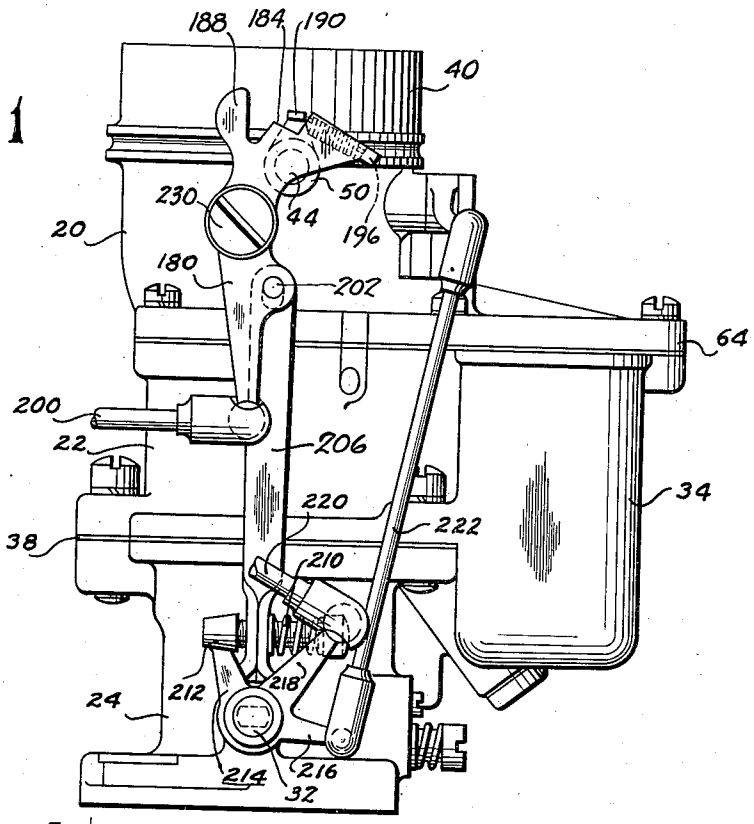
July 26, 1938. S. F. HUNT ET AL 2,124,777

CARBURETOR

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Fig. 1



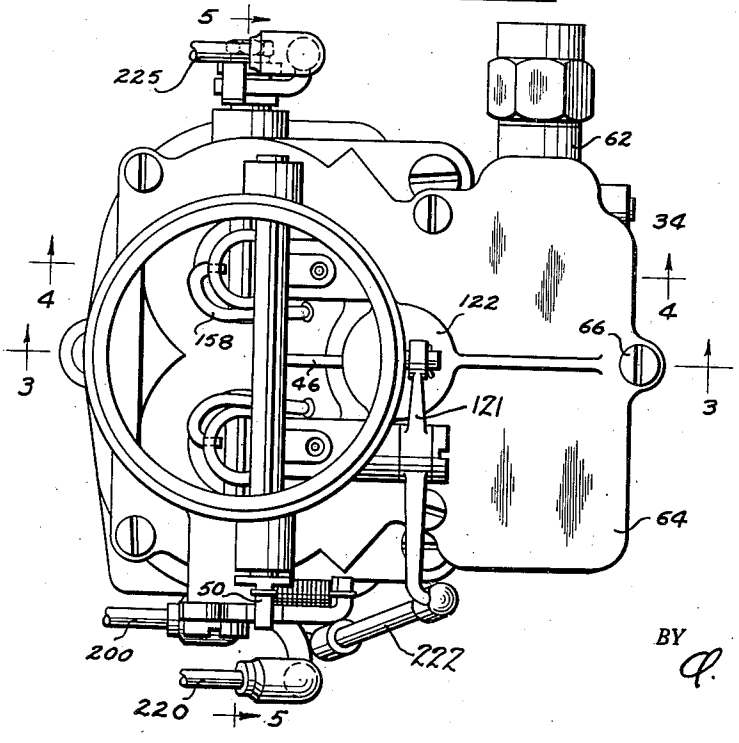


Fig. 2

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CARBURETOR

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Fig. 3

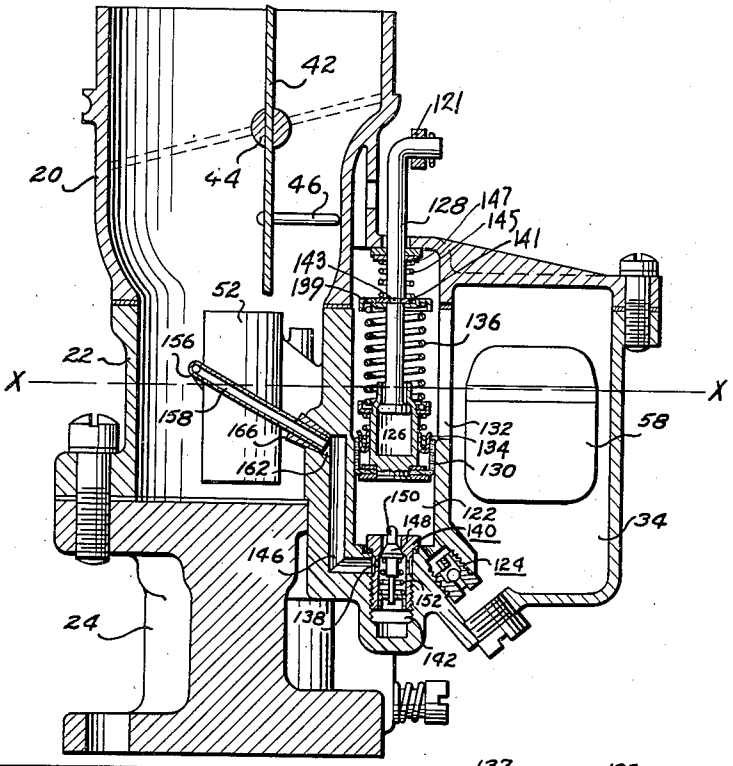
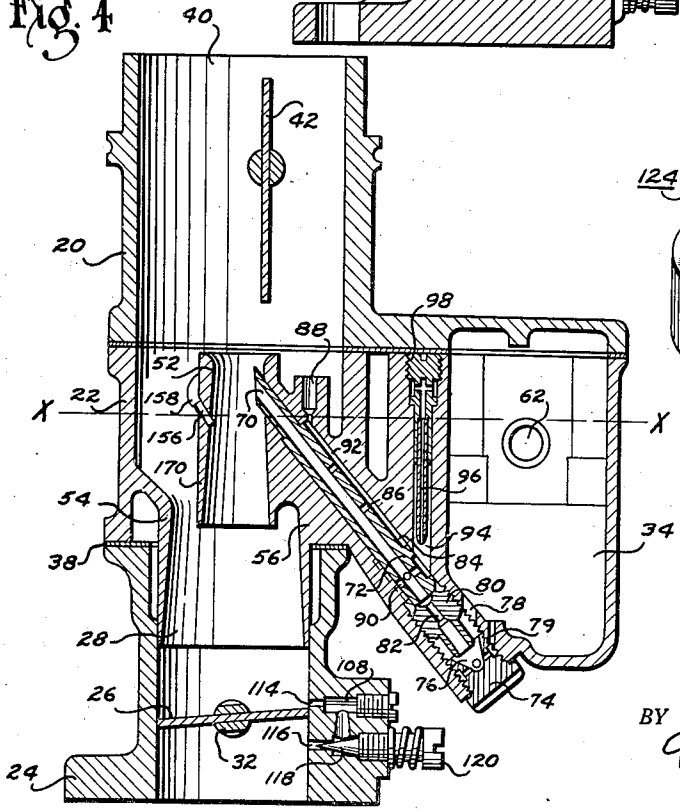


Fig. 4



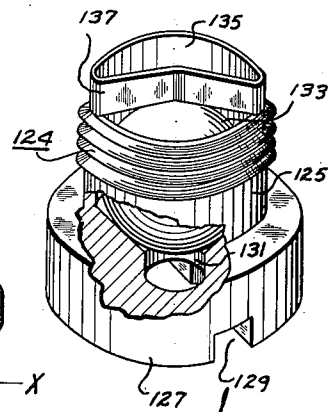


Fig. 9

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Fig. 5

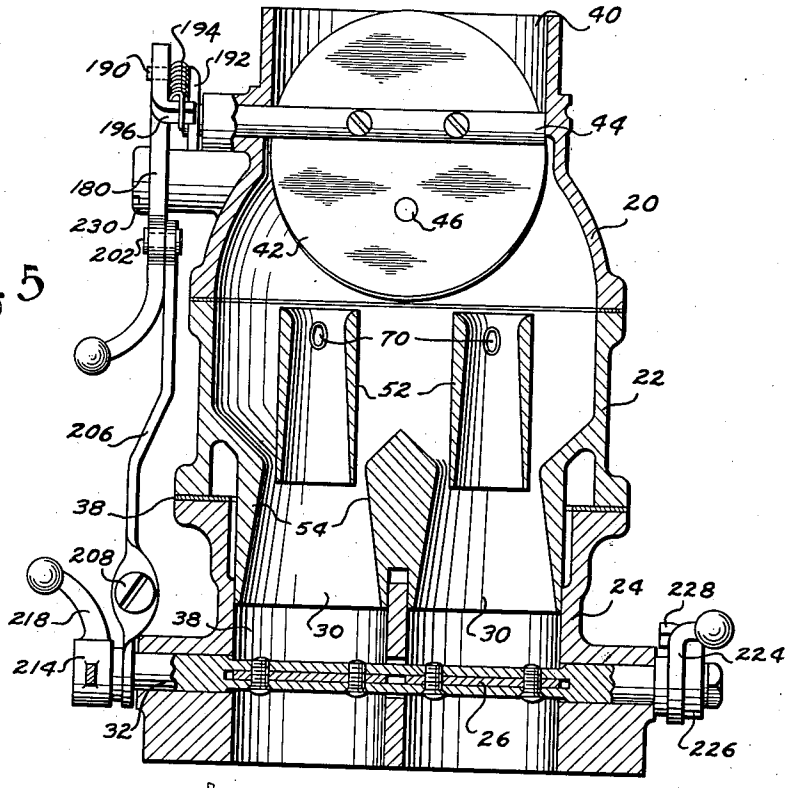
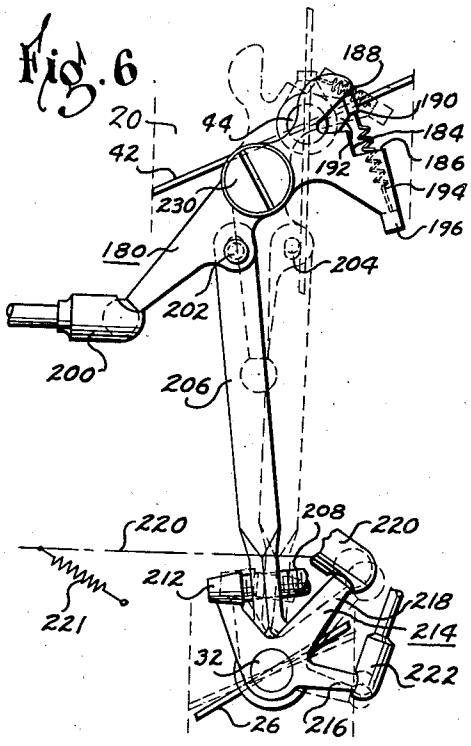


Fig. 6



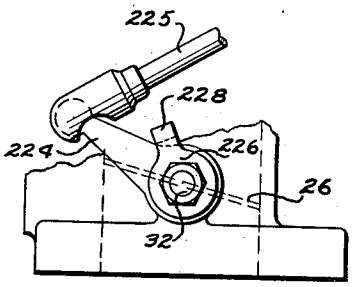


Fig. 7

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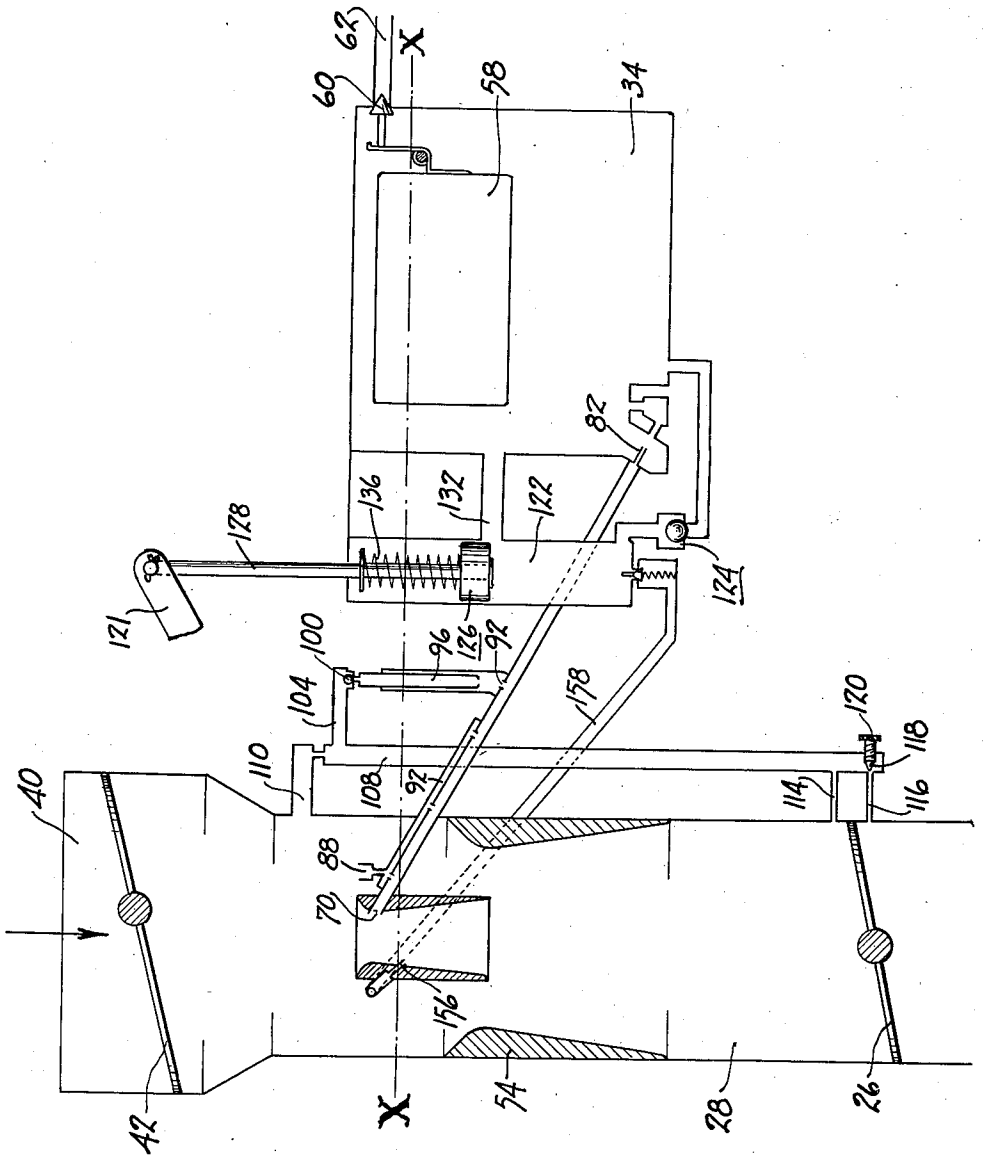


Fig. 8

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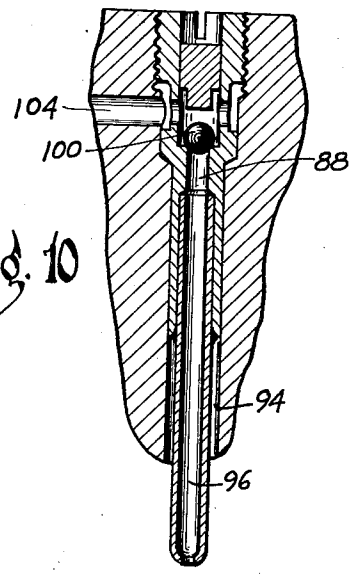


Fig. 10

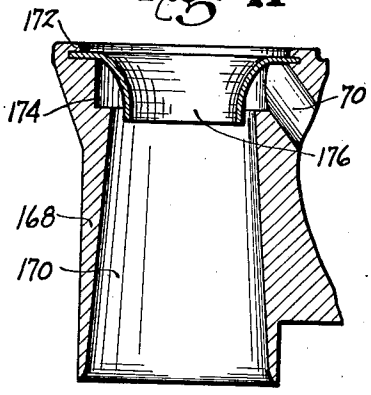


Fig. 11

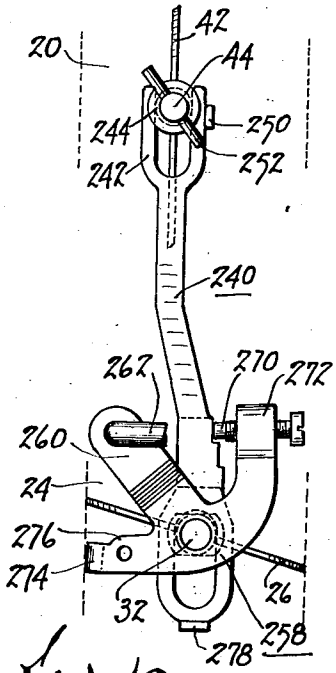


Fig. 12

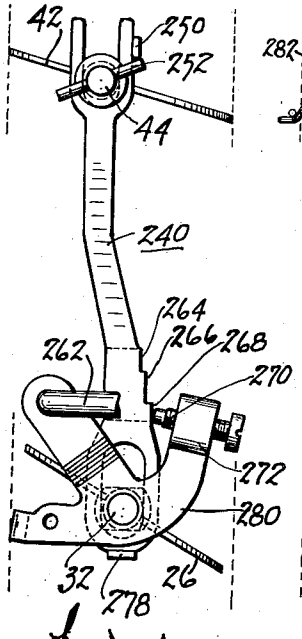


Fig. 13

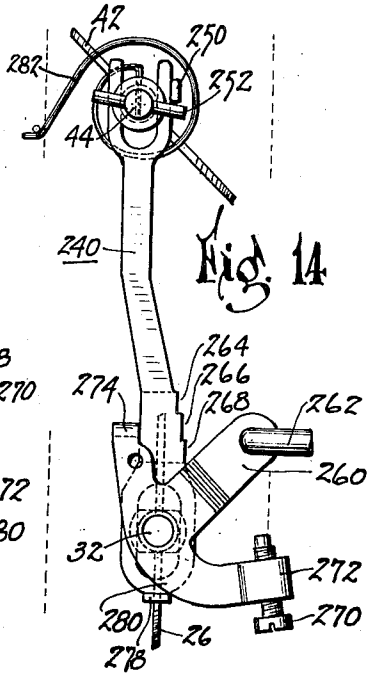


Fig. 14

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Patented July 26, 1938 2,124,777

UNITED STATES PATENT OFFICE

2,124,777

CARBURETOR

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Application December 11, 1933, Serial No. 701,740

5 Claims. (Cl. 261—52)

This invention relates to charge forming devices and more particularly to carburetors for internal combustion engines.

An object of this invention is to produce an improved carburetor in which the throttle and choke valves are so interconnected that, when the choke valve is closed, the throttle valve will be prevented from closing, so as to subject the main fuel discharge nozzle to the suction of the engine to facilitate starting and to cause the engine to idle at a speed above normal while it is cold.

Another object is to provide a carburetor of simplified construction which may be manufactured at a decreased cost and which will be economical and efficient in operation.

Further objects and advantages of the invention will be apparent from the following description, taken in connection with the appended drawings, in which:

Figure 1 is a side elevation of a carburetor embodying the invention;

Figure 2 is a plan view of the same;

Figure 3 is a section on line 3—3 of Figure 2;

Figure 4 is a section on line 4—4 of Figure 2, showing the details of construction of one barrel of the carburetor;

Figure 5 is a section on line 5—5 of Figure 2;

Figure 6 is an elevation showing the mechanism for cracking the throttle when the choke valve is closed;

Figure 7 is an elevation showing the connection from the hand throttle to the throttle shaft;

Figure 8 is a diagrammatic view showing the fuel and air passages in the carburetor;

Figure 9 is a view partly in section showing an improved check valve;

Figure 10 is a vertical section showing a detail of the fuel idling passage;

Figure 11 is a vertical section showing a modified form of primary venturi; and

Figures 12, 13 and 14 illustrate a modified form of fast idle mechanism in three positions.

The carburetor shown in the drawings for purposes of illustrating this invention is of the plain tube down draft type. It is expressly understood, however, that the invention may be applied to other types of carburetor.

In the drawings, Figure 1 shows a carburetor body comprising an upper or air horn section 20, a middle section 22 and a lower or throttle body section 24, the upper and middle sections being preferably formed of an alloy or metal suitable for die-casting, while the lower body section is preferably formed of cast iron and consists essentially of two plain tubes or barrels formed integral in parallel relation and having relatively thin walls. The usual throttle valves 26 controlling the flow of mixture through the mixing chamber 28 are mounted in the barrels 30 on a common shaft 32 which extends through both barrels and is journalled in the walls thereof substantially as shown in Figure 5.

The lower body section 24 is formed of cast iron or other material of low heat conductivity to retard the flow of heat from the intake manifold to the float chamber 34 and main discharge nozzles 70. It is separated from the middle body section 22 by a gasket 38 of material of low heat conductivity. The upper section 20 comprises the usual air horn 40 consisting of a single passage and having mounted therein an unbalanced choke valve 42 of the usual construction carried by a shaft 44 and having a stem 46 fixed therein to contact the walls of the carbureting passage and prevent the choke valve from rotating beyond the full open position.

The air passage formed by the upper section 20 divides into two channels in the middle section 22, which channels connect with the two barrels 30 leading to different groups of engine cylinders. Each channel has mounted therein an inner and an outer venturi 52 and 54 in the usual relation. The inner venturis are cast integral with the outer venturis and the middle section 22, being connected thereto by means of fins or bosses 56.

A float chamber 34 is cast integral with the middle section 22 and houses a float 58 which controls the inlet valve 60 admitting fuel through the fuel supply duct 62 to the float chamber 34. The normal fuel level in the carburetor is indicated by broken lines X—X in Figures 3, 4 and 8. The float chamber 34 is provided with a cover 64 which may be cast integral with the air horn section.

Referring now to Figure 4, a main fuel nozzle 70 is seated in an inclined bore formed in the middle body section 22 and terminates within the inner venturi 52. The lower end of the inclined bore is enlarged to form a fuel well 76 which is closed by a threaded plug 74, and communicates with float chamber 34 by means of a large port 78 and one or more smaller ports 79. Under normal operation fuel will be admitted to fuel nozzle 70 from float chamber 34 through ports 78 and 79, but when the carburetor gets hot, a portion of the fuel will vaporize and the bubbles thus formed will pass out of fuel well 76 through port 78, thus obstructing

the latter, whereupon the fuel will be supplied through port or ports 79. Fuel nozzle 70 is held in place by a metering plug 80 threaded in fuel well 76 and provided with a metering passage 82 connecting fuel nozzle 70 and fuel well 76.

An air bleed passage 92 communicating with the air horn 40 through port 88 formed in the top of boss 56, is formed by a flattened portion of fuel nozzle 70, and communicates with said nozzle by means of ports 86, to provide air bleeding of the fuel nozzle.

The idling system comprises a vertical idling passage 94 having a vertical tube 96 therein, closed at its upper end by a metering plug 98 which communicates with a horizontal bore 104 (see Figure 8) formed in the middle body section 22 and communicating with a downwardly extending idling passage 108 which extends through the middle and lower sections 22 and 24 to the idling ports 114 and 116 which communicate with the mixing chamber on opposite sides of the throttle valve 26. The idling passage 108 is air bled from the air horn 40 by means of air bleed plug 110 so that a mixture of air and fuel is drawn through passage 108. The discharge from port 116 is controlled by needle valve 118 which may be adjusted by means of an adjusting screw 120.

Figure 10 illustrates a modified vertical idling passage in which a ball check valve 100 is positioned in duct 88 to prevent air from entering through plug 110 and passing through bore 104 and duct 94 to the main fuel nozzle 70. Said check valve 100 is so positioned that it seats by gravity and will be unseated by suction in bore 104 when the idling system is in operation, to permit fuel to flow through duct 88 to the idling discharge port 116.

An acceleration pump cylinder 122 is cast integral with the middle body section 22 and communicates with the float chamber 34 through a check valve 124. A hollow plunger 126 slidable in cylinder 122 and actuated by means of rod 128 is formed with a flexible washer 130 fixed at the end of said plunger 126, extending back over the body of the plunger and urged against the walls of said cylinder 122 by means of a snap washer 134. This construction is designed to prevent vapor lock when the fuel in the carburetor has been raised to a high temperature, since it will allow the entrained vapor to pass between the flexible washer 130 and the walls of cylinder 122. A slot 132 is provided between cylinder 122 and float chamber 34 to equalize pressure in the two chambers and to insure a constant fuel level in cylinder 122 regardless of the position of plunger 126.

The plunger 126 is free to move longitudinally on rod 128 and is yieldingly urged to the lower extremity thereof by spring 136 so that when the pump is actuated rapidly rod 128 will move downward in plunger 126, compressing spring 136. This construction is desirable because the outlet from the acceleration pump is restricted by a small metering orifice 138 and excessive pressure would otherwise exist which would retard the opening of throttle valve 26 if some means for relieving the pressure were not provided. Spring 136 will urge plunger 126 downwardly in cylinder 122 and keep the entrained fuel under pressure to prolong the discharge of acceleration fuel. Spring 136 is fixed to shaft 128 by means of a washer 139 which is held in place by a key 141 fitted into a groove in shaft 128. A small spring 145 placed around shaft 128 and on top of washer 139 operates to hold a small washer 147 in contact with the upper surface of cylinder 122 to prevent dirt from entering said cylinder.

The check valve 124 between the acceleration pump and the float chamber is preferably of the type disclosed in Figure 9 and comprises a shell 125 provided with a head 127 having a screwdriver slot 129 and a hole 131 drilled through the end. A ball 133 rests by force of gravity upon a seat formed in head 127, and is retained in place by shearing rim 135 and crimping or bending a section 137 toward the axis of the valve substantially as shown, thus securing the ball in place.

A pressure-responsive valve 140 controls the flow of fuel discharged by the acceleration pump and comprises a plug threaded in a bore 142 having a duct therein communicating with the outlet passage 146. The movable member 148 of the valve has an upwardly projecting stem 150 designed to be engaged by plunger 126. A compression spring 152 urges valve member 148 upward with sufficient force to prevent the flow of fuel through the valve except when plunger 126 is forced downwardly due to opening of the throttle valve 26, whereupon fuel pressure is exerted on member 148 and when sufficient to compress spring 152 member 148 will be forced from its seat and a charge of fuel pump through duct 146 and tube 158 to the acceleration nozzle 156, which is positioned to discharge into the inner venturi 52 at a point opposite the end of the main fuel discharge nozzle 70. Tube 158 rises to a point above the fuel level X—X and terminates at or slightly below said fuel level. This construction prevents siphoning of fuel when the engine is not running even though the valve 140 is defective so as to permit fuel to pass it.

The construction of the acceleration pump is such that if the throttle is opened slowly, the movement of plunger 126 in cylinder 122 will be proportional to the movement of the throttle valve 26 and a continuous discharge produced. If, however, the throttle is opened rapidly considerable pressure will build up in cylinder 122, and since the outlet is restricted by a small metering orifice 138 considerable time will be required to empty cylinder 122 sufficiently to permit plunger 126 to reach the bottom. The pressure will cause plunger 126 to ride upwardly on rod 128, compressing spring 136 and permitting rod 128 to be fully depressed so as not to retard the opening of throttle valve 26. The fuel pressure below plunger 126 will rise sufficiently to compress spring 152, opening valve 140 and permitting a charge of fuel to be discharged through the acceleration nozzle 156. If the throttle is maintained in full open position plunger 126 will be moved downwardly on rod 128 by the force of spring 136 as soon as sufficient fuel has passed through valve 140 to lower the pressure. When plunger 126 reaches the bottom of cylinder 122 it will engage vertical stem 150 and hold valve 140 open permitting a steady flow of fuel through duct 146 by the suction in venturi 52 through tube 158 until vertical stem 150 is released by the movement of the throttle valve toward closed position.

The discharge tube 158 of the acceleration pump is seated in a bore 162 which communicates with passage 146, and tube 158 is held in place by means of a hollow tapered plug 166 which is placed around it and driven into bore 162 after the discharge nozzle 156 of tube 158

has been inserted into venturi 52, thus clamping the tube securely in place.

In the modified form of inner venturi shown in Figure 11, the body section 168 is formed with a tapered bore 170, and at its upper end is provided with a recess to receive an annulus 176 fitting therein and held in place by spinning a flange 172 at the top of body section 168 down over it, clamping it securely in place. The main fuel discharge passage 70 communicates with an annular fuel passage 174 formed in the body section 168, which passage forms with the annulus 176 the main discharge nozzle.

Referring more particularly to Figures 6 and 7, the throttle valve 26 and choke valve 42 are interconnected in such a manner that as the choke valve 42 is moved in the closing direction the throttle valve 26 is opened a small amount to facilitate starting.

A lever 180 is pivoted by means of a pin 230 to the upper body section 20 of the carburetor at a point between the choke and throttle valves. One end of said lever is provided with a cam surface 184 and two stops 186 and 188 to engage an ear 190 projecting laterally from an arm 192 which is fixed to choke shaft 44. A spring 194 connects ear 190 with an ear 196 formed on lever 180.

The other end of lever 180 connects with the choke actuating rod 200 designed to be actuated from the operator's seat, and imparts movement in the clockwise direction to lever 180 as the operator moves the choke actuating mechanism in the "closed" direction. Between this point of connection and the pin 230 lever 180 is provided with a pin 202 which operates in a slot 204 in one end of a link 206. The other end of link 206 is pivoted on throttle shaft 32. An adjustable stud 208 having a locking spring 210 is threaded through link 206 and engages a stop 212 formed on one arm 214 of a triple armed bell crank fixed to throttle shaft 32. Another arm 216 connects with the acceleration pump actuating rod 222, while the third arm 218 connects with the actuating rod 220 from the foot accelerator, which rod is yieldingly urged toward the "throttle closed" position by a tension spring 221 in the usual manner, as indicated diagrammatically in Figure 6. An arm 224 rotatably mounted on the other end of throttle shaft 32 has an actuating rod 225, connected to the hand accelerator and, by means of arm 226 having an ear 228 bent thereon fixed to said throttle shaft 32, transmits positive motion to throttle valve 26.

The normal positions of the choke and throttle valves when the engine is not running are shown in Figure 1 and in dotted lines in Figure 6, the choke valve 42 being open and the throttle valve 26 is closed. In order to prepare the carburetor for starting, the operator pulls out the choke button on the dash panel (not shown) thereby rotating lever 180 in the clockwise direction about pin 230, from the position shown in dotted lines toward the position shown in full lines in Figure 6. During this movement spring 194 will exert tension on arm 192 through ear 190 which will slide on cam surface 184 and carry with it choke valve 42. As lever 180 rotates to the position shown in full lines in Figure 6, stop 188 will engage ear 190 and positively rotate it until choke valve 42 comes in contact with the walls of the main carbureting passage 40 which will arrest further rotation of lever 180.

As lever 180 moves from the position shown in dotted lines in Figure 6, pin 202 will slide in slot 204, causing lever 206 to rotate in the counterclockwise direction, whereupon stud 208 will engage stop 212 and rotate the throttle in a counterclockwise direction, thereby opening it slightly, as shown. When the engine has started, the operator will push the choke control button part way in and permit the engine to run a short time to warm up before pushing the choke control button all the way in. The above described interconnecting mechanism will hold the throttle valve open an amount proportional to the closing of the choke valve, and therefore provide a fast idle for warming up purposes.

The fast idle mechanism just described does not form a part of our invention, but is disclosed and claimed in the copending application of M. A. Trisler, Serial No. 756,031, filed December 5, 1934.

Figures 12, 13 and 14 illustrate a modified fast idle mechanism comprising an interconnection between the choke and throttle valves by means of a link 240 having a fork 242 at its upper end, and slotted at the lower end to permit vertical movement of said link.

The fork 242 is slidable on the choke shaft 44 between a washer 244 and the body section 20 of the carburetor. One arm of the fork is provided with an ear 250 which is designed to engage a pin 252 extending through and fixed in choke shaft 44. Shaft 44 is mounted eccentrically of the air horn, so that the choke valve 42 is unbalanced or pressure responsive.

The lower end of link 240 slidably engages the throttle shaft 32 between the body section 24 of the carburetor and a triple armed bell crank 258 fixed to throttle shaft 32. Crank 258 imparts movement to the throttle by means of arm 260 which is fitted with a connection 262 from the acceleration pedal (not shown). Link 240 is provided with three steps 264, 266 and 268 which engage an adjusting screw 270 carried on arm 272. An ear 274 is provided on arm 276 to contact link 240 providing a stop when the throttle is in full open position. An ear 278 on the lower end of link 240 is provided to engage the cam surface 280 of arm 272 under certain operating conditions as described hereinafter.

Figure 12 shows the position of the mechanism when the choke valve is open and the throttle valve is closed. To prime and start the engine, the operator pulls out the choke button on the dash panel, rotating choke shaft 44 in the counterclockwise direction and carrying therewith pin 252 which will engage ear 250 on link 240 and force said link to slide upward, until the adjusting screw 270 in arm 272 contacts step 266 which will arrest further movement of the choke mechanism until the throttle has been partially opened by rotating bell crank 258 in the clockwise direction. This movement of crank 258 moves adjusting screw 270 out of the way of steps 266 and 268 and permits the choke valve to close, thus lifting link 240 by means of ear 250 and pin 252. When the throttle control is released, adjusting screw 270 will contact step 268 and hold the throttle partly open to condition the carburetor for starting. This stage of the operation is illustrated in Figure 13. When the engine has started, the operator pushes the choke control part way in, rotating pin 252 in the clockwise direction, and permitting link 240 to drop by force of gravity. Adjusting screw 270 will then engage step 266, permitting bell crank 258 to rotate in the counterclockwise direction and close the throttle valve

part way to cause the engine to idle at a speed above normal. When the engine is thoroughly warmed up, the operator pushes the choke button all the way in, and link **240** drops to the position shown in Figure 12 producing a normal or slow idle with the choke fully open.

This construction renders it impossible to close the choke valve unless the throttle is partly opened first, so that proper throttle setting is insured for starting and warming up purposes.

It will be understood that the fast idle devices described herein may be used in connection with automatic choke mechanisms such, for example, as that disclosed in the application of S. F. Hunt, Serial No. 630,274, filed August 24, 1932, in which the position of the choke valve is controlled by temperature and other factors. In such a construction, if the engine should fail to start after considerable cranking with the choke valve closed, the engine may become flooded and it will be impossible to start it. Figure 14 illustrates a choke valve controlled by a thermostatic spring **282**, and a method by which a flooded condition of the engine may be relieved.

If the engine is flooded, the throttle valve is thrown wide open as indicated in Figure 14, and as bell crank **256** rotates in the clockwise direction, cam surface **280** will engage ear **278** which is fixed to link **240** and force it down, partially opening choke valve **42** as ear **250** engages pin **252** and rotates it in a clockwise direction against the force of spring **282**. Since choke valve **42** is unbalanced, it will be forced further open by the unrestricted flow of air to the cylinders of the engine and the excess of fuel will therefore be driven out through the exhaust valves and the engine prepared for a new attempt to start it.

It is expressly understood that the scope of this invention is to be in no way restricted except by the terms of the appended claims.

We claim:

1. In a carburetor having a main carbureting passage with choke and throttle valves mounted therein on shafts journalled in the walls of said main carbureting passage, an arm fixed to the throttle shaft, and a fast idle mechanism interconnecting said choke and throttle valves and comprising a link having one end bifurcated and its other end slotted to permit vertical movement of said link, means for lifting said link as said choke valve is closed, and a series of steps formed in the side of said link to engage said arm to hold said throttle partly open.

2. A carburetor venturi comprising a member formed of cast metal and having a tapered bore, an annular fuel discharge chamber adjacent the smaller end of said bore, and an annular stamping overlying the fuel discharge chamber and spaced therefrom to form therewith an annular fuel discharge orifice, a portion of said first mentioned member adjacent said smaller end, being deformed to secure the annular member thereto.

3. In a carburetor having a carbureting passage with choke and throttle valves therein, separate means for actuating the choke and throttle valves, and a fast idle mechanism comprising a link having slidable engagement with the respective actuating means, means operative when the choke valve is moved toward closed position for moving said link longitudinally of the carburetor, and a plurality of stops carried by the link to variably limit the closing movement of the throttle valve.

4. In a carburetor having a carbureting passage, a choke valve and a throttle therein, shafts for said choke valve and throttle, and means including a member slidably related to said shafts and operative in accordance with the position of the choke valve to variably limit the closing movement of the throttle, operative upon opening movement of the throttle to open the choke valve, and operative when the throttle is fully closed to prevent closing of the choke valve.

5. A device as defined in claim 4, including temperature responsive means for influencing the operation of the choke valve.

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