Nov. 29, 1938. R. F. BRACKE 2,138,020

CARBURETOR

Filed March 22, 1935 2 Sheets-Sheet 1

Fig. 1

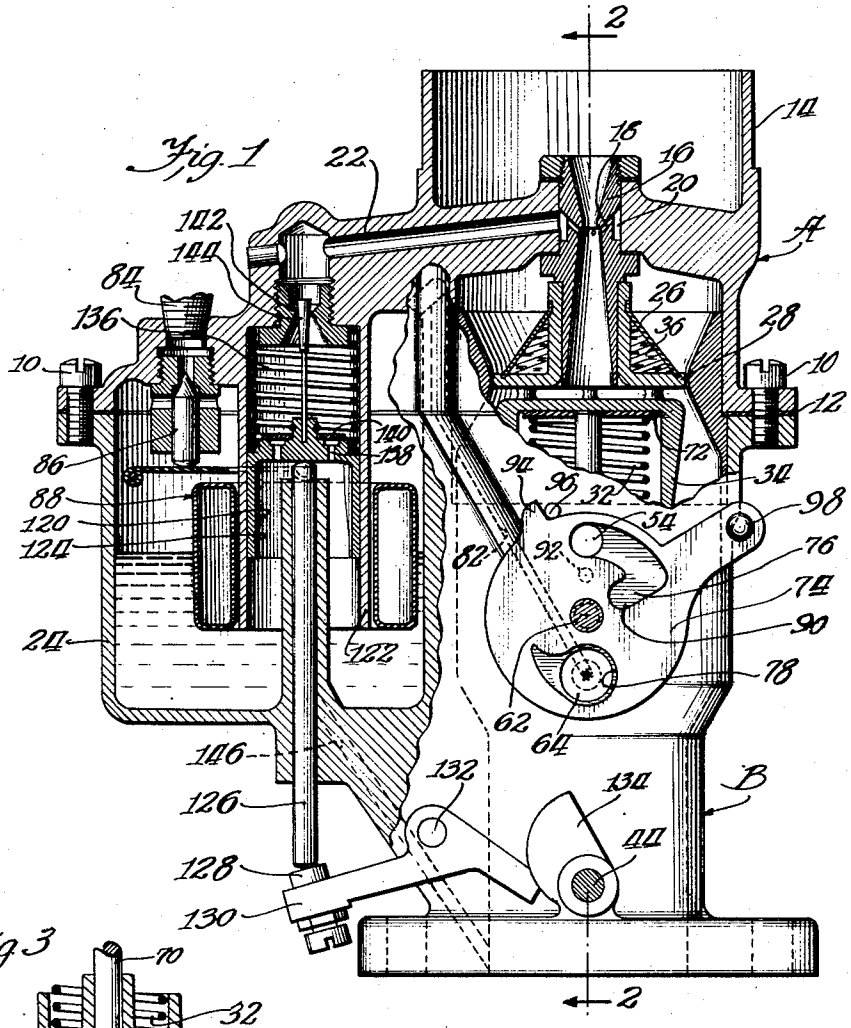
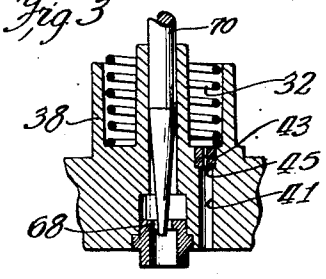


Fig 3



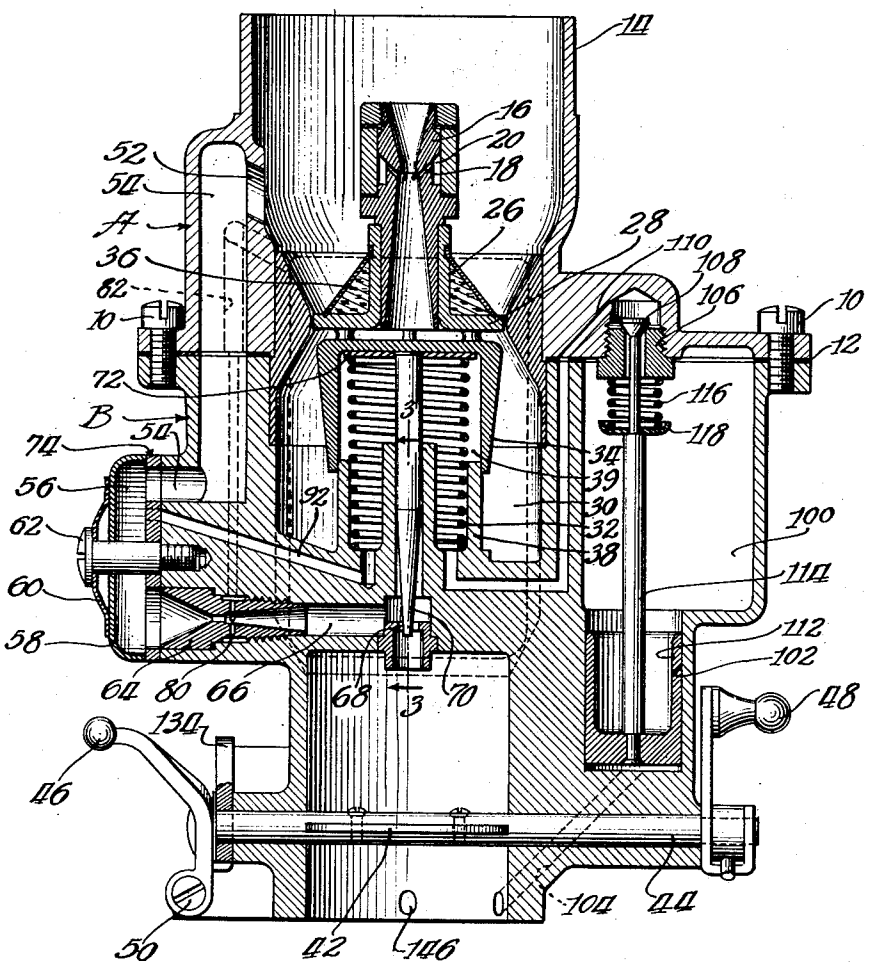
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Fig. 2



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Patented Nov. 29, 1938 2,138,020

UNITED STATES PATENT OFFICE

2,138,020

CARBURETOR

Robert F. Bracke, Chicago, Ill.

Application March 22, 1935, Serial No. 12,463

9 Claims. (Cl. 261—34)

My invention pertains to carburetors and is more particularly concerned with carburetors of the fuel-lift type.

An object of my invention is to provide a carburetor which will afford more rapid acceleration for the internal combustion engine to which it is attached.

Another object is to provide an improved carburetor of this type which is simple and economical to manufacture and which is durable and trouble-free in service.

Other objects and advantages will become apparent as the description proceeds.

In the drawings,

Figure 1 is a vertical elevation, partly in section, showing a carburetor embodying my invention;

Figure 2 is a vertical section through the carburetor of Figure 1, being taken on the line 2—2 of Figure 1; and

Figure 3 is a fragmentary cross-sectional view taken on the line 3—3 of Figure 2.

My improved carburetor is illustrated as comprising an upper casting A and a lower casting B secured together by bolts 10 and having an air-tight gasket 12 confined between adjacent portions of the two castings.

The casting A includes an air horn 14 having its upper end of reduced external diameter to facilitate the attachment of any usual form of air cleaner and silencer where the use of such a device is deemed desirable or necessary.

Part of the air entering the air horn 14 passes into the nozzle Venturi tube 16 where it mixes with fuel supplied through diagonal ducts 18 communicating with the throat of the nozzle 16. Annular space 20 and passageway 22 connect the ducts 18 with a fuel chamber 24 which constitutes a source of fuel supply for the nozzle 16.

The lower end of the nozzle 16 is surrounded by the upper end 26 of an air valve 28 which controls the admission of secondary air from the air horn 14 into the mixing chamber 30. A spring 32 urges the air valve 28 toward closing position. The nozzle 16 discharges against the flat upper surface of an inverted cup-shaped portion 34 provided by the air valve 28, and this flat surface causes the primary mixture delivered by the nozzle 16 to flow radially outward where it mixes with secondary air admitted past the air valve 28.

The upper portion of the air valve which surrounds the lower end of the nozzle 16 is preferably provided with heat insulating packing 36. The inverted cup-shaped portion 34 of the air valve, together with the air valve guide 38, forms a closed chamber 39 into which suction may be introduced for opening the air valve against the tension of its spring 32.

The chamber 39 communicates with the upper end of throttle bore 40 by means of passage 41 and the small orifice 43 provided by the plug 45 press-fitted into one end of the passage 41. By this means the suction existing in the upper part of throttle bore 40 is communicated to the chamber 39, and the valve 28 is opened an amount proportional to the degree of suction obtaining in the upper end of throttle bore 40.

The combustible mixture flows from the mixing chamber 30 into the throttle bore 40 which is provided with the usual throttle valve 42 carried by a shaft 44 pivotally mounted in the lower casting B. One end of the shaft 44 has an arm 46 adapted to be connected to the usual accelerator pedal of an automobile, and a second arm 48 adapted to be connected to the usual hand throttle of the automobile. The arm 46 carries the usual adjustable stop 50.

Part of the air entering the air horn 14 passes through a lateral opening 52 at one side of the air horn and flows downwardly through a conduit 54 into a chamber 56 provided by a sheet-metal cup 58 secured in place by a star-shaped spring plate 60 and screw 62. A booster Venturi tube 64 has its inlet end in communication with the chamber 56. This booster discharges into a duct 66 communicating with throttle bore 40 through an orifice 68 in which there is a tapered pin 70 having an enlarged upper head confined between a plate 72 and the adjacent portion of the air valve 28 so that the pin 70 reciprocates with the air valve.

The throat of the booster 64 is provided with radial ducts 80 communicating with a passage 82 connecting with the top of the fuel chamber 24. The function of this booster 64 is to draw fuel into the fuel chamber 24 through pipe 84 which connects with the main fuel tank of the automobile usually located at the rear of the vehicle and below the carburetor. The fuel chamber 24 is provided with the usual inlet valve 86 controlled by the float 88.

A choke plate 74 is located between the metal cup 58 and the adjacent portion of the casting B. This choke plate has an L-shaped opening 76 which maintains communication at all times between the chamber 56 and the conduit 54. This choke plate has a second opening 78 which controls the inlet to the booster Venturi tube 64. In the normal position of the choke plate, there is

free communication between the inlet to the booster 64 and the chamber 56, but when the choke plate is moved to full or part choke position, the inlet to the booster 76 is correspondingly reduced so that the suction created in the fuel chamber 24 by the booster 64 varies with the position of the choke plate 74.

When the choke plate 74 is in substantially the full choke position, the end 90 of the L-shaped slot 76 establishes communication between the chamber 56 and a duct 92 leading to the chamber 39 formed beneath the secondary air valve 28 so that under full choke conditions atmospheric air is admitted beneath the air valve 28. The duct 92 admits air to the chamber 38 faster than the air in the chamber 39 can be withdrawn through the small orifice 43, and the result is that the air valve 28 remains closed and an extremely rich mixture is supplied to the engine.

The choke plate 74 has a stop 94 which rests against a pin 96 when the choke plate is in the position it assumes when the engine is operating normally. The choke plate 76 has an arm 98 adapted for connection to the usual choke control mechanism for moving the choke plate to any desired position. When the choke plate is in the full choke position, the arm 98 rests against the stop pin 96.

When the throttle valve 42 is quickly opened for the purpose of obtaining rapid engine acceleration, it is important that the secondary air valve be opened fully to provide full charges of combustible mixture to the engine cylinders so that the full power of the engine will immediately become available for accelerating purposes. To insure full opening of the secondary air valve at such times, I provide a source of vacuum which is connected to the chamber 39 beneath the secondary air valve whenever rapid engine acceleration is desired.

At one side of the mixing chamber 36 I provide a vacuum chamber 100 having its lower end in communication with a cylinder 102 connected to a part of the throttle bore 40 beneath the throttle valve 42 by means of a duct 104. The upper end of vacuum chamber 100 is provided with a valve seat 106 and valve 108 controlling communication between this chamber and a passageway 110 leading to the chamber 39 beneath the secondary air valve 28.

A piston 112 is located in the cylinder 102 and has a piston rod 114. The valve 108 is mounted on the upper end of the piston rod 114. A spring 116 is confined between the valve seat 106 and a washer 118 supported on a shoulder suitably provided by the piston rod 114.

In the normal operation of the engine, the piston 112 and valve 108 assume the position shown in Figure 2 of the drawings. The piston 112 does not make a perfect seal with its cylinder 102 so that air is exhausted from the chamber 100 by the suction existing in the throttle bore 40 beneath the throttle valve 42 until the degree of vacuum obtaining in the chamber 100 is substantially equal to that existing on the engine side of the throttle valve 42.

When the throttle valve is quickly opened to obtain rapid engine acceleration, the pressure in the throttle bore 40 rises to almost atmospheric pressure, and this is communicated to the underside of the piston 112. Because of the relatively high vacuum existing in the chamber 100, the substantially atmospheric pressure acting on the under side of the piston 112 moves this piston upwardly against the tension of spring 116 and opens valve 108, thereby establishing communication between the vacuum chamber 100 and the chamber 39 beneath the secondary air valve 28. This immediately produces complete or substantially complete opening of the air valve 28, thus permitting the maximum flow of secondary air therepast and supplying the engine cylinders with the maximum amounts of combustible mixture. The piston 112 fits sufficiently tightly in its cylinder 102 to greatly restrict the leakage of air into the chamber 100 past the piston 112, so that the effect of the vacuum chamber 100 on the secondary air valve is not immediately dissipated but continues over an appreciable period of time.

Because of the rise in pressure in the throttle bore 40 during periods of acceleration, the booster 64 becomes ineffective during such accelerating periods to draw fuel from the main fuel tank into the fuel chamber 24. This fuel chamber 24 therefore must be made large enough to supply all of the fuel needed by the engine during periods of acceleration without replenishment from the main fuel tank during such accelerating periods.

The carburetor is further provided with a fuel pump 120 comprising a cylinder 122 extending downwardly into the fuel chamber 24, and a piston 124 located in the cylinder 122 and operated by a piston rod 126. The lower end of piston rod 126 rests on one end of an adjustable stop 128 provided by one of the two arms of a lever 130 which is pivoted on the casting B at 132 and which has its second arm adapted for engagement by a cam 134 rotatable with the throttle valve shaft 44.

The piston 124 is moved downwardly by a spring 136 confined between the upper side of the piston and an opposing part of the casting A. The piston is provided with ports 138 which are practically closed during the pumping movement of this piston by a valve disk 140. The valve disk 140 has a small orifice to provide the necessary fuel for engine idling, and when the engine is operating at greater than idling speed, the disk 140 is drawn upwardly away from the ports 138 to permit the passage of additional fuel to the engine.

The upper end of cylinder 122 communicates with passage 22 through an orifice 142 in which there is located a metering pin 144 attached to and reciprocable with the piston 124.

Leakage of air into the fuel chamber 24 around the piston rod 126 is prevented by a duct 146 which connects an intermediate portion of the guide for this piston rod with the portion of the throttle bore 40 which is beneath the throttle valve 42.

The operation of my improved carburetor is as follows:

Part of the air entering the horn 14 passes through the nozzle 16 where it mixes with fuel drawn from the fuel chamber 24 and delivers this mixture against the inverted cup-shaped portion 34 of the air valve 28. This mixture then flows radially and mixes with any secondary air flowing past the air valve 28. From the mixing chamber 36 the resulting combustible mixture flows to throttle bore 40 and past throttle valve 42 to the engine cylinders.

When the engine is operating at part or full throttle, the suction existing in the upper part of throttle bore 40 draws air from chamber 39 through orifice 43 and passage 41, and the resultant suction created in this chamber 39 moves secondary air valve 28 downwardly a distance

proportional to the suction existing in the upper part of throttle bore 40. At the same time pin 70 is moved downwardly and restricts the discharge from booster 64 to a greater extent so that the booster 64 always maintains substantially the same degree of vacuum in the fuel chamber 24. Under normal operating conditions, this vacuum is sufficient to draw fuel from the main fuel tank when the float 88 drops sufficiently to permit the inlet valve 86 to open.

When the throttle valve 42 is quickly opened to provide rapid engine acceleration, the suction chamber 100 is placed in communication with the chamber 39 beneath the secondary air valve by the resulting upward movement of the piston 112 and valve 108. This results in drawing the secondary air valve 28 downwardly to admit the maximum volume of secondary air, whereupon the engine cylinders receive a maximum charge of combustible mixture and the engine produces its maximum torque. The quick opening of the throttle valve 42 actuates the accelerator pump 120, whereupon additional fuel is supplied to the nozzle 16 which delivers an exceptionally rich mixture best suited for rapid acceleration.

During the accelerating period, the booster 64 becomes ineffective to supply fuel, and the fuel maintained at all times in the fuel chamber 24 suffices to carry the engine through the accelerating period, at the termination of which the booster 64 again functions to refill the fuel chamber 24. During this accelerating period, however, the booster 64 still exerts a regulating or calibrating influence on the nozzle 16, thereby insuring that the latter supplies the proper mixture for acceleration.

When the choke is applied, the chamber 39 beneath the air valve is connected with atmosphere through duct 92 and end 90 of opening 76 in choke plate 74, with the result that the spring 32 holds the secondary air valve in closed position. At the same time the available air supply for the booster 64 is materially decreased so that the booster creates a negligible vacuum in the fuel chamber 24. This permits the nozzle 16 to supply a richer mixture to the engine, thereby facilitating starting when the engine is cold.

The carburetor disclosed and claimed herein is an improvement over that disclosed and claimed in my prior application, Serial No. 6,421, filed February 14, 1935.

While I have disclosed and claimed only one embodiment of my invention, it is to be understood that my invention may assume numerous forms and that the scope of my invention is limited solely by the following claims.

I claim:

1. In a carburetor of the class described, the combination of a nozzle for supplying a mixture of fuel and air, a mixing chamber into which said nozzle discharges, a valve for admitting air directly to said mixing chamber, a vacuum chamber, means for creating a vacuum therein, and means for utilizing the vacuum in said chamber to open said valve, said means becoming effective only when the carburetor is conditioned for rapid engine acceleration.

2. In a carburetor of the class described, the combination of a fuel supply nozzle, a mixing chamber into which said nozzle discharges, a suction actuated valve for admitting secondary air to said chamber, a suction chamber beneath said valve, a spring for closing said valve, a throttle bore communicating with said mixing chamber, a restricted conduit connecting said throttle bore with said suction chamber whereby said valve is opened an amount proportional to the degree of suction existing in the upper part of said bore, a vacuum chamber, a conduit connecting said vacuum chamber with said suction chamber, a valve normally closing said conduit, means for opening said last-named valve when the carburetor is conditioned for rapid engine acceleration, and an accelerator pump for simultaneously supplying said nozzle with an additional quantity of fuel.

3. In a carburetor of the class described, the combination of a fuel-feeding nozzle, a mixing chamber into which said nozzle discharges, a throttle bore communicating with said mixing chamber, a throttle valve located in said bore, an air valve for admitting secondary air to said mixing chamber, a spring for closing said valve, suction-operated means for opening said valve, a restricted conduit connecting said last-named means with said throttle bore on the inlet side of said throttle valve, a vacuum chamber, a conduit connecting said chamber with said suction-operated means, a valve in said conduit, a passage connecting said vacuum chamber with a part of the throttle bore on the engine side of said throttle valve, a restriction for limiting flow through said conduit, and a piston for opening said last-mentioned valve when rapid engine acceleration is desired.

4. In a carburetor of the class described, the combination of a fuel-feeding nozzle, a mixing chamber into which said nozzle discharges, a throttle bore communicating with said mixing chamber, a throttle valve located in said bore, an air valve for admitting secondary air to said mixing chamber, a spring for closing said valve, suction-operated means for opening said valve, a restricted conduit connecting said last-named means with said throttle bore on the inlet side of said throttle valve, a vacuum chamber, a conduit connecting said chamber with said suction-operated means, a valve in said conduit, a cylinder in communication with said vacuum chamber, a passage connecting said cylinder with said throttle bore on the engine side of said throttle valve, a piston in said cylinder permitting slow leakage of air therepast in either direction, and means connecting said piston and said conduit valve whereby movement of said piston in one direction opens said valve.

5. In a carburetor of the class described, the combination of a fuel-feeding nozzle, a mixing chamber into which said nozzle discharges, a throttle bore communicating with said mixing chamber, a throttle valve located in said bore, an air valve for admitting secondary air to said mixing chamber, a spring for closing said valve, suction-operated means for opening said valve, a restricted conduit connecting said last-named means with said throttle bore on the inlet side of said throttle valve, a vacuum chamber, a conduit connecting said chamber with said suction-operated means, a valve in said conduit, a cylinder in communication with said vacuum chamber, a passage connecting said cylinder with said throttle bore on the engine side of said throttle valve, a piston in said cylinder permitting slow leakage of air therepast in either direction, means connecting said piston and said conduit valve for conjoint movement, and a spring for urging said piston and valve in one direction.

6. In a carburetor, the combination of a fuel feeding nozzle, a mixing chamber into which said nozzle discharges, a throttle valve controlling

communication between said mixing chamber and the manifold of an engine to which said carburetor is connected, an air valve for admitting air to said mixing chamber, said valve normally opening in response to mixing chamber suction, suction means independent of mixing chamber suction and responsive to sudden opening of said throttle valve for opening said air valve during acceleration, and an accelerator pump operated by said throttle valve for supplying said nozzle with an additional quantity of fuel.

7. In a carburetor, the combination of a fuel feeding nozzle, a mixing chamber into which said nozzle discharges, a throttle valve controlling communication between said mixing chamber and the manifold of an engine to which said carburetor is connected, an air valve for admitting air to said mixing chamber, yielding means for closing said air valve, a suction dashpot associated with said air valve for opening said air valve, said dashpot having a restricted communication with said mixing chamber, a suction chamber placed in communication with said dashpot by rapid opening movement of said throttle valve to exhaust said dashpot and open said air valve, and an accelerator pump operated by said throttle valve for supplying said nozzle with an additional quantity of fuel.

8. In a self-feeding carburetor of the class described, the combination of a fuel feeding nozzle, a mixing chamber into which said nozzle discharges, a fuel chamber for said nozzle, a booster for supplying fuel to said fuel chamber, a throttle valve controlling communication between said mixing chamber and the manifold of an engine to which said carburetor is connected, an air valve for admitting air to said mixing chamber, said valve normally opening in response to mixing chamber suction, an accelerator pump, said accelerator pump being simultaneously operated by said throttle valve for supplying said nozzle with an additional quantity of fuel, and suction means independent of mixing chamber suction and responsive to sudden opening of said throttle valve for opening said air valve during acceleration.

9. In a carburetor of the class described, the combination of a fuel supply nozzle, a mixing chamber into which said nozzle discharges, a suction actuated valve for admitting secondary air to said chamber, a suction chamber beneath said valve, a spring for closing said valve, a throttle bore communicating with said mixing chamber, means whereby said valve is opened an amount proportional to the degree of suction existing in the upper part of said bore, a vacuum chamber, a conduit connecting said vacuum chamber with said suction chamber, a valve normally closing said conduit, means for opening said last-named valve when the carburetor is conditioned for rapid engine acceleration, and an accelerator pump for simultaneously supplying said nozzle with an additional quantity of fuel.

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