May 10, 1960 W. C. EBERLINE 2,935,977

CARBURETOR CONSTRUCTION

Filed May 6, 1957 3 Sheets-Sheet 1

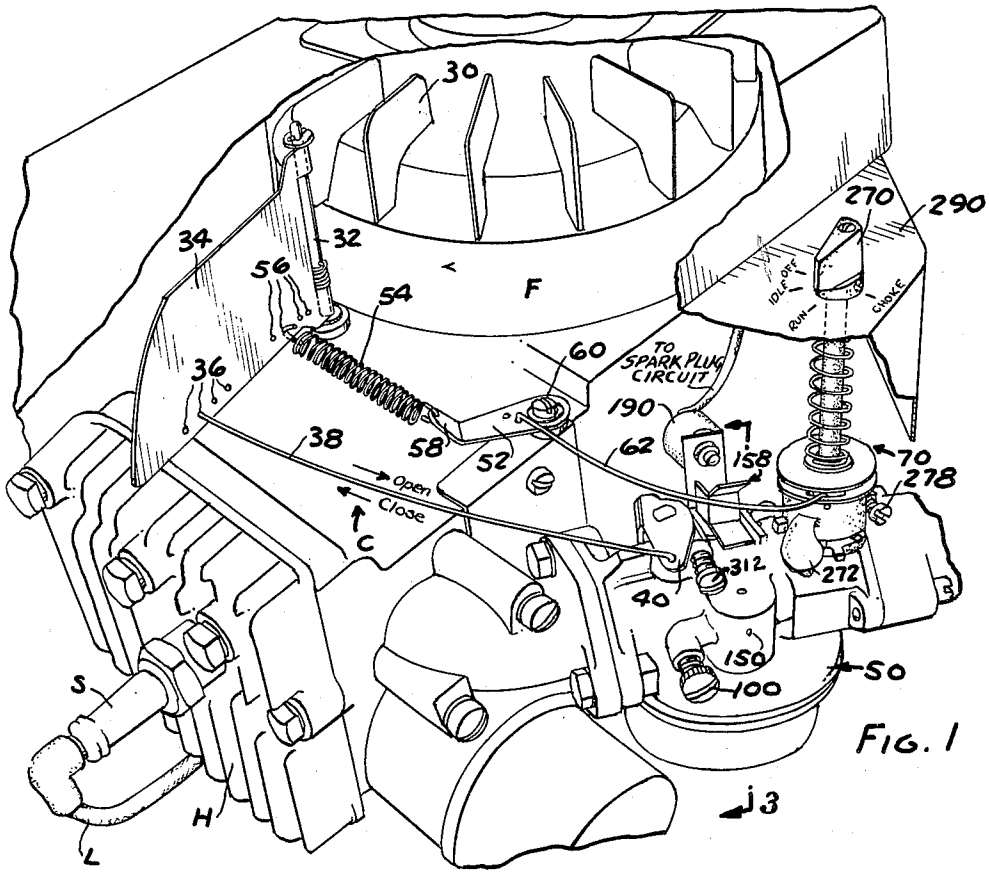


FIG. 1

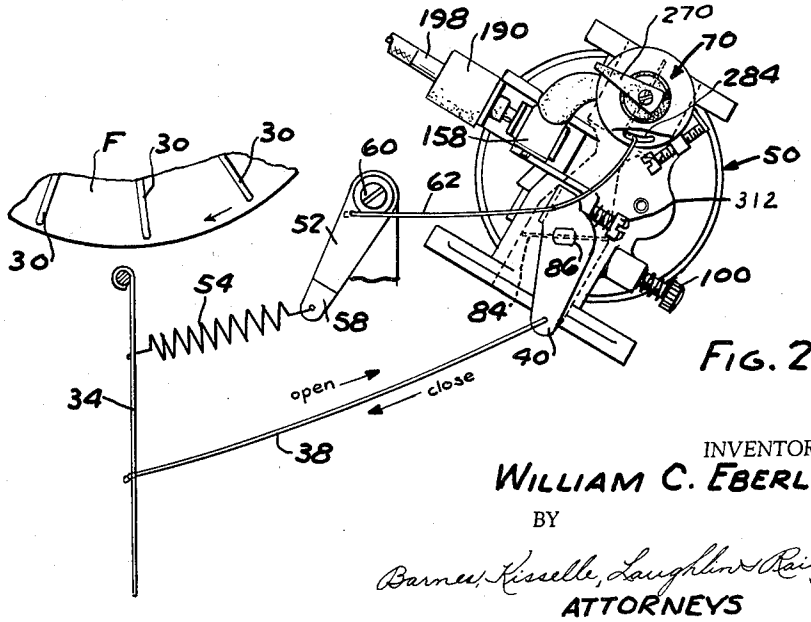


FIG. 2

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FIG. 3

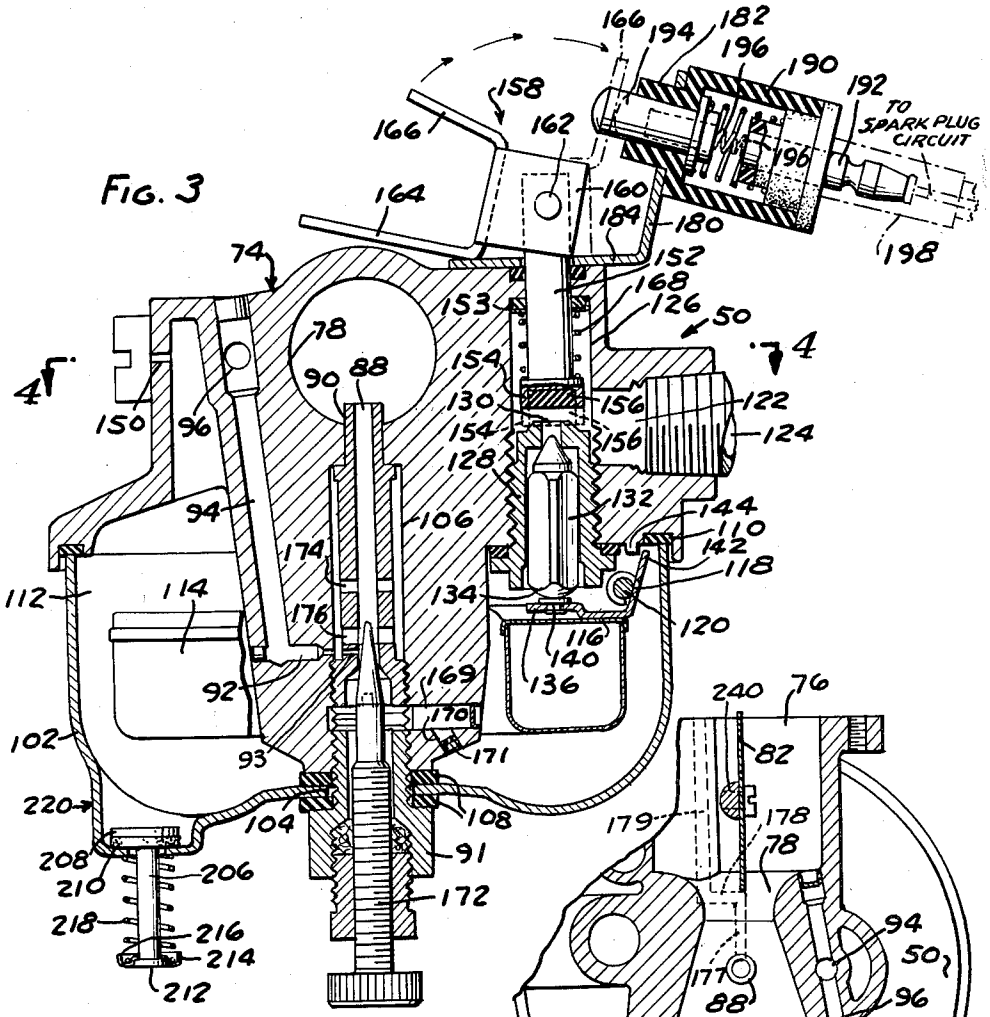


FIG. 4

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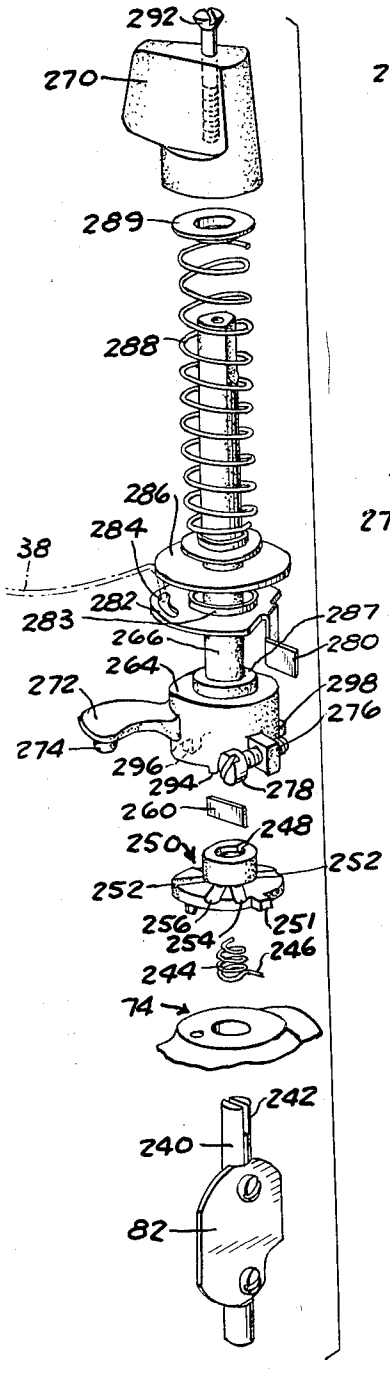


FIG. 5

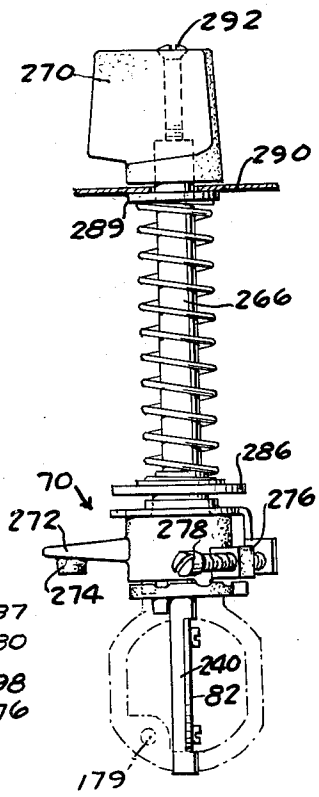


FIG. 6

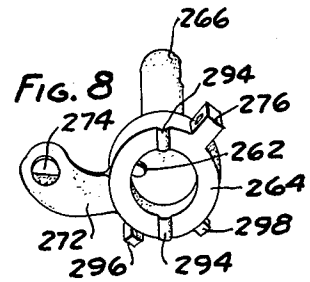


FIG. 8

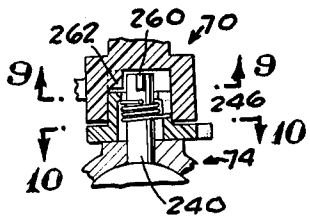


FIG. 7

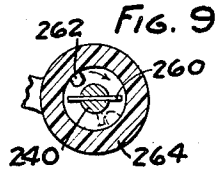


FIG. 9

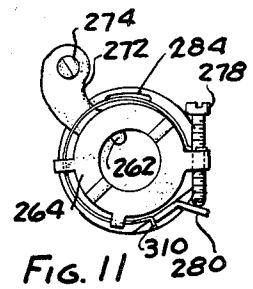


FIG. 11

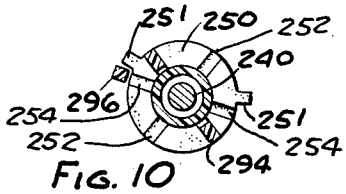


FIG. 10

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United States Patent Office 2,935,977 Patented May 10, 1960

2,935,977

CARBURETOR CONSTRUCTION

William C. Eberline, Cass City, Mich., assignor to Walbro Corporation, Cass City, Mich., a corporation of Michigan

Application May 6, 1957, Serial No. 657,164

22 Claims. (Cl. 123—119)

This invention relates to a carburetor and governor control for an internal combustion engine. The carburetor and governor control are particularly adapted for use on utility engines used for farm and home equipment.

It is an object to provide an improved and simplified control.

Drawings accompany the description, and the various views thereof may be briefly described as:

Figure 1, a perspective view of an engine showing the carburetor and governor assembly.

Figure 2, a plan view of the control elements.

Figure 3, a sectional view of the carburetor on line 3—3 of Figure 1.

Figure 4, a sectional view of the carburetor on line 4—4 of Figure 3.

Figure 5, an exploded view of a control assembly.

Figure 6, an assembled view of the control assembly.

Figure 7, a sectional view of the assembly shown in Figure 6.

Figure 8, an end view of one of the control elements shown in Figure 6.

Figures 9 and 10, sectional views on lines 9—9 and 10—10 of Figure 7.

Figure 11, a view of the bottom of the control showing a modified application of a return spring.

Referring to the drawings, an engine is shown in Figure 1 having a cylinder block C and a head H with spark plug S provided with a lead wire L. The engine has a flywheel F provided with blades 30. Mounted on the engine block C on a vertical shaft 32 is a governor blade 34 having a plurality of holes 36 for attachment to a control wire 38 leading to a throttle lever 40 on a carburetor 50.

The governor blade 34 is also connected to a pivot arm 52 by a spring 54 which has one end hooked in holes 56 on the blade 34 and the other end hooked into a tab 58 on pivot arm 52, which is anchored at 60 on the engine block. The arm 52 between the pivot point 60 and the tab 58 is connected to a wire link 62 which leads to a control on the carburetor 50 being connected in a manner which will be described in detail to a control assembly generally indicated at 70.

A combination control such as that above described is generally known to the art and has been used on commercial devices. The invention herein is particularly related to the carburetor and control assembly which is associated with the governor control.

As shown in Figures 3 and 4, this carburetor consists of a body 74 having an air inlet 76, a venturi 78, and a mixture outlet 80 adapted to be secured to the fuel inlet of the internal combustion engine. A valve member 82 in inlet 76 provides a choke, and another valve member 84 adjacent the mixture outlet provides a throttle control.

The valve 82 is controlled by the assembly 70, which will be later described, and the valve 84 is mounted on a shaft 86, which projects upwardly through the housing and is attached to the lever arm 40. A passageway 88 formed in a cartridge insert 90 forms an opening for raw fuel into venturi 78, and another passageway 92, 94, 96

in the body supplies raw fuel to idling jet 98, which is controlled by a screw needle valve 100. The restricted drilled port at the end of passage 92 is extended through the wall of cartridge 90 at 93. These passages are thus arranged to insure smooth change-over from idle to run and vice versa. A bowl 102 is secured on body 74, preferably by a retainer nipple 91 projecting through a central opening 104 in the bowl and threaded to an interior portion in a central bore 106 of the body, into which bore the insert 90 is also threaded at one end.

Suitable sealing washers 108 may be provided adjacent the opening 104, and sealing ring 110 is provided between the top rim of the bowl 102 and an annular recess in the body. Bowl 102 forms a chamber 112 containing a torus shaped float 114 having one side portion 116 connected to a hinge 118 pivotally secured to body 74 through a pin 120. Float 114, having inherent buoyancy, may be a hollow shell formed of thin corrosion resisting metal in the order of .004 to .007 inch thick.

Body 74 has a fuel inlet passage 122 adapted to receive a fuel line 124 and communicating into chamber 112 through a bore 126 and a nipple insert 128 threaded into the bottom of the bore. Insert 128 is formed with an orifice 130 at the top end thereof, the inner end of the orifice forming a seat for a bullet-nosed, square cross section slide valve 132.

This valve has a spherically rounded end 134 at the bottom and is operated by an extension 136 on the end of hinge 118. A small nylon rivet 140 is inserted in the tab 136 to provide a wear point and insure smooth operation.

It will be obvious that when the float 114 rises, the valve 132 will close the orifice 130. Hinge 118 has a projection 142 which contacts a small tab 144 to provide a stop for the downward movement of the float 114. Chamber 112 is vented at 150 with a small air port, and the fuel supply through the passageway 122 and the orifice 130 can be cut off by a plug valve 152, which comprises a spring biased plunger shaft having a recessed end 154 containing a compressible material 156 which engages the end of the insert 128. Shaft 152 projects upwardly through the body and is controlled by an operating element 158 which is a combination lever and cam-throw.

As shown in Figure 3, the valve 152 is in open position. Bifurcate lugs 160 are transfixed by a pin 162 which passes through the shaft 152. The lugs 160 are formed on the U-shaped operating member 158 having tabs 164 and 166. When these tabs are swung in the direction of the arrows, the corners of the tabs 160 will cam around the pin 162 and raise the shaft 152 slightly and then lower it down to a closed position under the influence of compression spring 168. Plunger 152 is sealed by an O-ring recessed from the top of housing 74 and also by an O-ring and cupped washer assembly 153 which forms a seat spring 168 at the upper end.

It will be seen that this valve 156 closes the inlet to the carburetor float chamber in a positive maner. If it is desired to store or ship an engine, it is possible to drain the float chamber and the entire carburetor will be dry. Also, as will be described later, the valve 156 is closed each time the engine is shut off.

The chamber 112 is connected to the passageway 88 of insert 90 through a plugged bore 169 which leads to central bore 106. A short angled passage 170 connects the float chamber to passage 169 at the bottom of the housing 74. Passage 170 has a plug 171 provided with a metered opening. This arrangement permits a high degree of tiltability of the carburetor. The metered opening or jet in plug 171 is preferably calibrated to a "50% rich" condition. This permits adjustable control for altitude and engine variations by a threaded needle valve 172 in nipple 91 which controls the bottom end of pasageway 88. The insert 90 is restricted in diameter at its central

portion and provided with cross passageways **174** and **176** to permit flow of air from passages **177**, **178** and **179** to the passageway **92** and also to the main passage **88**. As the engine starts, the liquid level may be about at passage **174**. Under running conditions the level will drop down to cover only the passages **92** and **93**.

Mounted around plunger **152** on the top of the housing **74** is an L-shaped conductive bracket **180** which has one leg extending upwardly and apertured to receive in supporting association the neck **182** of a non-conductive switch housing **190** (Figure 3). The bracket **180** is held in place by cam member **158** which rests on the prone leg **184**. Spring **168** is the hold-down force for this assembly of parts. The leg **184** must be in contact with housing **174** to insure ground contact for switch **190**.

Switch **190** is an explosion-proof construction which has at one end a conductor **192** projecting into the switch, this connector being adapted to short the ignition system by grounding it to the engine. This is accomplished by a spring-pressed plunger **194** at the other end of the switch which has a small recessed spiral convolution spring contact **196** which can contact the inner end of conductor **192**, on which is located a connecting wire **198** leading to the ignition circuit. Tab **166**, when it moves to its upper position shown in dotted lines, moves the plunger **194** and the contact spring **196** to contact position at the same time that the valve **156** is moved to closed position, thus shorting out the ignition system.

Thus, each time the manipulatable control unit **158** is shifted to a valve closing position of valve **156**, it also shorts out the ignition system. The switch **190** is preferably connected into the low voltage side of the magneto, that is, the primary side of the transformer circuit. This avoids arcing to a great degree since a very small gap of about .002" is sufficient in this primary circuit. If cut out is made in the secondary circuit, a gap of ½" or more is necessary. This positive cut-out switch is also significant when the engine is used on lawn mowers. If no ignition cut-out is available, or even a cut-out which is pressure released by an operator, when weeds or other objects are being removed from a fouled blade rotor, the incidental turning of the rotor may cause the engine to start and injure the operator.

A small spring-pressed plunger **206** is shown at the bottom of Figure 3 to permit drainage of the chamber **112**. This plunger at the top has a small flange **208** with a sealing washer **210**. At the bottom a small head **212** is formed on the plunger **106**, and this head passes through a hole in a cup-shaped element **214**, it being assembled through a slot **216** in the wall of the cup. The spring **218** seats in the cup around the shaft **206** to hold the assembled parts in position. Upward pressure on the cup permits gas to drain from the chamber **112** and also the slight depression **220** in housing **102** forms a sediment trap and permits cleaning out of the bowl. This drainage is useful for storage or shipping and also permits prime starting with gasoline when cheaper fuels, such as kerosene, are used to run the engine, as is frequently done in European countries.

In Figures 5 to 10, a control assembly is shown for the engine and carburetor. Starting at the bottom of Figure 5, the choke valve **82** shown in Figure 4 is illustrated affixed to a shaft **240** cut away to a flat at its central portion. The upper part of the shaft **240** is slotted at **242**, and this portion passes through a portion of the housing **74**. The shaft is surrounded by a spring **244**, one end **246** of which is anchored in a slot **248** in the neck of a small plastic insert **250** and the other end in slot **242**. This insert has a lug projection **251** extending radially therefrom and is provided with a series of three diametrical surface groves **252**, **254**, **256**, which provide four stops for the various positions of the control in a 180° turn.

A small cross plate **260** fits in the slot **242** of shaft **240** and co-operates with a projection **262** within a cylindrical plastic housing **264** to provide a lost motion rotating connection between housing **264** and shaft **240** (Figures 7, 8, 9). This plastic housing has a neck portion **266** extending centrally and upward thereof on which is fastened a control knob **270**. Housing **264** also has an outwardly extending arm **272** with a small depending lug **274** which serves to actuate the control element **158**.

Circumferentially spaced from arm **272** is another radial projection **276** threaded to receive an adjustment screw **278** which co-operates with a depending tab **280** on a plate **282** mounted around shaft **266**. Plate **282** has a spacer neck portion **283** which improves the stability of the plate. A slotted grove **284** in plate **282** receives the L-end of wire link **62** (Figure 1). On top of plate **282** is another circular plate **286** which rides on ferrule **287** of housing **264** and serves as a spring seat for a spring **288** surrounding the neck shaft **266** and bearing against a washer **289** which rests against the bottom of an indicator plate **290** fixed on the engine. A screw **292** holds the knob **270** on the assembly. Spring **288** serves to hold the various parts in assembly and also to stabilize the action of control knob. The knob can be adapted for remote control if desired by flexible cable or gear and rack assembly.

The parts shown in Figure 5 are assembled in Figure 6.

In Figure 8, it will be seen that the bottom of housing **264** has two downwardly projecting lugs **294** which co-operate with the grooves in the element **250**. A stop element **296** is also provided on the body **264** to co-operate with the radial extensions **251** on the element **250**. A radial lug **298** on body **264** serves as a limit stop for part **280**.

The operation of the knob **270** performs directly three main functions. First of all, when moved to choke position, the housing **264** through lug **262** contacts the cross piece **260** on shaft **240** to move the choke plate **82** to a positon blocking the passage **76** to create a choke condition in the carburetor. In this position the shaft **240** is moved against the return action of spring **244**.

When the knob **270** is turned from choke position in a clockwise direction as viewed in Figure 1, it first reaches a run position in which the choke plate is moved by spring **244** to a non-choke position in passage **76**. In this position the actuator lever **272** moves in between arms **164** and **166** of operating element **158**.

A further shifting of the control knob **270** in a clockwise direction to the off position shown swings the operating cam lever **158** to the dotted line position shown in Figure 3, causing the arm **166** to contact the switch button **194** to ground out the ignition system of the circuit and also to lower the valve plunger **152** so that the sealing insert **156** closes off the passage **130**.

If desired, a return spring **310** can be mounted around control housing **264** anchored at one end on screw **278** and the other end being free to bear against tab **280** to insure return to a position against adjustment screw **278** when the control shaft is returned from choke position (see Figure 11).

It will be readily seen that when the knob **270** is returned fully in counterclockwise direction it returns to the choke position as originally described and at the same time cams the operating member **158** to a position where valve **156** is open again and the ignition circuit is complete through the switch **190**.

In addition to these three direct functions, the control knob **270** also has other functions in that the plate **282** is connected to link **62** leading to the pivot arm **52** which controls the governor blade **34** through spring **54**. In the choke position, spring **54** is tensioned to its greatest degree, and thus through the blade **34** and the ring **38** the throttle is in its wide open position.

Moving knob **270** to its run position releases some of the tension on spring **54** and permits operation of the fan blades **30** to urge the governor to a further closed

position to control the throttle lever **40**. The knob **270** can also be moved clockwise to an idle position where the spring **54** is relieved completely permitting the air from the flywheel **30** to shift blade **34** in a clockwise direction, thus forcing throttle lever **40** against stop screw **312**, which can be adjusted for any r.p.m. idle speed. Further movement of knob **270** in the clockwise position will be to an off position where the end of link **62** is loosely disposed in slot **284**. The governed speed of the engine at the run position may be adjusted in a wide range by moving screw **278**, which limits the motion of the tab **280** on plate **282**. Also, the action of governor vane **34** is such that in response to rotation of blades **30** on flywheel F, it tends to tension spring **54** and through control wire **38** move lever **40** in the throttle closing direction. Additional stops can be provided in the "run" zone if desired.

The knob **270** thus has five functions in that it may control choke position, run position (one or several), idle position, off position of shut-off valve, off position of ignition switch. As is usual with these governor controlled engines, when load is applied to the engine, the reduced speed will affect the position of blade **34** to increase gas supply to the engine and stabilize the running speed.

It will be noted that to reach the "off" position the control is always moved through the "idle" zone so the engine is slowed down and the throttle closed as the engine stops. Thus, the engine cannot be cut out at high speed. This avoids pulling of excessive amounts of raw gas into the cylinders as the engine is stopped. Various other adjustments in the running condition of the engine can be accomplished through the usual adjustments provided in the carburetor.

A carburetor of a somewhat similar description is disclosed in my pending applications Serial No. 365,427, filed July 1, 1953, now Patent No. 2,813,540, and Serial No. 509,154, filed May 18, 1955. This application is a continuation-in-part of application Serial No. 365,427.

I claim:

1. In a carburetor of the type having a float control chamber and a horizontal venturi passage together with an inlet from a fuel supply, a float controlled valve port leading from said supply inlet to said float chamber, a float controlled valve movably mounted in said port, and a second valve member independent of said float controlled valve and mounted in said inlet on said carburetor shiftable from an open position to a closed position blocking said inlet from said float chamber.

2. In a carburetor construction for supplying fuel to an internal combustion engine, a body portion, means connected to the body portion and forming a chamber, a float in the chamber, a bore in the body above the chamber, a fitting in the bore having an inlet port, means in the body providing an inlet passage adapted to be connected to a fuel supply container positioned above the inlet passage for the gravity flow of fuel, said inlet passage communicating with the port above the same, a valve member in the said fitting acted upon by the float and positioned below the port and arranged to open and close the port in accordance with the position of the float, a plunger positioned in said bore and located above said fitting, a spring around the plunger, a seal member carried by the plunger and adapted to engage the fitting on the inlet side of the inlet port to close said inlet port, the body having a wall at the end of the bore, said plunger extending through said wall and accessible on the outside of the body, and an operating element associated with the accessible end of the plunger movable to shift the plunger against the action of the spring to open said inlet port for engine operation and movable to release the plunger so that it is acted upon by the spring to close the port for periods of non-use.

3. A device as defined in claim 2 in which the operating element comprises a cam member pivoted on said plunger and engageable with said body portion wherein movement of said cam moves said plunger in and out of said body to and from a closed position.

4. A device as defined in claim 3 in which means is provided for grounding out an ignition connection for an internal combustion engine, said cam member having a conductive portion to contact said grounding out means when said cam is in closed-valve position.

5. In a carburetor construction for supplying fuel to an internal combustion engine having a fuel chamber and a venturi passage together with an inlet from a fuel supply, means forming a control port between said chamber and said inlet, valve means on one side of said port to open and close said port in response to fuel in said chamber, a second valve means movably mounted on the other side of said port between said inlet and said port to open and close said port in respective positions of movement, and means mounted on said carburetor independent of said chamber manipulatable to control said second valve means selectively to close said chamber from a fuel supply connected to said inlet.

6. A device as defined in claim 5 in which shiftable means is associated with said carburetor for grounding out an ignition connection for an internal combustion engine, and said selectively manipulatable means is positioned to actuate said grounding out means.

7. A device as defined in claim 6 in which said manipulatable member comprises a conductive member pivoted on a portion of said valve member and movable from a valve-open position out of contact with said grounding out means to a valve closed position in contact with said grounding out means.

8. A device as defined in claim 5 in which said manipulatable means comprises a plunger projectable into said carburetor having one end extending therefrom, a bracket for a grounding-out switch mounted adjacent said plunger, a grounding-out switch on said bracket, resilient means urging said plunger inwardly, and cam means in contact with said bracket to hold it in place and shiftable to cam said plunger outwardly against the action of said resilient means, said cam means having an extension to contact said grounding-out switch when said valve is in closed position.

9. A carburetor of the type having a venturi passage with a throttle valve in one end and a choke valve in the other, said carburetor having a fuel chamber and a fuel-level control valve for admitting fluid from an inlet of said carburetor to said chamber, a valve control port leading from said inlet to said fuel chamber, a shut-off valve means selectively operable to close said port independently of said control valve, and means on said carburetor operatively connected with said choke valve, said throttle valve and said shut-off valve, wherein said valves may be operated sequentially and selectively by said means.

10. A device as defined in claim 9 in which there is associated with the carburetor a switch means for influencing an ignition circuit of an internal combustion engine and means associated with said shut-off valve and said switch wherein actuation of said shut-off valve to closed position will also actuate said switch to affect an ignition circuit.

11. In a carburetor of the type having a venturi passage with a throttle control valve at one end and a choke valve at the other, said valves being associated through a governor arm, means for introducing fluid to said carburetor through an inlet, a control port at said inlet, a shut-off valve for opening and closing said control port, and a control means directly associated with said choke valve and indirectly associated with said throttle valve through said governor arm, said control means being shiftable to open and close said shut-off valve.

12. A device as defined in claim 11 in which the control means comprises a shaft, means at one end of said shaft for manually manipulating said shaft, means at

the other end of said shaft connected to said choke valve in a lost motion connection wherein said choke valve is actuated at one extreme position of rotation of said shaft and is released in the other position of extreme rotation of said shaft, means for limiting the rotation of said shaft between said extreme positions, means on said shaft operably associated with said shut-off valve to open and close said valve at a portion of the travel of said shaft adjacent one extreme position, and means on said shaft wherein rotation thereof will influence the biasing effect on a governor arm associated with the throttle valve.

13. In a carburetor of the type having a venturi passage with a throttle control valve at one end and a choke valve at the other, means for introducing fluid to said carburetor through an inlet, a shut-off valve for opening and closing said inlet, an idling passage in said carburetor for furnishing fuel when said throttle valve is closed, a ground-out switch means for an ignition system, a secondary control device for actuating said shut-off valve and said switch means, and a primary control device movable between two extreme positions, means connecting said primary control device to said choke valve to move the choke valve to choke position at one extreme position, means connecting said primary control device to said throttle valve to influence its position selectively in a zone intermediate the two extreme positions and to close said throttle in a position adjacent the other extreme position wherein said idling passage may function, and means operably associating said primary control device and said secondary control device to cause actuation of said secondary control device between the intermediate zone and the said other extreme position to close said shut-off valve and said ground-out switch means.

14. A device as defined in claim 13 in which the primary control device is a rotatable first shaft, and the means connecting the primary control device and the choke valve comprises a second shaft co-axial with the first shaft and on which the choke valve is mounted, a cross-member on said second shaft, and a housing on said first shaft over said cross-member having an off-center projection to contact said cross-member to shift it and the choke valve when said first shaft is rotated to one extreme of its movement.

15. A device as defined in claim 13 in which the means connecting the primary control device and the throttle valve comprises a linkage of the governor type and a connection on the control device for said linkage comprising a plate adjustably associated with said control device to vary the relation with the linkage, and a lost motion connection between said linkage and said plate.

16. A device as defined in claim 13 in which the secondary control device comprises a cam-throw mechanism pivotally mounted on a portion of said shut-off valve to move said valve to open and closed positions, and means projecting from said mechanism which contacts and actuates said switch means when said valve is so moved to closed position.

17. A device as defined in claim 16 in which said shut-off valve comprises a port between said inlet and said carburetor and a plunger valve projectable into said carburetor to block said port in one position, said plunger extending from said body, and said cam-throw is pivoted on said plunger and engageable with said carburetor to move said plunger in and out to and from engagement with said port, and said means associating said primary control device and said secondary control device comprises a movable arm engageable with said cam-throw at said other extreme position to shift said cam-throw to the shut-off valve closing position.

18. In a carburetor of the type having a fuel chamber and a venturi passage together with an inlet from a fuel supply to the chamber, a control valve for liquid level in said chamber, and a second valve movably disposed in said carburetor to an open position admitting fuel to said control valve and to a closed position blocking fuel for said control valve and said fuel chamber.

19. In a carburetor of the type having a fuel chamber and a venturi passage together with an inlet from a fuel supply to the chamber, a control valve for liquid level in said chamber, and a second valve movably disposed in said carburetor to an open position admitting fuel to said control valve and to a closed position blocking fuel for said control valve and said fuel chamber, said second valve being manually actuatable, and means external of said carburetor for shifting said second valve to open and close positions, said means serving also to hold said second valve in open position.

20. In a carburetor of the type having a fuel chamber and a venturi passage together with an inlet from a fuel supply to the chamber, a control valve for liquid level in said chamber, and a second valve movably disposed in said carburetor to an open position admitting fuel to said control valve and to a closed position blocking fuel for said control valve and said fuel chamber, said second valve being manually actuatable, means external of said carburetor for shifting said second valve to open and close positions, said means serving also to hold said second valve in open position, means associated with said carburetor for grounding out an ignition connection for an internal combustion engine, said means for actuating said second valve being positioned also to actuate said grounding out means.

21. In a carburetor of the type having a fuel chamber and a venturi passage together with an inlet from a fuel supply to the chamber, a control valve for liquid level in said chamber, and a second valve movably disposed in said carburetor to an open position admitting fuel to said control valve and to a closed position blocking fuel for said control valve and said fuel chamber, said second valve being manually actuable, means external of said carburetor for shifting said second valve to open and close positions, said means serving also to hold said second valve in open position, means associated with said carburetor for grounding out an ignition connection for an internal combustion engine, said means for actuating said second valve being positioned also to actuate said grounding out means, said grounding out means comprising an explosion-proof switch, the contacts of which are completely enclosed and having a plunger extension projecting from said switch and shiftable to actuate said switch.

22. In a carburetor of the type having a venturi passage with a throttle control valve at one end and a choke valve at the other, said valves being associated through a governor arm, means for introducing fluid to said carburetor through an inlet, a control port at said inlet, a shut-off valve for opening and closing said control port, a control means directly associated with said choke valve and indirectly associated with said throttle valve through said governor arm, said control means being shiftable to open and close said shut-off valve, and means interposed between said control means and said governor arm comprising a movable plate resiliently biased for movement in one direction, means for adjustably limiting the movement in said direction, and a lost motion connection between said plate and said governor arm wherein said control means in one position will determine the position of said governor arm and said throttle valve dependent on the adjusted position of said plate, and in the other position will operate said shut-off valve independently of said governor arm.

No references cited.