opens into the passage 48 and serves to emulsify the fuel discharged from the nozzle 49.

Adjustment of the shell 37 by means of its external head 39 shifts the metering orifice in the shell bottom 45 relative to the valve taper 44 thus determining the initial or idling fuel supply for conditions when the air valve is closed.

As the rate of flow of air through the carburetor is changed, due to the opening of the air valve, the air and fuel must be kept in the proper proportions. This is accomplished by linking the fuel metering valve to the air valve. The air valve carries an arm 51 to which is pivoted one end of a proportioning lever 52. This lever passes through and has a closed sliding fit in a trunnion block 53 which is pivotally mounted on a movable fulcrum arm 54 on a shaft 55. The lever 52 passes to one side of the fuel valve guide boss 46 and carries a fixed block 56 adjacent thereto which has a connecting link 57 extending to the lower end of the valve

stem 43. Thus as the air valve moves downwardly the proportioning lever 52 turns about the pivot of the trunnion block 53 and gives to the valve stem 43 a motion that is proportional to that of the air valve.

With the above described arrangement the opening of the fuel metering valve will be in direct proportion to that of the air valve, as theoretically required by the fundamental laws of an increase in fluid flow with an increase in the pressure differential within the carburetor which causes the air valve to open. Practically however it is usually necessary to vary the proportioning by altering either the taper of the fuel valve or the form of the air valve housing or seat. Further, an enriched mixture for full power at open throttle is desirable because with such an arrangement the carburetor may be adjusted for maximum economy at partial loads comprising the average driving conditions. To provide such an enriched mixture at open throttle. I provide an arm 58 on the fulcrum shaft 55 which arm carries a screw 59 engageable by a cam 60 on the throttle shaft when the latter is in wide open position, the cam lifting the arm 58 and thus swinging the fulcrum arm 54 clockwise or away from the fuel and air valves, thus increasing the leverage of both the air valve and the fuel valve, resulting in an increased opening movement of the fuel valve relative to the air valve. From the geometry of Figure 3 it will be evident that this movement of the trunnion block also drops the fulcrum point to some extent, thus increasing the fuel valve opening relative to the air valve entirely aside from the change in the proportioning effect.

The fulcrum arm is held in its initial position of maximum economy by a spring 61 acting against a lug 62 on the arm 54. This initial position is adjustable by means of a cam 63 which limits the counter-clockwise movement of the fulcrum arm. This cam 63 is carried by a shaft 64 which is externally adjustable by means of a lever 65 to form the normal range or economy setting.

A dash type of control is also provided to facilitate starting. This control comprises a Bowden wire 66, the tube 67 of which is fastened at 68, while the wire is fastened to the end of a lever 69 loose on the fulcrum shaft 55 but which engages a clamp yoke 70, which is fastened to the shaft, when the lever 69 is pulled up by the dash control. When this control is pulled up to its limit the fulcrum arm 54 is shifted clockwise to its limit, as shown in dotted lines in Figure 3. In this position the proportioning lever 52 is brought down hard against the top edge 71 of the wall of the air passage or mixing chamber 21 and thus locks the air valve shut, making starting very easy because the customary primary venturi is absent and when the air valve is locked against its seat all air will be shut off except for minor leakage about the valve and the air bleed 50. The loose lever 69 is so arranged that the trunnion block can be moved by the cam 63 or the high speed cam 60 without moving the dash adjustment.

The operation of the various units coacting to form a complete carburetor have been described in connection with the description of the structure, so that only a brief résumé of the operation is believed to be required. The fuel pump may be mechanically or electrically operated, as pumps of either type are commercially available and their structure form no part of the present invention. Fuel from the pump is admitted to the interior of the sleeve 37 and the metering valve 45 controls the supply of fuel to the carburetor nozzle 49 in accordance with the air valve opening as well as the modifying adjustments. Any excess fuel is discharged into the overflow and dashpot chamber and from there is either returned to the fuel tank or to the suction side of the pump. As the air valve opens in response to increased suction in the carburetor, the fuel valve opens proportionately thus decreasing the quantity of fuel which flows into the overflow chamber and thence back to the tank or pump as the case may be.

It will thus be seen that I have invented an improved and simplified down draft carburetor which operates in a novel manner, taking its fuel supply directly from a fuel pump without the interposition of a float controlled fuel chamber.

I am aware that numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted, otherwise than necessitated by the prior art.

I claim as my invention:

1. In a down draft carburetor the combination of a downwardly discharging mixing chamber, a fuel valve and an air valve controlling respectively the quantities of fuel and air delivered into said mixing chamber, proportioning means interconnecting said fuel and air valves so that the fuel valve is actuated by movements of the air valve, a fuel dash pot chamber having a dashpot piston therein linked to the air valve, a fuel pump for supplying fuel directly to the fuel valve, a relief connection for excess fuel leading from said fuel valve to the fuel dash pot, and an overflow connection from said fuel dash pot to a source of fuel supply for said fuel pump.

2. In a down draft carburetor the combination of a downwardly discharging mixing chamber, a fuel valve and an air valve controlling respectively the quantities of fuel and air delivered into said mixing chamber, proportioning means interconnecting said fuel and air valves so that the fuel valve is

actuated by movements of the air valve, means for varying the primitive position and the ratio of said proportioning means, a fuel dash pot chamber having a dashpot piston therein linked to the air valve, a fuel pump for supplying fuel directly to the fuel valve, a relief connection for excess fuel leading from said fuel valve to the fuel dash pot, and an overflow connection from said fuel dash pot, to a source of fuel supply for said fuel pump.

3. In a down draft carburetor, a fuel valve and an air valve controlling respectively the quantities of fuel and air admitted to the carburetor, a lever interconnecting the fuel and air valves so that the fuel valve is actuated by movements of the air valve, a movable fulcrum point for said lever for varying the movement of the fuel valve relative to that of the air valve, and means for shifting said fulcrum point adapted in one position to lock the lever against movement whereby to prevent opening of said air valve.

4. In a down draft carburetor, a fuel valve and an air valve controlling respectively the quantities of fuel and air admitted to the carburetor, a lever interconnecting the fuel and air valves so that the fuel valve is actuated by movements of the air valve, a movable fulcrum point for said lever for varying the movement of the fuel valve relative to that of the air valve, means for shifting said fulcrum point adapted in one position to lock the lever against movement whereby to prevent opening of said air valve, and movable means for limiting the movement of said shifting means in the opposite direction whereby to define the economy position of the fulcrum point.

5. In a down draft carburetor, a fuel valve and an air valve controlling respectively the quantities of fuel and air admitted to the carburetor, a lever interconnecting said two valves, a fulcrum for said lever, and means for shifting said fulcrum on said lever to a point where said lever will be locked against opening of said air valve.

6. In a down draft carburetor, a fuel valve and an air valve controlling respectively the quantities of fuel and air admitted to the carburetor, a lever interconnecting said two valves, a fulcrum for said lever, and means for shifting said fulcrum on said lever to a point where said lever will be locked against opening of said air valve, and means co-acting with said shifting means to define the maximum economy setting thereof.

7. In a down draft carburetor, a fuel valve and an air valve controlling respectively the quantities of fuel and air admitted to the carburetor, a lever interconnecting said two valves, a fulcrum for said lever, means for shifting said fulcrum on said lever and means adapted at one extreme of said fulcrum movement to lock said air valve against opening.

In testimony whereof I have hereunto subscribed my name.

HOWARD W. LINKERT.