

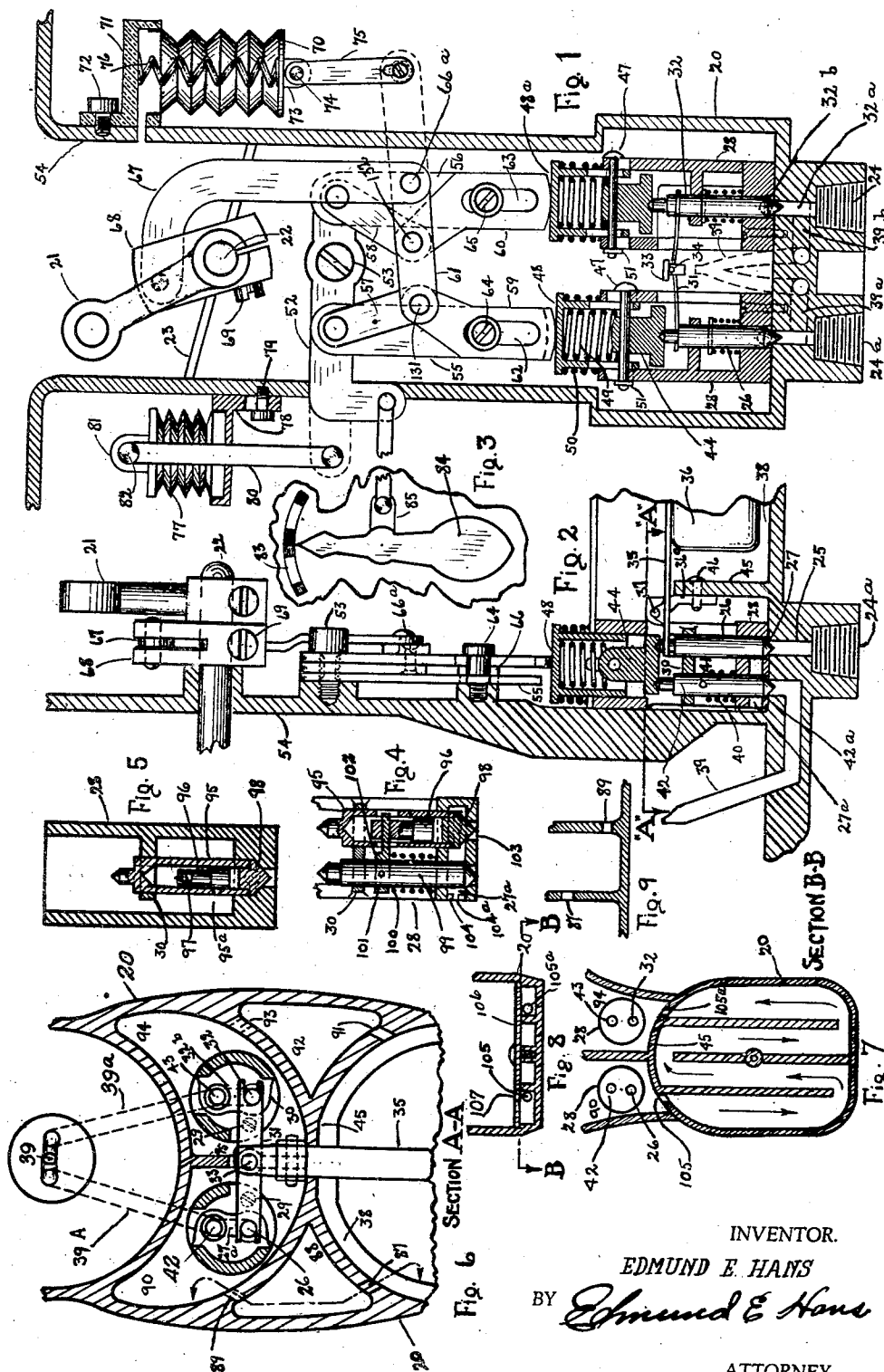
Jan. 3, 1939.

E. E. HANS

2,142,979

FUEL FEEDING SYSTEM FOR INTERNAL COMBUSTION ENGINES

Original Filed July 26, 1932 3 Sheets-Sheet 1



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FUEL FEEDING SYSTEM FOR INTERNAL COMBUSTION ENGINES

Original Filed July 26, 1932 3 Sheets-Sheet 2

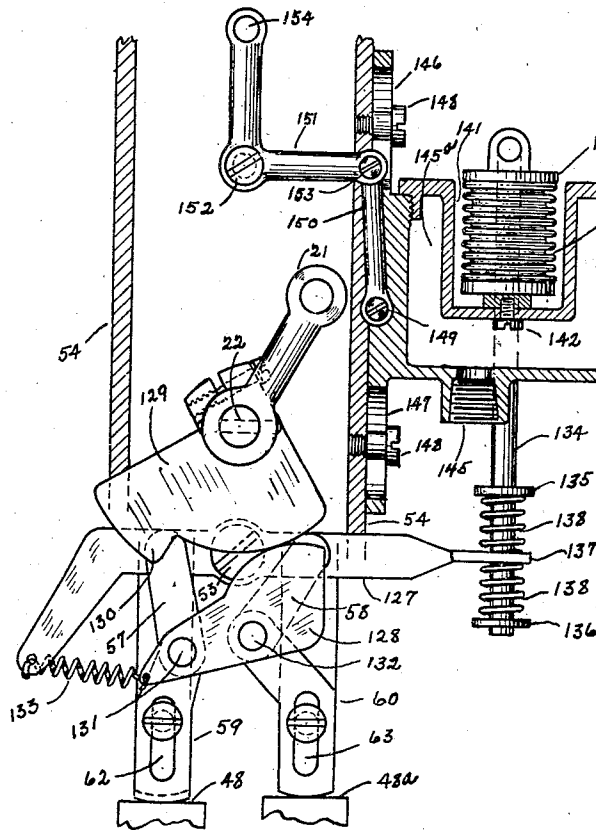


Fig. 10

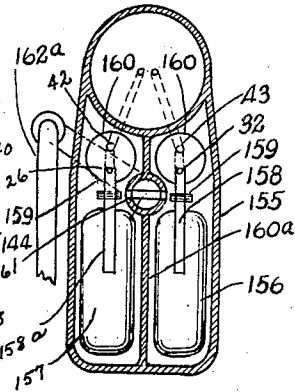


Fig. 11

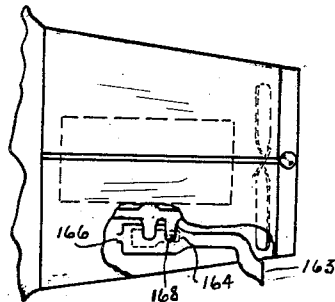


Fig. 12

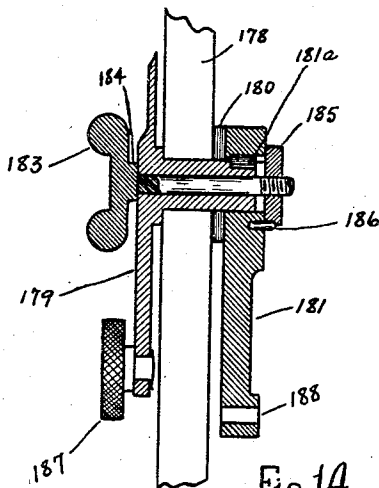


Fig. 14

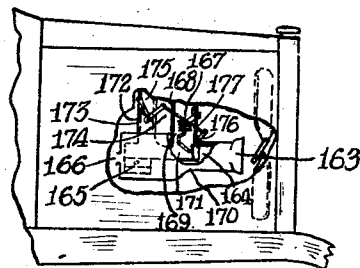


Fig. 13

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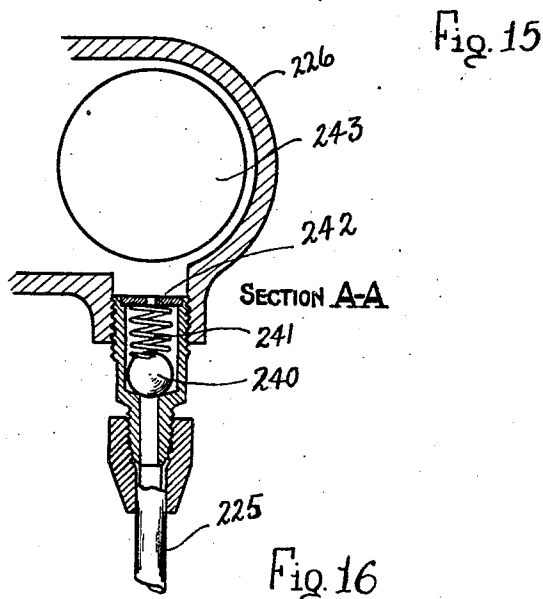
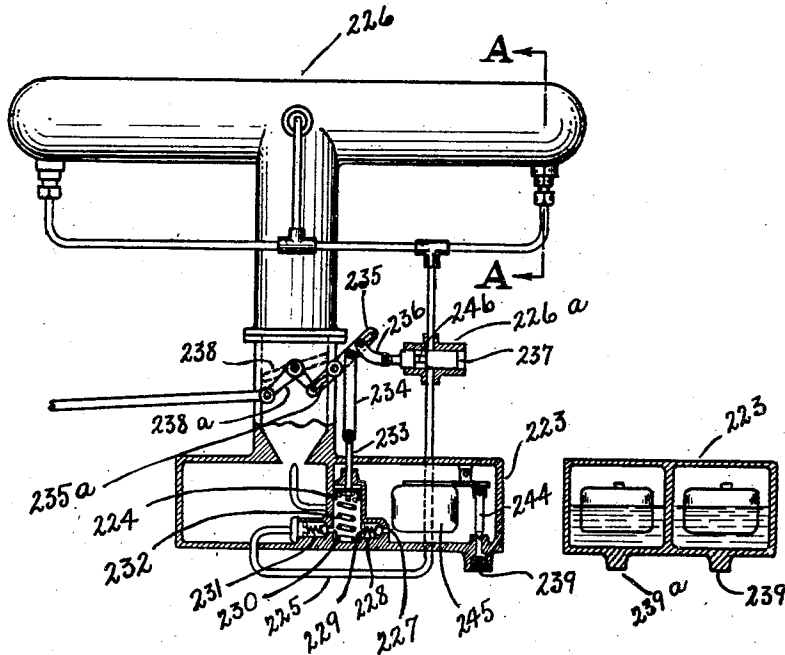
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FUEL FEEDING SYSTEM FOR INTERNAL COMBUSTION ENGINES

Original Filed July 26, 1932 3 Sheets-Sheet 3



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2,142,979

FUEL FEEDING SYSTEM FOR INTERNAL COMBUSTION ENGINES

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Refiled for abandoned application Serial No. 624,865, July 26, 1932. This application April 1, 1938, Serial No. 199,517

3 Claims. (Cl. 123—127)

This invention relates to an improved fuel feeding system for internal combustion engines; a new and improved carburetor designed to supply and properly carburet two grades of fuel, and means for maintaining the carburetor at a temperature such as to insure the highest efficiency.

Supplying two kinds of fuel to a motor is admittedly old in the art, the same having been done in farm tractors, for example where kerosene and gasoline were frequently the fuels used. Of the many attempts made to use two kinds of motor fuel for road motors by resorting to the use of two carburetors, none, to the knowledge of applicant, have been entirely successful.

This application is a refiling of abandoned application 624,865 of July 26, 1932.

The principal object of the present invention is to provide a new and improved means of automatically bringing about harmonious action of a motor through the use of motor fuels of variant characteristics to the highest point of motor efficiency and smoothness of operation at the various changes of power application, and to attain results considerably beyond those now known as the highest obtainable point of efficiency.

Another object of the present invention is to provide for supplying a motor fuel of relatively low volatility until the engine has reached its highest point of compression on a certain fuel, and then changing over to a fuel of higher volatility and compression values and using that fuel at or above the critical point or beyond the useful limit of the first fuel.

A further object of the present invention is the provision of an indicating device adapted to enable the operator of a motor car to determine the critical point, and also to provide a convenient means for testing the various motor fuels in order to ascertain the relative qualities of said fuels and thereby to get the greatest value and benefit from the same.

A still further object is to provide a new and improved means for supplying a sudden gush of fuel through the spray nozzle of the carburetor to bring about a richer mixture, which in turn provides for more powerful acceleration.

Another object is to provide such a system incorporating but one carburetor containing a single float, but adapted to control two motor fuels in such fashion.

A further object is to provide in such system a single lever control to enable the operator to make his own analyses of the value and power of the fuel which he purchases and also to be able to

control instantaneously the use of more than one fuel.

Another object is to provide an automatic temperature control which greatly increases the efficiency of the fuel used by reason of the fact that it is at all times automatically adjusted to its best point of performance in combination with an automatic temperature control mounted on the said lever control, thereby saving the use of a more expensive motor fuel. Benefits will be derived from the use of means automatically responsive to variations in temperature of the motor for controlling the volume of air passing to the carburetor. The same automatic thermal control means is also employed for regulating the volume of a current of cooling air that flows exteriorly of the carburetor to prevent overheating of the liquid fuel during carburation.

A further object is to provide a dual fuel control which may be operated in either a suction type carburetor or mixing chamber, or on which is known as the injection fuel feeding means, where fuel is directly deposited in the combustion chamber.

A still further object is to provide a new and improved means for the carburetor whereby cold air is conducted from the outside of the automobile hood to the carburetor.

Another object is to provide a means for injecting high compression fuel into the manifold which at the time is partially filled with low compression fuel, the intermixing of which extinguishes the possibility of producing a ping or knock in the motor.

The above and other objects of the invention will appear more fully from the following more detailed description, and by reference to the accompanying drawings forming a part hereof and wherein:

Fig. 1 is a vertical cross section of my improved dual fuel control;

Fig. 2 is a side elevation of Fig. 1;

Fig. 3 is a detail of the indicator and dial control;

Fig. 4 is a vertical cross-section of the fuel enriching valve control;

Fig. 5 is a vertical section through inlet valve showing plunger and valve mounting;

Fig. 6 is a horizontal section through line A—A viewed downwardly;

Fig. 7 is a horizontal section immediately below float chamber, looking downwardly through section B—B, showing guiding baffles and inlet and outlet ports;

Fig. 8 is a vertical section immediately below

float chamber showing guiding baffles and inlet and outlet ports;

Fig. 9 is a vertical section through left well between float chamber and valve chamber showing fluid tank;

Fig. 10 is a vertical section of a carburetor and dual fuel control viewed from the rear, same as in Fig. 1;

Fig. 11 is a horizontal section of a dual control and communicating valve for both chambers;

Fig. 12 is a plan view of an automobile hood, partly broken away;

Fig. 13 is a side view of Fig. 12;

Fig. 14 is a vertical section of the dash control indicator;

Fig. 15 is a front elevation showing a method of injecting fuel directly into the manifold;

Fig. 16 is a cross-section of the intake port nearest to the intake valve of Fig. 15.

Referring now to the drawings, the numeral 20 indicates the carburetor bowl, and Fig. 6 a cross section of the carburetor bowl and valve control as shown in Fig. 2, which also represents the same cross section in Fig. 1. The numeral 21 indicates the conventional throttle or butterfly valve control arm. This arm is adjustably mounted on the shaft 22. The shaft 22 is suitably supported in the walls of the pipe 54. Pivotaly mounted on the shaft 22 is a butterfly valve 23 of the well-known type. Connected to the inlet 24a (Fig. 2) is a passage 25 and needle valve 26. The valve 26 is seated in a suitable countersunk seat 27. A circular valve cage 28 (Figs. 1 and 2) rests upon the bottom of the carburetor bowl 20 and is rigidly secured thereto by screws 29 (see Fig. 6). The valve stem 26 is supported by the web 30. (Figs. 2, 4, 5 and 6.) The cross bar 31 rests on top of valve 26 and valve 32, as shown in Figs. 1 and 6 of the drawings. In the center of the cross bar 31 is a connecting pin 33 through which is placed a pivot pin 34. Connecting pin 33 is secured to pivoting bar 35, in Fig. 2, one end of which is fastened to a carburetor float 36. The pivoting bar 35 is also supported in brackets 36a which is secured to the wall 45 of the carburetor by screw 46, or other well known means. Pin 37 passes through bracket 36a, through bar 35, which acts as a pivot for controlling valves 26 and 32, also shown in Fig. 6. When the liquid in the float chamber 38 (Fig. 2) drops, due to a suction on spray nozzle 39, the float 36 is lowered causing the pressure to be relieved from whatever valves may be in use at that time. The compression spring 40 surrounding valve 42, (Fig. 2) and valve 43 (Fig. 1) back of valve 32, is held compressed against pin 41 (Figs. 1 and 2), as shown in dotted lines back of valve 32 when valve 42 is held in position by plunger 44 (Fig. 2), which allows a free action on the opposite valve 43, back of valve 32 in Fig. 1, which is also shown in Fig. 6, so that there is a free passage of motor fuel to spray nozzle 39.

Valve cap 48, Fig. 1, has two slots, diametrically opposed, cut therein. This valve also has a compression spring 49 which is inserted in the inside of the cap 48 and rests on pin 47. Coil spring 50 surrounds valve cap 48. Valve cap 48 has a peripheral flange on its upper end, the same acts as a shoulder or abutment for the upper end of the coil spring 50, the lower end of which is abutted against the valve cage 28. Pin 47 is inserted through slotted apertures in the valve cage 28 and through valve cap 48 and valve plunger 44 and through opposite

apertured slot 48, thence through valve cage 28 and cotter pin 51 is then inserted.

The main valve control assembly link 52 Figs. 1 and 2 is pivotally mounted on cap screw 53 which is secured to the manifold 54. On link 52 are pivotally mounted links 55 and 56. On the same pivot are also mounted links 57 and 58, also slotted links 59 and 60. On links 57 and 58 are mounted slotted links 59 and 60, together with control link 61. Links 59 and 60 are slotted as designated by the numerals 62, 63. Screws 64 and 65 pass through the slots 62, 63, 55 and 56 into the manifold 54, a washer 66 as shown in Fig. 2 being interposed between slotted links 59 and 60, and also passes through slotted links 53 and 56 into the manifold. Link 61, Fig. 2, is connected by rivet 66 to hooked arm 67 and pivotally secured to slotted connecting link 68 and is adjustably mounted on shaft 22 with set screw 69.

A bellows 70 is secured to bracket 71 which in turn is fastened to manifold 54 by set screw 72. At the lower extremity of the bellows 70 is an apertured ear 73. Pivotaly secured to the apertured ear 73 by pin 74 is adjustable link 75, the lower end of which is attached to the extremity of arm 61 which is shown in dotted lines, Fig. 1. A coil spring 76 is placed within the bellows 70, the top of said spring resting on a bracket 71 and the lower end against the ear 73, and is normally held as shown in Fig. 1. At the other side of the manifold 54 is mounted a thermostat 77, and thermostat being slidably mounted on a bracket 78 by a cap screw 79 to the manifold 54. Link 80 is pivotally mounted on an apertured ear 81 by a pin 82. The lower end of link 80 is pivotally secured to pivot link 52 shown in dotted lines in Fig. 1.

An indicator dial, Fig. 3, is suitably mounted on the dash or panel of the car, also shown in Fig. 23 details of which will be described later, and mounted below said dial is a pointer lever 84, the same being frictionally mounted on the dash or instrument panel. Pointer 84 has an arm 85 rigidly secured to the same. Arm 85 is connected through a series of linkage and arms, not shown, and terminates at the arm 52, the same being pivotally mounted thereon.

Fig. 9 is a side elevation of float chamber and fuel reservoir as shown by the arrows in Fig. 6, which shows the flow of fuel from float chamber 38 as follows: Through passageway 87, which is at top of float chamber 38, into chamber 88, thence to passage 89 at a lower level as shown in Fig. 9, and into chamber 90 as shown in Fig. 6. The opposite side of the fuel chamber 88, Fig. 6, is also connected with float chamber 38 through opening 91 near top of float chamber into chamber 92, thence through opening 93 near the bottom into chamber 94. Partition 95 separates chambers 90 and 94. The valve 95 as shown best in Figs. 4 and 5, may be substituted for valve 26, chamber 90, Fig. 6, and is constructed as follows: A hollow tube type stem opened at one end. Slidably mounted within this hollow valve tube is a plunger 96 which has an aperture 97, Fig. 5, adjacent its upper end. Into the lower end of the follow valve is pressed a shoulder plug 98, the same being formed to seat in the fuel inlet passage of chamber 90. In valve body 95, Fig. 4, is an inlet passage. As shown by numeral 95, Figs. 4 and 5, valve 99 is mounted in valve cage 28 which slides in apertured bracket 30 and its lower end is guided by the lower apertured base of said cage. Arm 102 is placed through apertured

valve 95, through apertured suction plunger 96, Figs. 4 and 5, and protrudes through the opposite side of valve casing. Valve 99 is placed through apertured bracket 30, through arm 102, into its lower guide in valve cage 28. A coil spring 100 surrounds valve 99 and is interposed between arm 102 and lower base of valve casing 28, said spring being held in position by a pin 101. On the lower portion of valve cage 28 is an inlet channel through opening 103. A calibrated plug 104 is inserted in the lower inlet passage of the valve cage 28. This valve assembly may be substituted for present valve in chamber 90.

The constructions illustrated in Figs. 7 and 8 may be substituted for float chamber 38 and chambers 88 and 92. Referring to Fig. 7 of the drawings—Fig. 7 is a section of the lower portion of the float chamber 38 which is constructed in the following manner. The valve cages are shown by the numeral 28. Seated within the valve cages, as before described, are the valves already described in Figs. 1 and 6. The incoming fuel enters through valve 26 into chamber 90, see Fig. 6, and passes through port 105 at the bottom of float chamber 38 and flows in the direction of the arrows and circulates back and forth in the channels indicated by the arrows. The cover 106 shown in Fig. 8 is tightly fitted over the top of the partitions, and a gasket, not shown, is interposed between the top of the partitions and the side walls of float chamber 20 to make it liquid tight. In the top cover is a perforated hole 107 which has for its purpose the circulation of liquid into the main float chamber 38. The object of this substitution is that it eliminates the two chambers 88 and 92 and is another way of keeping the two liquids separated. The walls or channels are of sufficient capacity to allow enough liquid to flow back and forth when float opens and closes when valves 26 and 32 operate, the point being that with these wells or channels there will always be sufficient fuel in the channels or wells to take care of the change over from one fuel to another, for example when the fuel is used out of chamber 38 it only requires a very small amount to cause the float to lower sufficiently to open either valve 26 or valve 32 when a fresh supply of fuel again enters the float chamber keeping a circulation back and forth in these wells or partitions but at no time will there be any noticeable mixture of the fuel in chambers 90 and 94.

Fig. 10 illustrates another form of operating the valve caps 48 and 48a. Arm 127 may be substituted for arm 52 in Fig. 1 of the drawings. Cam 128 is a substitute for arm 61, Fig. 1. Cam 129 is a substitute for arm 67, Fig. 1 and operates in the same manner except that it has a quicker acting movement in that the point 130 of cam 129 is turned counterclockwise on shaft 22 and strikes cam 128. Cam 128 is pivotally mounted on arms 59 and 60 by means of rivets 131, 132, and links 57, 58, which links are mounted on bar 127. A tension spring 133 is connected to the extremity of the bent portion of arm 127 and the point of cam 128 for the purpose of keeping cams 128 and 129 in contacting relationship. Cam 129 is pivotally mounted on shaft 22. Arm 21 is connected to the foot throttle in the floor board of the car (not shown). Cam 129 is moved counterclockwise until the point 130 contacts with cam 128. This contact is imparted through arms 57 and 58 causing plungers 59 and 60 to move alternately.

The outer extremity of arm 127 (Fig. 10) is formed in a half twist 137 with a hole punched

therethrough to receive rod 134. Rod 134 has a shoulder collar 135 formed thereon and at the lower extremity of rod 134 is formed a collar 136. Both the shoulder collar 135 and the collar 136 at the lower extremity of rod 134 are held rigidly by pins, (not shown). Interposed between the shoulder collar 135 and the half twist portion 137 of arm 127, is a compression spring 138. Also interposed between the half twist portion 137 and the collar 136 is a compression spring 139. Rod 134 is connected to the top of the thermostat 139. Rod 134 is pivotally mounted in apertured ear cap 139. The thermostat 140 is filled with expanding liquid and is of the well known design. Thermostat 140 is seated in a circular cup 141 by means of a screw which passes through the bottom of said cup and into the base of the thermostat. Circular cup 141 forms a top enclosure of receptacle 143 which acts as a reservoir which has tapped therein an inlet port 144 and also a discharge port 145. Circular cap 141 is screw threaded into chamber 143 and forms a seal. The space 145a which is thereby formed is constructed to receive a temperature control liquid from the motor, either water used for cooling motor or lubricating oil from crankcase. Receptacle 143 is slidably mounted on the side wall of manifold 54. The receptacle 143 has cast thereon upper and lower slotted brackets 146, 147. Shoulder screws 148 pass through the slots and fasten to the manifold 54. Receptacle 143 has a pivot screw 149 passing through link 150 into receptacle 143. Arm 151 is pivotally mounted on the manifold 54 by means of shoulder screw 152. The lower portion of arm 151 is apertured to correspond with the apertured screw threaded opening in the upper portion of the link 150 into which is inserted shoulder screw 153. The opening 154 in the upper portion of arm 151 is for the purpose of connecting by suitable linkage to arm 95, Fig. 3 of the drawings, which is the control lever mounted on the dash.

In Fig. 11, I have shown a double float chamber 155, mounted therein are floats 156, 157, the same being mounted on float arms 158, 158a the same being mounted on brackets 159 and are also connected to valves 26 and 32. Arm 158 operates valve 32. Arm 158a operates valve 26. Circles 160 represent the foundation for valve cage 28. The operation of this mechanism is identical with the operation shown in Figs. 1 and 6, the only difference being that I am substituting two floats for one. Cast in the dividing portion 160a is a valve opening 161 which has a cast plug arm 162 fitted therein with a hole drilled crosswise. On the extreme end of plug arm 162 is an apertured opening to receive control rod 162a which is connected by suitable links and bell cranks to dash so that operator may be able to change fuel when desired independent of operating plungers 59 and 60 as shown in Fig. 10.

Fig. 12 represents an automobile engine hood of the well known design. The numeral 163 designates the cooled air intake conduit. This intake comprises a conduit which leads cooled air from the outside of the automobile hood to the carburetor intake 164. Member 165, Fig. 13, represents the lower portion of the carburetor bowl and fuel pump. Numeral 166 represents an exhaust port around the carburetor and fuel pump which has an opening at the rearward end as shown. An adjustable thermostat 167 is slidably mounted on the hot air intake 168. A bell crank 169 is pivotally mounted on the hot air intake 168. A carburetor intake control valve 170 is pivotally

mounted on the top of the carburetor intake housing. On valve 170 is pivotally mounted a link 171, one end of which is pivotally mounted to bell crank 169. A butterfly valve 172 is suitably mounted on a shaft 173, said shaft being journaled in the sides of the intake. A bell crank 175 is pivotally mounted on the shaft 173. Numeral 176 represents an arm cast integral with the valve 170. Pivotally connected to the extremity of the arm 176 is one end of the link 177, the other end of which is pivotally connected to one arm of the bell crank 175.

Fig. 15 represents a direct fuel injection system comprising a float chamber 223 of the conventional type. A pump 234, to inject high compression fuel to the nearest point of the intake valve of the combustion chamber of the engine. The numeral 225 designates the fuel conduit leading to the manifold 226. A valve 226a is interposed between the pump 224 and the intake manifold 226. An inlet port 227 communicates the high compression float chamber of well. A ball check valve and compression spring 228 is seated against the port 227. A port 229 leads into the pump chamber. A discharge port 230 has a check valve and compression spring 231 on the opposite side thereof. A coil spring 232 tends to hold the plunger 224 normally as shown in Fig. 15. A link 234 connects the upper portion of the plunger rod 233 and pivoted slotted link 225. The slotted link 235 is journaled on the upper portion of the carburetor intake manifold. A floating link 236 connects one end of the slotted link 235 to the valve plunger 237. 238a is a bell crank journaled in the upper portion of the carburetor intake manifold one end of which is slidably connected to link 235 and the other end of which is connected to the connecting rod leading to the accelerator, not shown. Numeral 238 designates a butterfly valve in the carburetor. 239 designates the inlet for the high compression motor fuel into the float chamber.

Fig. 16 is a cross section of the intake port nearest to the intake valve, not shown, of an internal combustion engine. The numeral 240 designates a ball check valve with a compression spring 241 interposed between said ball check valve and perforated cap or atomizer 242. 243 designates an intake port nearest to the intake valve of the combustion chamber.

As shown most clearly in Fig. 2 of the drawings the fuel enters inlet 24a and conduit 25 and when valve 26 is unseated, passes through channel 27a (also shown in Fig. 6, chamber 90). When valve 42 is released high compression fuel passes through conduit 39a to spray nozzle 39; (also shown in Fig. 1 of the drawings).

As shown in Fig. 1 low compression fuel enters inlet 24 and conduit 32a passes through conduit 32b (also shown in Fig. 6). After valve 32 is opened, and when valve 43, which is back of valve 32, is opened low compression fuel passes through conduit 39b to spray nozzle 39 into intake manifold. Fig. 1 shows a carburetor arm 21 which opens butterfly valve 23, said valve being mounted on shaft 22. When valve 23 is opened a suction is caused in spray nozzle 39 which draws whatever fuel is controlled by valves 42 and 43. On shaft 22 is also mounted slotted arm 68 which in turn is connected to elbow arm 67, the lower extremity of which is pivoted on cross bar 61, which is supported by links 57 and 58 which in turn is connected to slotted arms 59 and 60 which operate valve caps 48, 48a. As shown in the drawings Fig. 1, butterfly valve 23 is in a closed position,

which also shows valves 26 and 42 in a closed position. As also shown in Fig. 1 valve cap 48a is in an open position allowing free passage of low compression fuel into spray nozzle 39 through valves 32 and 43. When carburetor control lever 21 is in a vertical position valve 23 will be about half open. At this point the position of valve caps 48, 48a will not have changed by reason that slotted arm 68 will have passed slightly over dead center, the reason being that arm 67 has not moved sufficiently in a downward position to change the action of cross bar 61 sufficiently to move valves 48, 48a. However, after carburetor valve lever 21 has passed in a clockwise direction from the last mentioned point, it will begin to act in moving cross bar 61 by reason of the fact that arm 68 travels to the right, thereby opening valve 23 to a greater extent. Valve 26 and valve 42 are released as valves 32 and 43 are closed. Should there be a variation in either fuel, bar 52, being connected by links to arm 55 and hand lever 84 with indicator pointer on opposite end, the slight movement of pointer 84 in either direction would change the time element of the valve controlled by valve cap 48, 48a. Should it become necessary that either one of the fuels are desirable, moving pointer 84 to the extremity in either direction would cause a constant use of either fuels irrespective of the action of arm 21. When arm 32 is moved in either direction, pressure is applied to valve cap 48, 48a by slotted bar 55, 56. When the cap 48 is compressed the following action takes place. Valve plunger 44 is held in an upward position by spring 50 around valve cap 48. Valve spring 49 is a cushion for valves 46, 42, 32 and 43. Without this cushion spring action valve 21 might become locked or bound due to the pressure on slotted arms 55, 56. Valves 26 and 32 also have a spring mounted therein for the purpose of causing immediate action of valve with plunger 44 and 44a, allowing free flow of fuel to the nozzle 39. Also shown in Fig. 1 is a vacuum bellows which may be connected to control bar 61 by means of an adjustable connecting link 75 to apertured ear 73. The purpose of this bellows is that the same may be substituted for the action of slotted arm 68. As the vacuum is increased in the manifold the bellows is drawn inwardly, causing the bar 61 to act accordingly changing the action of valve caps 48 and 48a from low compression to high compression fuel at the critical point. This will have no interference with the action of bar 52 as previously described. Bar 75 may be lengthened or shortened depending upon the position of arm 61 by the further adjustment of the bellows 70 which may be drawn in to further accommodate the operation of bar 61. It will be also understood that compression spring 76 may be of the required length to completely adjust the bellows to the proper working length.

In Figs. 1 I also show an adjustable thermostat 77 which may also be connected to bar 52 by link 80. This thermostat may be placed in a location near the exhaust port, which is cast integral with the intake manifold which is at the point of the extreme upper portion of intake manifold 54 as shown by the turn of the manifold. This thermostat is so arranged that the temperature of the motor or manifold will cause the thermostat to act and change the fuel accordingly. When the engine is cool the bar 52 will be in a position to cause only low compression fuel to enter the nozzle 39. As soon as the engine becomes heated the thermostat expands and brings the bar 52 to

into normal position where it will have the normal action in changing over from one fuel to the other as desired.

In Fig. 2 is shown a convenient form of carburetor float 36. Float 36 is mounted in float chamber 38 (also shown in Fig. 6 and is connected to cross bar 31 which operates valves 26 and 32, depending upon which of the two valve caps 48 and 48a are positioned. If valve cap 48a should be released as shown in Fig. 1 and Fig. 6 inlet valve 32 would be free to act whenever the fuel in the float chamber 38 drops below the desired level. Either of the above mentioned valves would be free to operate depending upon which of the two valve caps 48, 48a would be positioned. When the position of valve 48 is altered both valves 26 and 42 are always effected, both valves being released causing a free flow of the fuel to spray nozzle 39. In order that there may be the desired fuel always in chamber 94 there has been provided auxiliary fuel chambers 88 and 92. Chambers 88, 90 have small connecting ports as shown in Figs. 6 and 9. These openings 87, 89 are placed at different heights to assure no intermixing of the fuel from float chamber 38. Chambers 92 and 94 are also connected in like manner as shown by passage 91 and 93 on opposite side. There is also shown in Figs. 7 and 8 another means of separating the two fuels by eliminating chambers 88, 92 and substituting partitions in the lower part of float chamber 38 as shown in Figs. 7 and 8. Should valve 26 open, the fuel would naturally pass through conduit 25 shown in Fig. 2 and pass across to valve chamber 27a, part of the fuel would then pass into conduit 39a, Fig. 6, thence through nozzle 39 into the manifold. Some of the fuel passing through conduit 27a would pass out of opening 104a, Fig. 4, there being a calibrated plug 104 inserted therein. Some of the fuel from chamber 90 in Fig. 6, also shown in Fig. 7, would then pass through opening 105 into the bottom partition and flow in the direction of the arrows shown in Fig. 7. The cover 106, Fig. 8, seals the bottom partition so that there is no chance for fuel becoming intermixed with the flow in the false bottom as indicated by the arrows. By this means the fuel from chambers 90, 94, would not become intermixed to any noticeable degree, if at all, because in order for float 36 to act it requires but a very small amount of motor fuel to cause either valve 26 or 32 to open, there always being a suction in either conduit 27a or 32b, whichever fuel may be used, due to the suction in conduits 39a, 39b caused by the vacuum of the operation of the motor. In Fig. 7 there is also shown an opening into chamber 105a into chamber 94. This causes free circulation from float chamber 38 into either chamber 90 or 94. (In Fig. 6 chambers 88, 90 are connected by a communicating passageway as shown by the arrow. The same provision is made on the opposite side in chambers 91, 94.) In Figs. 4 and 5, I have shown another type of valve which may be substituted for the valves already described. In Fig. 5 the valve 95 may be substituted for valve 26, as shown in Figs. 2 and 6. The advantage of this valve is that when a change of fuel is made by the action of valves 26, 42, it is desirable to have an extra flow or gush of oil enter conduit 39. This is accomplished by suction plunger 96 mounted within the circular valve 95. The sudden opening of butterfly valve 23 would cause valve 48 to respond in like manner and in turn would effect valve 99, Fig. 4, which is mounted in a coil spring and abuts against arm 101 which

passes through slot in valve 95 thence into suction plunger 96 through rectangular opening 97, which in turn would suddenly draw on suction plunger 96 located in valve 95. Suction plunger 96 is so fitted in valve 95 that it would cause a suction sufficient to instantly draw valve 95 from seat 98 and cause an inrush of fuel into passage 27a Fig. 2, which in turn would flow into conduit 39a through opening 39. Rushing in a sudden gush of fuel into the manifold gives a richer mixture. In Fig. 5 is shown an opening 95a which may be placed at any desirable height to release the suction of plunger 96 which would regulate the amount of fuel which would pass into conduit 39a. As soon as valve 99 in Fig. 4 has opened to its limit against bracket number 30, the valve 95 would immediately find its seat and then be governed by float 36 and arm 31, Fig. 1.

Fig. 14 is a cross section of the metering control assembly and shows more clearly the operation of the pointer arm. Pointer arm 179 is pivotally mounted on dash 178 and arm 181 is slidably mounted thereon and a key 181a is fitted on pointer arm 179 and slidably fitted to arm 181 interposed by a friction washer 180. The threaded washer 185 is mounted on the free end of wing shaft 183. Washer 185 is held in place on arm 181 by pin 186 so that when pressure is applied to wing shaft 183 the washer 185 will be in a rigid position on arm 181. The purpose of this is that when arm 181 is pivotally connected through links and bell cranks in the usual manner, from instrument board on dash to carburetor controls, the described parts are always freely and pivotally mounted so they are connected to arm 52, Fig. 1, as heretofore described.

Thermostat 77 connected to arm 52 will be allowed to operate the mechanism above described so that pointer arm 179 will correspond with the movement of arm 52 in Fig. 1 through the action of thermostat 77. On starting the motor the engine is cold and no high compression fuel is required, however, should the high compression fuel contain high test properties for easy starting, the mere changing of position of the pointer arm 179 by locking the same with wing bolt 183 would enable the operator to use this fuel merely for starting purposes and as soon as the motor has started, by the mere release of wing shaft 183 the thermostat would automatically switch back to low compression fuel and would remain there until the critical temperature of the motor would require the high compression fuel.

By the elimination of the thermostat 77, Fig. 1, the operator would depend upon his own choice of fuel setting. The great advantage of placing the pointer arm 178 and dial 83 on the instrument panel of the car is that very few operators understand anything about motor fuels, for instance, there are no two motors alike in compression, neither is there a motor fuel obtainable that is made up to the same standard of high compression value. What I accomplish in this invention is to scientifically and automatically meter the fuel into any motor irrespective of the compression ratio or the high compression value of the fuel. If the operator should fill his car with two unknown fuels he would not have to be an experienced chemist or oil expert to immediately test the quality of the fuel in the tanks, he would merely move pointer arm 178 immediately to the low compression fuel and leave it there until his engine would start to knock. This of course, would start after the motor had reached its critical temperature. At this point he would move

the lever to the position where no knock would be noticed. If no thermostat were used he would lock pointer arm 178 in the position last mentioned and turn down wing bolt 183 until the pointer arm is held against movement. It would not be necessary to change this arm until another supply of motor fuel had been purchased by the operator. If he should use another make of motor fuel, he would immediately notice whether or not that fuel was of the same quality and thereby be guided in the selection of his fuels. However, if the motor fuel should be of a poor quality he would merely change the position of lever 178 until the knock would cease.

In Fig. 10 another method of thermostatic control is shown which controls the change of operations of valves 48, 48a in another way. Arm 127 is connected to rod 132 which operates through a thermostat assembly 141 which is slidably mounted on manifold 54, connected to bell crank 151, which has an opening 154, and is connected through suitable linkage and bell cranks to the dash or instrument panel 178 and connected to arm 181, as shown in Figs. 3 and 14. After the motorist has purchased a supply of both fuels and adjusted pointer hand lever 179 he may lock wing bolt 183 in a permanent position. He is not concerned any further with temperature changes in the motor as this is automatically controlled by thermostat 140 in the following manner: When the engine is cold, thermostat 140 will close valve 48 through arm 127 or 52. As soon as the motor becomes heated, arms 127, 52 will again be brought into normal position. There will, however, be a further advantage to open high compression valve 48. This thermostat assembly may also be used in Fig. 1 to replace thermostat 77 connected to arm 52. In Fig. 10 openings 144 and 145 represent suitable inlet and discharge ports which may be connected to either the lubricating or water cooling system of the motor. In each case the liquid is circulated through thermostat 140. Thermostat 140 may also be used without the use of liquid operation 145a in a manner heretofore described. The thermostat would be placed near some suitable part of the motor that generates more than the usual amount of heat, perhaps near the exhaust discharge port.

In Fig. 11 is shown a double float chamber 155 with two floats therein which are directly connected to the control valves 26, 32, as shown in Figs. 1 and 6. The operation of the valves are the same as heretofore described, the only difference being the use of two floats instead of one. On the lower part of float chamber 155 is mounted a control valve plug 162 which has an opening 161. Valve plug and arm are connected to control rod 162a which is connected by suitable bell cranks and linkage to dash or cowl panel in the motor car body. Any means of operating this valve from the seat of the car may be employed. This device enables the motorist to use two fuels in either float chamber, should any one fuel become exhausted.

In Figs. 12 and 13 is shown a cold outside air inlet to carburetor for the purpose of cooling the combustion chamber of the motor, thereby increasing power and preventing pinging or pre-ignition of the gas. Tests have shown that by the use of this method of cool air intake, the power of the motor is considerably increased, and it also diminishes the earlier use of high compression motor fuel. The temperature of air under the hood in the average car is from 30 to

60% higher than that taken outside of the hood. As shown in Figs. 12 and 13 housing 163 is for cooling the motor fuel by a flow of air around the carburetor and pump bodies through opening 166. It further eliminates the boiling of the motor fuel and stalling of the motor due to rich gas created by boiling of the motor fuel. The thermostat 167 is mounted in the hot air intake pipe 168. After the motor is started, the exhaust manifold becomes heated, hot air is drawn into the carburetor intake 168 through butterfly valve 172. When motor exhaust has reached a predetermined temperature, valve 170 opens, cool air enters the opening in housing 163.

If it is desired to inject fuel directly into the intake manifold, I have disclosed in Figs. 15 and 16 a simple and compact means of accomplishing this result. High compression fuel is forced into the carburetor bowl through opening 239 and is controlled by needle valve 244, which in turn is controlled by the carburetor float 245. When the butterfly valve 238 is opened more than half way, bell crank 238a, which in turn is connected to slotted link 235, causes one arm of said bell crank 238a to move upwardly in the slot 235a and when the same has contacted with the end of said slot, the slotted link 235 moves in a clockwise direction causing link 235 to push down on plunger rod 233 and also causes plunger 237 to register with opening in conduit 225 which allows a free passage of the liquid into the manifold. When the plunger 224 descends, valve 240 (Fig. 16) becomes unseated and allows fuel to pass through apertured cap 242 into the valve chamber. After the charge is complete, valve 240 is caused to close and stays closed at low vacuum in the manifold. After plunger 224 has returned to the top of the chamber, valve 240 is again normally seated and held so by the compression spring 241. Valve plunger 237 is always timed so that when plunger 224 starts downwardly to cause pressure in conduit 225, valve plunger 237 will always be in an open position. Plunger 224 on its return stroke sucks in another load of high compression fuel into intake port 227.

After he has purchased his fuel and his engine operates under normal temperature, he will notice either a smooth or rough performance of the pulsation of the motor. At this time he merely changes the pointer setting on the cowl in whatever direction he gets best performance, then proceeds to lock the setting. With this simple adjustment he has accomplished the following results. The low compression fuel that he has purchased now feeds into his motor to the highest degree of efficiency for it is developing the highest power attainable before the automatic means of changing over to the high compression fuel takes place, thus decreasing the use of the high compression fuel. The dial adjustment on the cowl is never changed until he buys a different fuel. Should the motor become carbonized he will immediately notice the different setting on his dial, warning him to have carbon removed. The dual fuel system will give the motorist an accurate indication as to the increased cost of operating his car as the carbon deposit increases as it will require constant increase in the use of high compression fuel.

Any change in the temperature of the motor would cause a re-occurrence of the rough pulsation. This has been met by the use of an automatic thermostatic control which is in combination with the fuel changing means, so that the motorist gets added protection and saves in the

operating cost of his fuel by reason of the fact that his engine will always operate at the highest compression that the fuel he uses can produce.

It is understood that at all times with this invention the motor is equipped with a high compression head. Without this invention the motorist would be obliged to use the high compression fuel all of the time. This invention will substitute the use of the lower grade fuels to about two thirds volume to the use of only one-third of the higher grade and operate at all times to the full advantage of the higher grade fuel thereby saving three or four cents on the purchase of his fuel.

While I have shown a satisfactory and practical embodiment of my invention for the purposes disclosed in this application, it will be understood that the invention is not limited to the specific constructional details of such embodiment, but that many variations and modifications may be resorted to without departing from the spirit of the invention.

I claim:

1. In combination with an internal combustion engine having a fuel intake portion within which pressure variations occur when the engine is operated at different speeds, means for independently feeding a plurality of fuels to said intake, means for throttling said intake to control the speed of the engine, means for controllably increasing the quantity of one fuel fed to said intake relatively to another in response to increasing engine speed resulting from opening of the throttle, including

a valve controlling the flow of said controlled fuel, means including a pressure-operable member connected to said intake portion for moving said valve toward opened position in response to increasing pressures in said intake and vice versa, and means for moving said valve quickly and independently of such pressure conditions upon sudden opening movement of the throttle.

2. In combination with an internal combustion engine having a fuel intake portion within which pressure variations occur when the engine is operating at different speeds, means for independently feeding high compression and low compression fuels to said intake portion, means for controllably varying the quantity of one fuel fed to said intake portion relatively to another in response to the pinging conditions in the combustion chamber of said internal combustion engine, means for feeding low compression fuel at normal driving speed and means to cause high compression fuel to be injected into said fuel intake portion in advance of low compression fuel.

3. In combination with an internal combustion engine having a fuel intake portion, means for supplying high and low compression fuels to said intake portion of said internal combustion engine constantly during operation thereof, means for normally tuning out the ping in said engine when said engine is operating at wide or nearly wide open throttle, and manually operable means to feed additional high compression fuel to said engine prior to low compression fuel.

EDMUND E. HANS.