Oct. 1, 1963 A. C. KORTE 3,105,861

CARBURETOR

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FIG. 1.

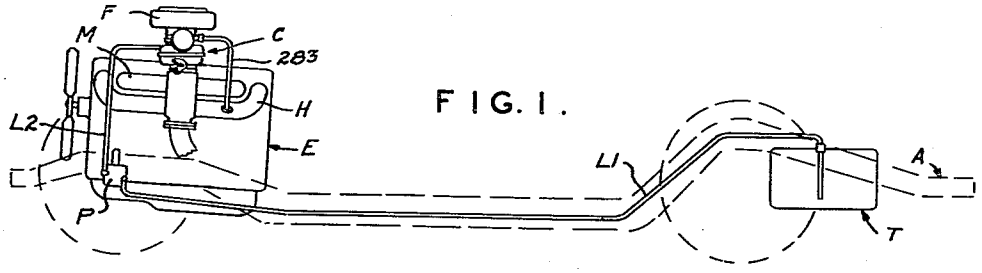


FIG. 2.

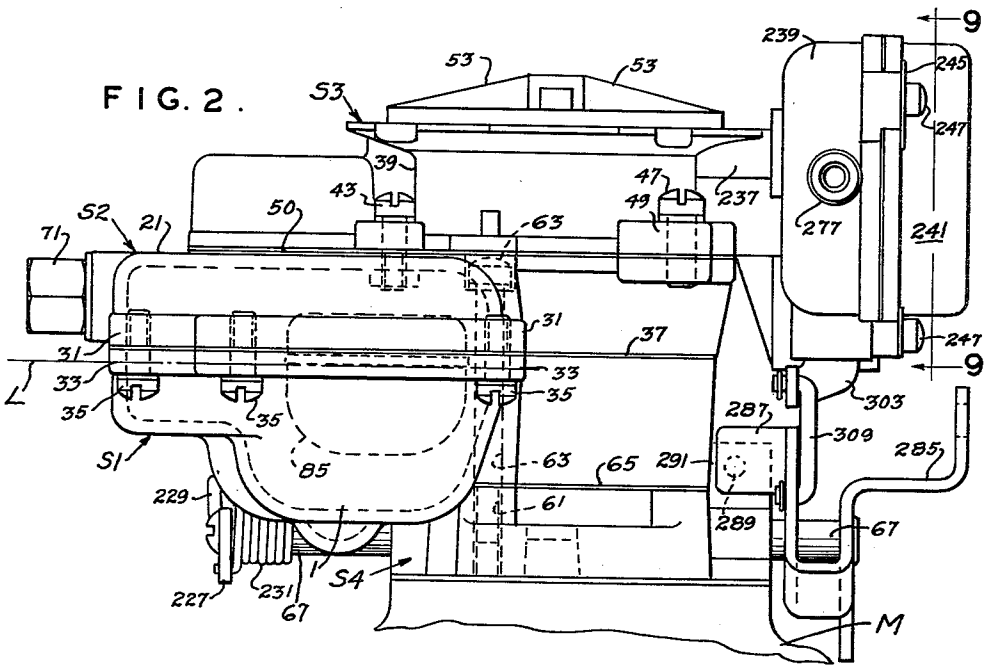
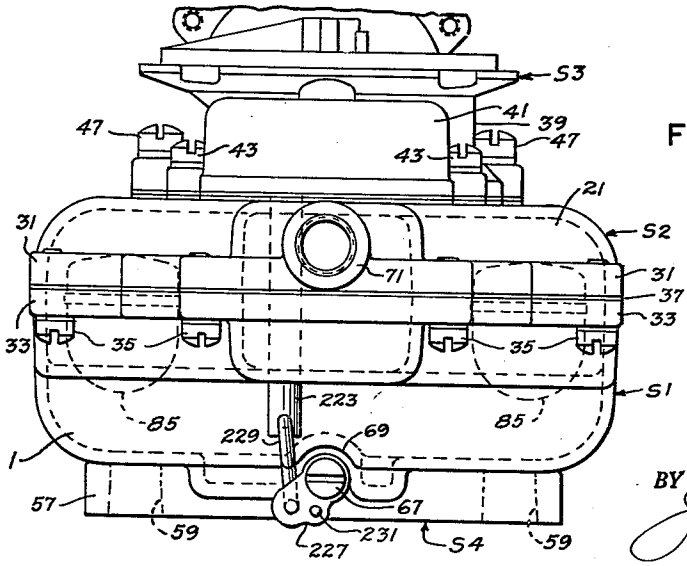


FIG. 3.



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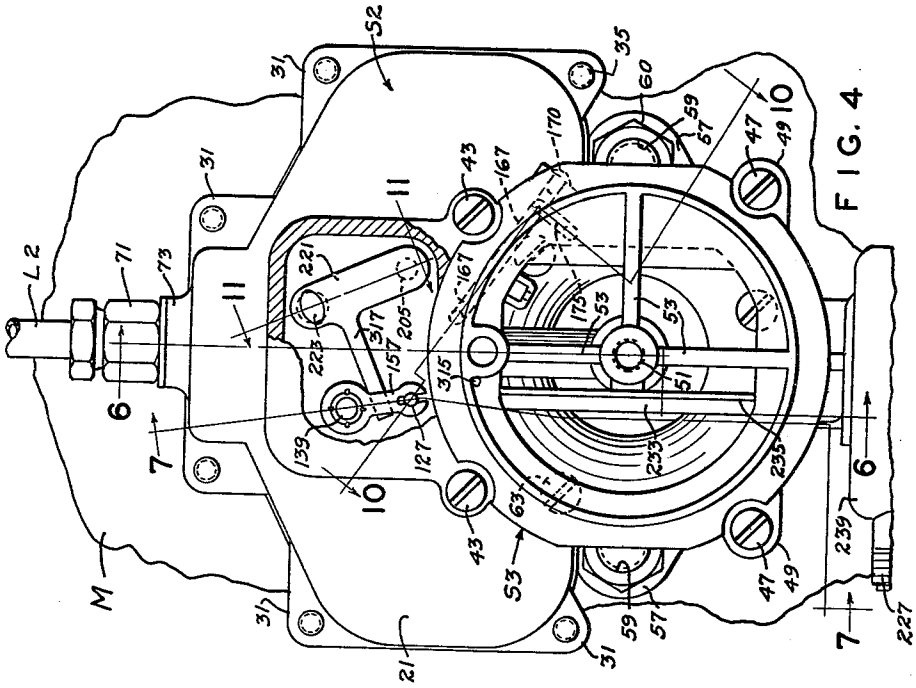


FIG. 4

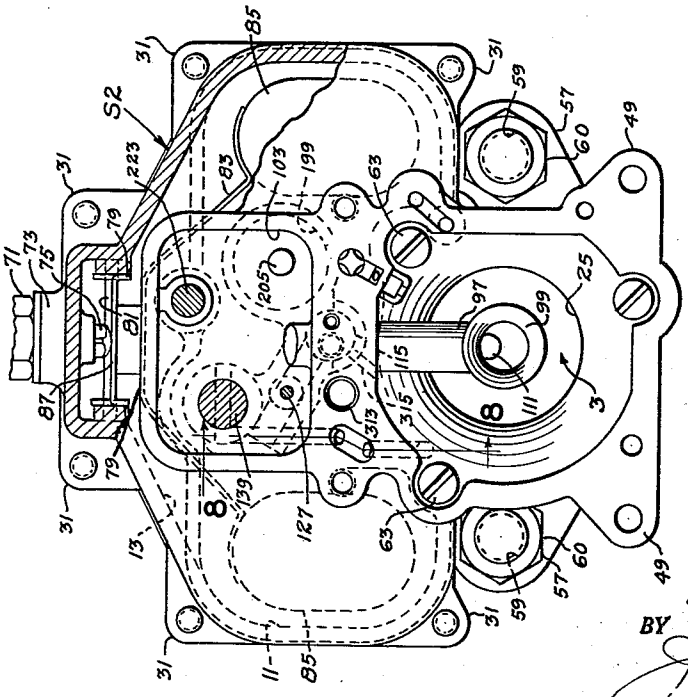


FIG. 5

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FIG. 6.

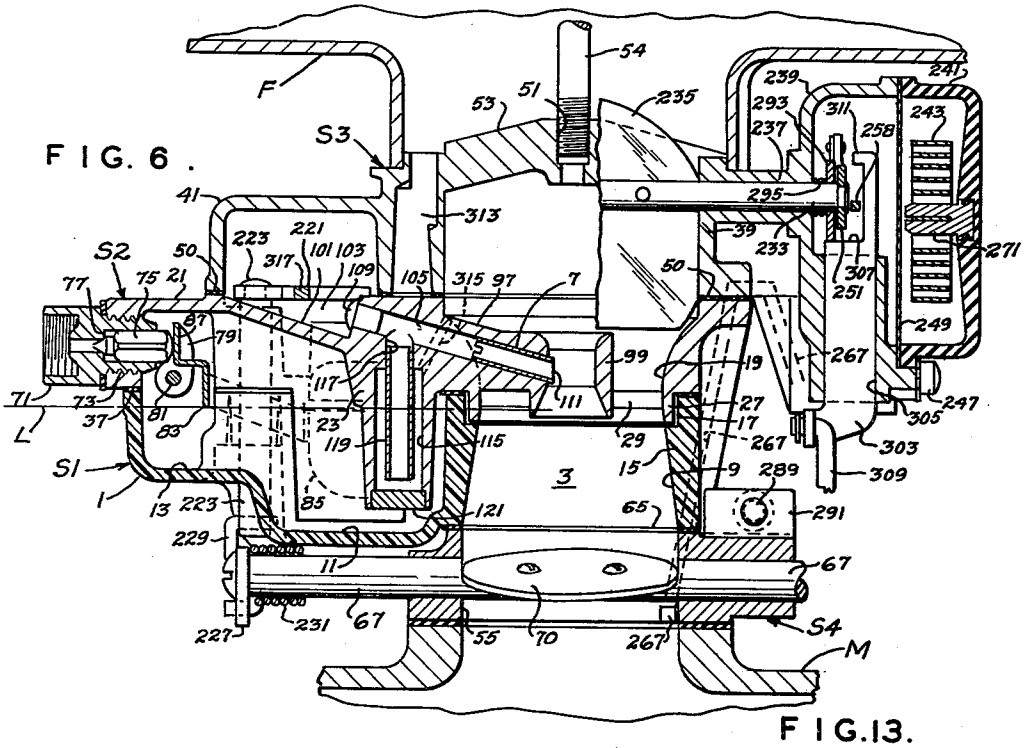


FIG. 12.

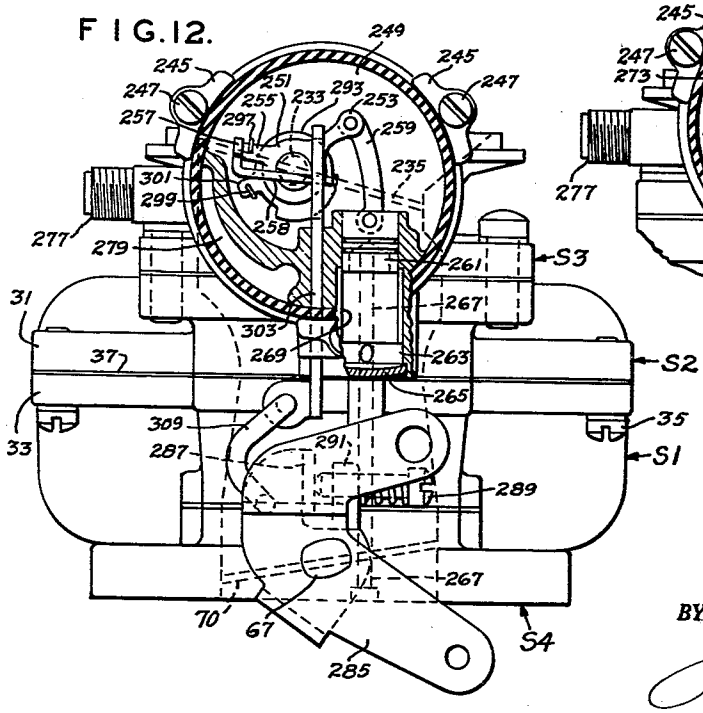
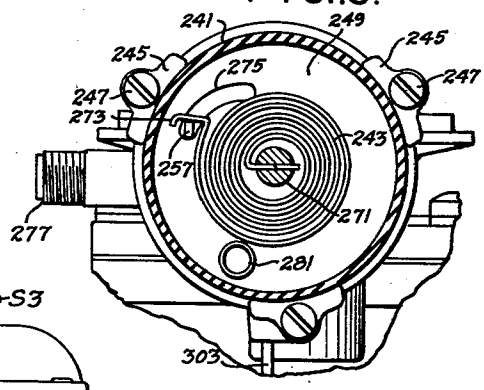


FIG. 13.



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FIG. 7.

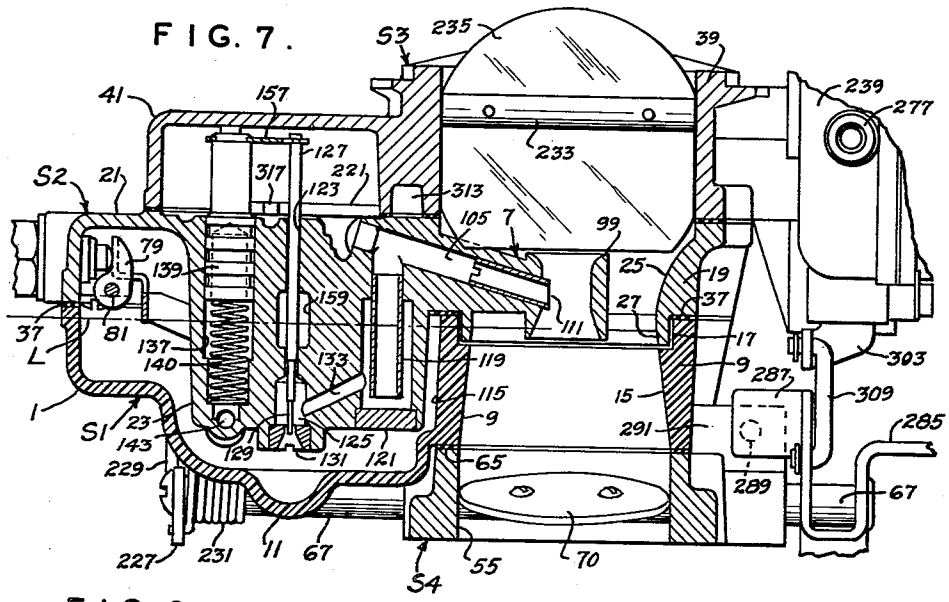


FIG. 8.

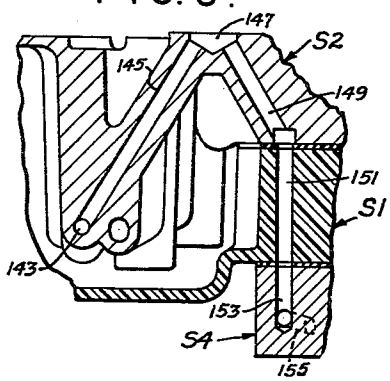


FIG. 9.

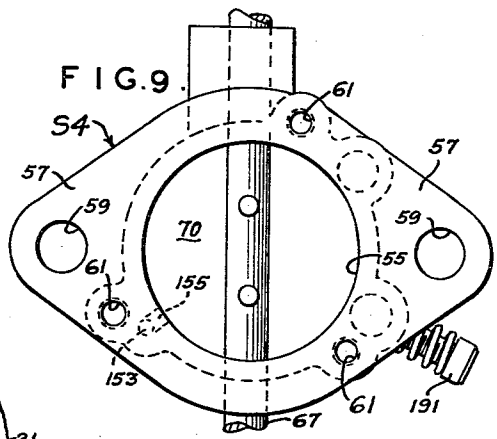
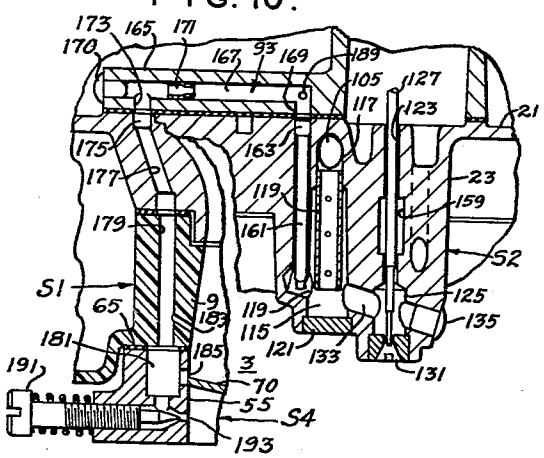


FIG. 10.



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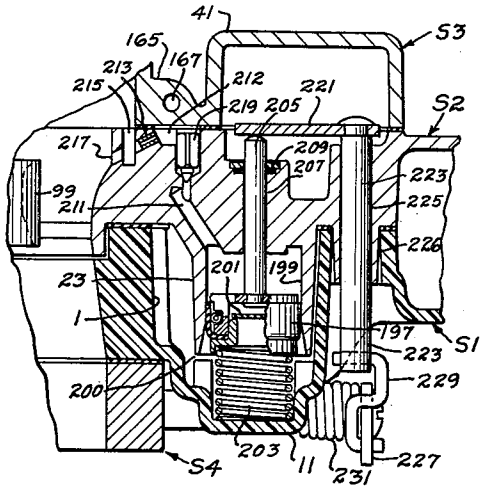
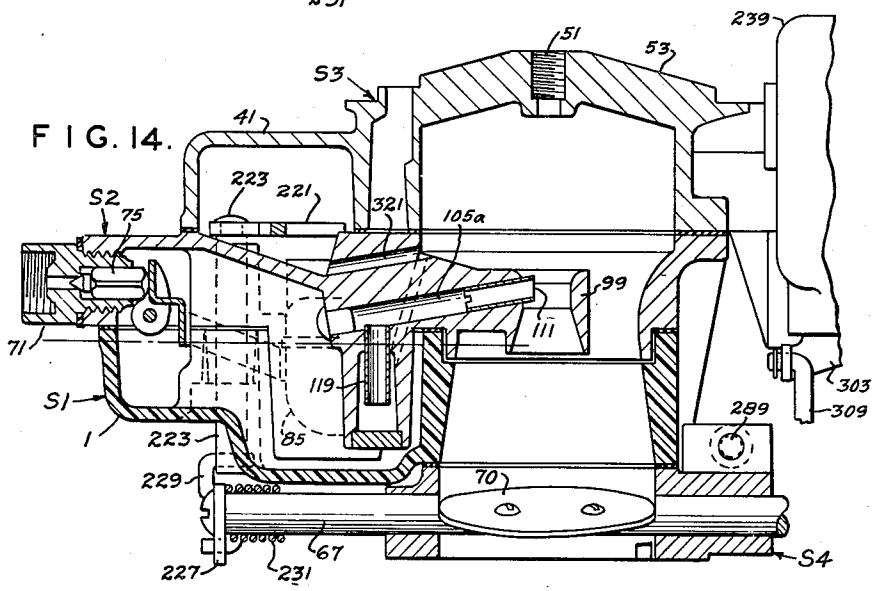


FIG. 11.

FIG. 14.



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3,105,861

CARBURETOR

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Filed June 16, 1960, Ser. No. 36,631
5 Claims. (Cl. 261—72)

This invention relates to carburetors for internal combustion engines, and particularly to downdraft carburetors useable on engines of automotive vehicles.

In recent years, the hot operating problem of carburetors on automotive vehicles has become increasingly more complex. The lowering of automobile hood lines, the addition of heat producing accessory devices, such as air conditioners, power steering, and so forth, and the increased volatility of modern fuels have aggravated the problem. The modern carburetor is expected to properly meter fuel and air when the fuel is gaseous and the air is rarefied as well as when the fuel is liquid and the air is dense. A metering device for both air and fuel can be readily designed for one set of conditions, but the problems become acute as the conditions fluctuate.

An example of hot operating conditions may readily be one in which the ambient air temperature is 100° F. After a car has been operated at 70 miles per hour for some time, it has been found that the temperatures within the carburetor may vary from 126° F. in the fuel bowl, to 135° F. of the air entering the air cleaner, and to 74° F. of the temperature of the fuel just below the fuel nozzle. At these temperatures, it is quite obvious that cartain components of the fuel will be vaporized. The conditions are even more extreme, when, after operating an automobile at high temperatures, the car is stopped for a period of time, such as twenty minutes. During such a "period of soak," the temperatures of the several carburetor parts will all rise to a substantially common level, such as 160° F., for example. Thus, under such conditions of "soak," fuel in the carburetor passages and bowl will tend to vaporize. The vaporized fuel in the carburetor passages will build up pressure which will force out the liquid fuel and cause vapor lock conditions. This results in difficulty in starting the engine until a flow of liquid fuel through the fuel systems of the carburetor is restored.

Accordingly, it is an object of this invention to provide an improved carburetor which will operate between the extremes of environmental temperature conditions normally met.

It is an other object of this invention to provide an improved carburetor which will minimize the effect of heat to which the carburetor will be subjected in the engine compartment.

It is a further object of this invention to provide a novel carburetor structure in which the liquid fuel will have a minimum tendency to volatilize during car operation or immediately thereafter.

The novel carburetor, in accordance with the invention, is one which is built of several sections. One section comprises the flange structure, which is adapted to be bolted or otherwise connected to the intake manifold of an engine with a gasket to provide sealing and heat insulation between the intake manifold and the flange structure. This flange section will contain the throttle plate and the idle port and is preferably formed of high thermal conductivity metal. Connected immediately to the flange body is a reservoir or bowl section, made of good insulating material with low thermal conductivity so that heat will not be transferred to the fuel within the bowl by conduction from the relatively warm throttle plate flange section or by radiation and conduction from the ambient air or hot engine. The fuel bowl section is covered by a relatively

thin casting of high thermal conductivity metal, such as an aluminum alloy. Part of this structure is formed with a part of the carburetor throat as well as the venturi of the carburetor. Extending downwardly from this thin body casting into the fuel of the fuel bowl are several depending structures, which incorporate the several fuel circuits of the carburetor. The thin body casting is designed to have a minimum of exposed surface to the outside and thus minimize heat transfer from the ambient air as well as to minimize heat radiated from adjacent hot parts of the motor. The fuel within the fuel bowl further adds heat insulation to the pending structures enclosing the various fuel circuits. An uppermost member of the composite carburetor, possesses the air horn and includes the choke mechanism for the carburetor.

FIG. 1 is a schematic view of a motor vehicle with a carburetor of this invention mounted thereon.

FIG. 2 is a view in elevation of the carburetor of this invention, with the air filter removed.

FIG. 3 is a view in elevation of the carburetor of this invention as viewed from the left of FIG. 2.

FIG. 4 is plan view of the carburetor of this invention with the air filter removed.

FIG. 5 is a plan view of the carburetor of this invention with the air horn casting removed and certain parts in section.

FIG. 6 is a vertical section taken on line 6—6 of FIG. 4.

FIG. 7 is a vertical section taken on line 7—7 of FIG. 4, with parts broken away.

FIG. 8 is a vertical section taken on line 8—8 of FIG. 5.

FIG. 9 is a bottom plan view of the carburetor of FIG. 3.

FIG. 10 is a vertical section taken on line 10—10 of FIG. 4.

FIG. 11 is a vertical section taken on line 11—11 of FIG. 4.

FIG. 12 is a view in elevation of the carburetor as viewed from the right of FIG. 2 with the automatic choke cover cut away.

FIG. 13 is a sectional view taken on line 13—13 of FIG. 2.

FIG. 14 is a vertical section of a carburetor in accordance with a modification of the invention.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, there is indicated at A in FIG. 1 an automotive vehicle having an engine E on which is mounted a carburetor C of this invention. Fuel is supplied to the carburetor C from the fuel tank T of the vehicle through a line L1 to a fuel pump P on the engine. Pump P may be operated by the engine and is adapted to pump fuel to the carburetor through a line L2. The carburetor C is mounted on the intake manifold M of the engine. The exhaust manifold of the engine is indicated at H. An air filter F is conventionally mounted on the carburetor C.

Carburetor C (FIGS. 2, 3 and 6) is a single-bore downdraft carburetor, having a fuel bowl 1 and an adjacent vertical mixture conduit 3. Air is adapted to flow downwardly through mixture conduit 3 to intake manifold M of engine E under control of a throttle valve 70 at the lower end of the mixture conduit. Fuel is adapted to be supplied to the mixture conduit from bowl 1 through fuel nozzle 7 for admixture with the air to provide a combustible mixture of air and fuel.

As shown, the carburetor consists in an assembly of four individual sections which are designated S1, S2, S3 and S4. As shown best in FIG. 6, section S1 is a cast-

ing made of a hard heat insulating material formed to provide the fuel bowl 1 and a portion 9 of mixture conduit 3. Section S1 may be referred to as the fuel bowl section of the carburetor. Section S1 is made of any appropriate heat insulating material, such as a plastic formed as a recation product of phenol and formaldehyde (Bakelite). The bottom of bowl 1 is stepped so that the bowl has a relatively deep generally rectangular part 11 adjacent to portion 9 of the mixture conduit 3 and a relatively shallow part 13 projecting outwardly from one of the long sides of the deep part 11. Portion 9 of the mixture conduit 3 is constituted by a vertical tubular portion 15 integral with the bowl 1 on the other long side of part 11 of the bowl. The tubular portion 15 is of slightly conical form flaring downwardly to the lower end of portion 9 from an annular recess 17 at its upper end.

Section S2 is mounted on top of section S1. It comprises a casting formed to provide an upper portion 19 of the mixture conduit 3. A portion 21 (FIGS. 2–6) forms a cover for bowl 1. A portion 23 of section S2 extends down from portion 21 into the bowl. Section S2 is cast from a material having good heat-conductive properties, such as aluminum and functions to conduct heat from the fuel bowl 1 to cooler portions of the casting, as described below. The bowl cover portion 21 of section S2 has essentially an inverted cup shape, with an outline corresponding to that of the fuel bowl 1. The mixture conduit portion 19 of section S2 is constituted by an annular formation integral with bowl cover 21 having a vertical axis and of rounded form convergent downwardly and merging with the upper end of tubular portion 15 of the mixture conduit. Portion 19 has a reduced-diameter lower end 27 fitting into recess 17. Conduit portions 19 and 15 form a venturi passage with the throat 29 of the venturi located at the level of the top of section S1.

Section S2 has ears such as indicated at 31 registering with ears 33 on section S1, which receive screws 35 for fastening section S2 on section S1. A gasket 37 is interposed between sections S2 and S1 and is made of a material such as a cellulose fiber mixed with a synthetic rubber binder, to thermally insulate section S2 from section S1.

Section S3 is a casting having a vertical tubular portion 39 which constitutes the air horn of the carburetor and a portion 41 of inverted cup shape overlying bowl cover 21 for enclosing certain parts to be described which extend upwardly above cover 21. Section S3, which may be referred to as the air horn section of the carburetor, is secured on top of section S2 by screws 43 which are threaded in tapped holes 45 in cover 21 and by screws 47 received in tapped holes 48 in ears 49 on mixture conduit portion 19 of section S2. A gasket 50 is interposed between sections S3 and S2. The gasket 50 is also made of a thermally insulating material such as a cellulose fiber with a synthetic rubber binder to heat insulate section S2 from S3. A screw-threaded socket 51 is provided at the top of the air horn 39 and coaxial therewith for attachment of the air filter F by bolt 54. This socket is supported by radial inclined struts 53; the struts and socket being cast integrally with the air horn S3.

Section S4 constitutes the throttle body of the carburetor, bottoming mixture conduit portion 9 of section S1. It has a cylindrical throttle bore 55 constituting a downward extension of the mixture conduit 3, and horizontal flange portions 57 provided with holes 59 for receiving bolts 60 mounting the carburetor on intake manifold M. The throttle body S4 is fixed to the bottom of section S1 by long screws 63 which extend through sections S2 and S1 into tapped holes 61 in section S4. A thermally insulating gasket 65 made of an appropriate material such as a cellulose fiber mixed in a synthetic rubber binder, is interposed between sections S1 and S4. A throttle shaft 67 extends horizontally across the throttle bore 55 in the central vertical plane of the mixture conduit 3 and bowl 1. The throttle shaft 67 extends under the fuel bowl 1, which has a bottom formation such as indicated at 69 in FIG. 3 accommodating the shaft. A throttle valve 70 is secured on the throttle shaft in bore 55 at the lower end of the mixture conduit 3.

A combination fuel inlet fitting and needle valve body 71 (FIGS. 5 and 6) is threaded into a bushing 73 in the peripheral wall of the bowl cover 21 in the central vertical plane of the carburetor. Fitting 71 has a needle valve 75 horizontally slidable therein, and is formed to provide a seat 77 for the valve. Arms 79 pivoted on a horizontal rod 81 extending across the bowl cover 21 carry a yoke 83 having floats 85 at its ends. These floats 85 are located in bowl 1 on opposite sides of downwardly extending portion 23 of section S2. The yoke has an upwardly extending central part 87 above the rod 81 engageable with the needle valve 75. The floats hold the needle valve closed when the fuel is at a predetermined level in the bowl such as indicated at L. When the fuel level drops, the yoke 83 swings downwardly so that part 87 rotates clockwise, as seen in FIG. 2 to permit the needle valve 75 to open and admit fuel to the bowl. Fuel flows into the bowl 1 until level L is restored and then the needle valve closes.

Section S2, part of which constitutes the bowl cover 21 and part of which constitutes the upper portion 19 of the mixture conduit 3, has embodied therein the entire high speed fuel system 91 of the carburetor. This is the system for supplying fuel from bowl 1 to mixture conduit 3 at engine speeds above idle. This high speed system includes means for metering the fuel to provide different air to fuel ratios. Section S2 also contains the idle fuel system of the carburetor which is the system for supplying fuel from the bowl 1 to the mixture conduit 3 when the engine is idling. An accelerating fuel system for the carburetor is also contained in section S2. The accelerating fuel system is for pumping fuel from the bowl to the mixture conduit upon acceleration. Thus, section S2 may be referred to as the fuel system section or cluster of the carburetor. It is in effect sandwiched between section S3, the air horn section and section S1, the fuel bowl section.

The high speed fuel system includes an arm 97 cast integrally with section S2, and extending radially into the mixture conduit 3. Arm 97 contains a primary venturi 99 at its outer end coaxial with the adjacent mixture conduit portion 19. The bowl cover 21 is formed with an inclined portion 101 providing a recess 103 to enable a downwardly inclined passage 105 to be drilled in section S2 through the arm 97 to the primary venturi 99. The upper end of passage 105 is closed by a plug 109, and a nozzle tube 111 is provided in the lower end of passage 105 projecting into the primary venturi 99. The nozzle tube 111 has a press fit in passage 105. The arm 97 with primary venturi 99 thereon and tube 111 constitute the nozzle 7 of the carburetor.

Portion 23 of section S2 extends downwardly from the bowl cover 21 into the fuel bowl 1 closely adjacent to the mixture conduit 3. Portion 23 is in effect suspended in the bowl so that it extends down nearly to the bottom of the deep part 11 of the bowl and is spaced from all portions of the wall of the fuel bowl 1. This may be referred to as a block and is formed with a vertical cylindrical recess 115. The axis of this recess 115 is slightly offset to the right of the central plane of the carburetor as viewed in FIG. 6. A vertical passage 117 of smaller diameter than recess 115 extends between the upper end of recess 115 and the fuel passage 105. This passage 117 is centered in the central plane of the carburetor. A main fuel tube 119 has its upper end press fitted into passage 117 and extends downwardly into recess 115. The bottom of the recess 115 is sealed by a plug 121.

Section S2 is provided with a vertical hole 123 (see FIG. 7) extending down from its top through block 23 to a recess 125 of larger diameter than hole 123. This recess 125 extends up from the bottom of block 23.

A fuel metering rod 127 is vertically slidable in the hole 123 and has a stepped lower end portion 129 (two steps being shown) cooperable with an annular fuel metering jet 131 held in a counterbore at the lower end of recess 125. An inclined cross-passage 133 (see FIG. 11) in portion 23 intersects recess 125 and extends to the recess 115 adjacent the lower end of the fuel tube 119. The outer end of cross-passage 133 is closed by plug 135. Fuel is adapted to flow from the bowl 1 though metering jet 131 to recess 125, thence through inclined cross-passage 133 to recess 115 which constitutes a fuel well, thence upward through the main fuel tube 119 and passage 117 to the fuel passage 105 and down the latter and out through the nozzle tube 111 into the mixture conduit 3 for admixture with air flowing downwardly through the mixture conduit. Metering rod 127 is adapted to control the rate of flow, according to the position of its lower end portion 129 in the orifice in jet 131.

Section S2 is formed with a cylindrical recess 137 adjacent to metering rod hole 123 extending down and penetrating into but terminating short of the lower end of block portion 23. This recess 137 constitutes a cylinder for a metering rod piston 139, the latter being slidable up and down in the recess of cylinder 137 and extending upwardly above the top of section S2. The piston 139 is biased upwardly by a spring 140 positioned between the bottom of cylinder 137 and piston 139. Piston 139 is adapted to move downwardly under the influence of vacuum in the lower part of cylinder 137 transmitted thereto from mixture conduit 3 below the throttle valve 5 via a vacuum passage 143 drilled in block 23 and intersecting the lower end of the cylinder 137, which is otherwise closed. The inner end of passage 143 intersects the lower end of a long inclined passage 145 (FIG. 8) drilled down from a recess 147 in the top of section S2. When the carburetor sections are assembled this recess 147 is closed by gasket 50 between sections S2 and S3. An oppositely inclined passage 149 extends down from recess 147 through section S2 to the upper end of a vertical passage 151 in mixture conduit portion 9 of section S1. Passage 151 extends down to the upper end of a vertical passage 153 in throttle body section S4, and there is a vacuum port 155 (FIGS. 8 and 9) providing for communication between the throttle bore 55 and the lower end of passage 153.

The upper end of metering rod piston 139 and the upper end of the metering rod 127 are interconnected by a bar 157. Block 23 has a recess or passage 159 providing communication from the bowl 1 to the metering rod hole 123 above the recess 125 and the cross-passage 133. Fuel in this recess or passage 159, which is partly below and partly above fuel level L, provides an air seal on the metering rod to prevent leakage of air past rod 127 to recess 125.

The idle fuel system comprises an idle tube 161 (see FIG. 10) which extends downwardly into fuel well 115 from a vertical passage 163 through the upper surface of section S2. The air horn section S3 has a horizontal rib 165 (FIGS. 4, 10, 11) in which a horizontal passage 167 is drilled to an intersection with a vertical pasage 169 in section S3 which registers with passage 163. The outer end of passage 167 is closed by a plug 170 after insertion of an economizer restriction 171 in passage 167. Section S3 is provided with a vertical hole 173 extending down from passage 167 between plug 170 and economizer 171 to a groove 175 (FIGS. 4 and 10) in the top of section S2. An inclined hole 177 extends up from the bottom of section S2 to an intersection with groove 175. Hole 177 registers with vertical hole 179 extending through the mixture conduit portion 9 of section S1, and hole 179 registers with an idle port recess 181 in the top of the throttle body section S4. An idle by-pass 183 extends from hole 179 in portion 9 of section S1 to the mixture conduit 3 adjacent the lower end of portion 9, and an idle port 185 provides for communication from recess 181 into the throttle bore 55. There is an idle bleed 189 in rib 165 for bleeding air into the idle system between idle tube 161 and economizer 171. An idle adjusting screw 191 is threaded in the throttle body S4 and extends into an idle adjustment screw port 193.

With the throttle closed, an idle air and fuel mixture is sucked into the intake manifold M through the idle port 193. This mixture is formed from air passing into the idle port recess 181 from idle bleed 189, idle by-pass 183 and idle port 185. Idle fuel is sucked up from fuel well 115 through the idle tube 161 into the idle passage 167 and 179 where it mixes with idle air. The idle air and fuel mixture flows into the idle system because of the low manifold pressure present in recess 181.

The accelerating fuel system (FIG. 11) comprises a pump 195 including an inverted cup shaped pump piston 197 slidable in a vertical cylindrical recess 199 formed in block 23. This cylindrical recess 199 extends up from the bottom of the right side of block 23, as viewed in FIG. 5, and is open at the bottom at 200 to the fuel bowl. A check valve disc 201 extends across the inside of piston 197, and forms an inlet check for the space in cylinder 199 above the piston. Check valve 201 opens for priming the cylinder and closes on upward movement of the piston 197. The piston is biased upwardly by a spring 203 from the bottom of bowl section 11. Piston 197 has a rod 205 extending upwardly therefrom and slidable in vertical hole 207 in section S2. Packing for rod 205 is indicated at 209. Section S2 is formed with a pump outlet passage 211 leading from the upper end of the cylindrical recess 199 to a recess 212 in the top of casting S2 which in turn leads through a restriction or pump jet 213 into another pocket 215 in the top of section S2. This pocket is open at the top of mixture conduit 3 and in lateral communication with the mixture conduit via a lateral port 217. Between passage 211 and recess 212 there is a discharge valve 219 for checking flow of fuel back into passage 211.

The pump piston 197 is adapted to be held down against the upward bias of pump spring 203 by a pump actuating arm 221 fixed to the upper end of a pump-actuating rod 223 slidable vertically in a bore 225 formed in section S2 alongside the pump cylinder 199. This actuating arm 221 extends over the upper end of piston rod 205. Rod 223 extends down below the fuel bowl section S1 through an opening 226 in section S1. Throttle shaft 67 has a crank arm 227 (FIGS. 3 and 11) fixed on its end under the fuel bowl 1. S-shaped link 229 interconnects this crank arm 227 and the lower end of rod 223. When the throttle shaft 67 turns in throttle-opening direction, rod 223 is driven upward, thereby raising arm 221 to permit spring 203 to drive pump piston 197 upward through a discharge stroke. A limited amount of fuel is thus forced along passage 211, past valve 219 and through jet 213 and passage 217 out into the mixture conduit 3. This instantaneously enriches the fuel mixture passing through the carburetor and provides sudden acceleration responsive to the action of the throttle opening.

When the throttle shaft turns in throttle-closing direction, link 229 pulls rod 223 down, and arm 221 on rod 223 pushes the pump piston down which opens valve 201 to allow fuel to fill the pump cylinder 199. The throttle shaft is biased to turn in throttle-closing direction by a spring 231. The upper ends of rods 205 and 223 and arm 221 are enclosed within portion 41 of section S3.

A choke shaft 233 (see FIGS. 6 and 7) extends across the air horn 39 parallel to the throttle shaft 67, and offset from the vertical plane of the throttle shaft as appears in FIG. 4. A choke valve 235 is unsymmetrically secured on the choke shaft in the air horn section S3 and unbalanced to open under the bias of gravity and air flowing downwardly through the air horn 39. The choke shaft extends through a bearing 237 cast integrally with the air horn 39 and into a cup-shaped casing 239 cast integrally as a part of air horn section S3. It is closed

by a cup-shaped dust cover 241 containing a choke thermostatic coil 243 (FIGS. 6 and 13). Cover 241 is rotatable on casing 239, clamping members 245 and clamp screws 247 being provided for clamping the cover in various positions of angular adjustment relative to the casing. A partition or baffle plate 249 is provided between the casing and the cover.

A choke lever 251 (FIG. 12) is fastened on the end of the choke shaft 233 in casing 239. This lever has radial arms 253 and 255, a finger 257 extending laterally from arm 255, and a finger 258 extending at right angles to finger 257 outward of the end of the choke shaft. Arm 253 is interconnected by a link 259 with a vacuum-responsive choke piston 261 slidable in a vertical choke cylinder 263 formed as a part of casing 239. The lower end of cylinder 263 is closed by a plug 265. The space in cylinder 263 below piston 261 is in communication with mixture conduit 3 below the throttle valve 70 via passages in sections S3, S2, S1 and S4 indicated at 267 in FIGS. 6 and 12. Choke cylinder 263 has longitudinal scores such as indicated at 269. The arrangement is such that piston 261 is adapted to move downward under the influence of vacuum in the lower end of cylinder 263 to swing the choke valve open.

The cover 241 has a center stud 271 with the inner end of thermostatic coil 243 being secured to this stud. The coil 243 has a hook 273 at its outer end which engages the finger 257 of choke lever 251, this finger extending through an arcuate slot 275 in partition 249. Coil 243 acts as a spring tending to close the choke valve 235. When heated, coil 243 relaxes to permit the choke valve to open. Casing 239 has a hot air inlet 277 and a passage 279 from this inlet to a hole 281 (FIG. 13) in partition 249. Air is delivered to inlet 277 via a tube 283 from a heat pocket in the exhaust manifold H of the engine to operate coil 243 to release the choke valve 235.

A throttle arm 285 (FIGS. 2, 6 and 12) is fastened on the end of throttle shaft 67 under the choke casing 239 and cover 241. This arm has a finger 287 engageable with a stop screw 289 adjustably threaded in a lug 291 on throttle body S4 to determine the fully closed position of the throttle valve. A fast idle cam 293 is rotatably mounted on the end portion of choke shaft 233 on the inside of choke lever 251. A spring 295 biases the fast idle cam to rotate clockwise as viewed in FIG. 12 relative to the choke shaft 233 and choke lever 251. This spring 295 has one end 297 hooked around the arm 255 and its other end 299 hooked around a projection 301 on the fast idle cam. A bar 303 is slidably mounted in a vertical guide slot 305 in choke casing 239 and has a shoulder 307 (FIG. 6) engageable with the fast idle cam 293. A link 309 interconnects throttle arm 285 and the lower end of bar 303, so that bar 303 is pulled down when the throttle valve 5 is opened, and pushed up when the throttle valve is moved in closing direction. Bar 303 has an unloading finger 311 at its upper end engageable with finger 258 of choke lever 251 when bar 303 is moved downward on full opening of the throttle valve to open the choke valve for unloading purposes.

The fuel bowl 1 is vented into the mixture conduit 3 via passages 313 in sections S2 and S3 (see FIGS. 6 and 13). The fuel well 115 is also vented to the mixture conduit 3 via a passage 315 (FIG. 6). Pump actuating arm 221 has a finger 317 (FIGS. 2, 6 and 7) which extends under bar 157. When the throttle valve 5 is opened wide, and rod 223 is moved upward to its upper limit of travel, finger 317 is adapted to lift metering rod 127 upwardly for increased fuel flow irrespective of vacuum acting on metering rod piston 139.

In the operation of the carburetor, fuel for high speed operation of the engine (throttle valve 70 open) is delivered from the bowl 1 through the orifice in metering jet 131 at a rate dependent upon the position of metering rod 127 to recess 125 (see FIG. 7), thence through cross-passages 133 to the fuel well 115, thence up through main fuel tube 119 to passage 105 (see FIG. 10), and thence out through nozzle 7 into mixture conduit 3. The position of metering rod 127 depends on vacuum in cylinder 137 below metering rod piston 139, the rod being up when vacuum is low for increased fuel flow, and being down when vacuum is high for decreased fuel flow. Fuel for idling (throttle valve 70 closed or almost closed as determined by the fast idle cam 293) is delivered from fuel well 115 via idle tube 161 and the idle system passaging through idle port 185 and idle adjustment screw port 193 to the mixture conduit 3. On opening of the throttle valve 70, pump piston 197 is driven upward by pump spring 203 to pump accelerating fuel to the mixture conduit.

The fuel system section S2 of the carburetor, being sandwiched or enclosed between the fuel bowl section S1 and the air horn section S3, has little surface area directly exposed to heat in the engine compartment of the vehicle, and is insulated against conduction of heat thereinto from sections S1 and S3 by gaskets 37 and 50. This reduces the effect of engine compartment heat on section S2, and reduces the tendency toward premature volatilization of fuel in the fuel passages of the high speed fuel system, the idle fuel system and the accelerating fuel system, which are provided in the block 23 of section S2.

Expansion of fuel as it exits from nozzle 7 into the mixture conduit 3 has a cooling effect on nozzle 7. Accordingly, there is an extraction of heat from section S2 by heat being transferred from the nozzle to the expanding fuel in conduit 3. During engine operation, there is a conductive flow of heat through the metallic casting S2 from those portions of casting S2 submerged in the fuel of bowl 1 to the cooler nozzle section 7 and venturi portion 99. The fuel in bowl 1, also, has a heat insulating effect on the fuel systems block 23 submerged therein. This all reduces the effect of engine compartment heat during operation of the vehicle, and also when the engine stops, section S2 tends to be cooler than section S1 and S3.

A significant feature of the construction is that the entrances to all three fuel systems are low in the bowl. Thus, even though the fuel level in the bowl should be lowered by volatilization of fuel under unusual conditions, it is unlikely that the level would drop below the fuel system entrances. Thus, the fuel level in the bowl generally remains sufficiently high, even after a so-called "soak," i.e., a short period (fifteen minutes), during which the engine is stopped after a hard, hot run. Accordingly, difficulty in starting after such a soak is avoided because of the presence of liquid fuel in the several systems rather than fuel vapors.

As pointed out above, section S4 is separated from the manifold M by an insulating gasket. Section S4 furthermore is formed of a material such as cast iron having high thermal conductivity. This is effective when the idle mixture is released to the throttle plate 70 in that section S4 tends to absorb and retain sufficient heat to minimize icing. The plastic bowl section S1 also is insulated from the flange section S4 by heat insulating material. Since the material forming the bowl section S1 has low thermal conductivity, a minimum amount of heat is transferred to the fuel within the bowl 1 by conduction from the relatively hot plate flange S4, or by radiation from the heated engine parts, or by convection from the ambient air. Section S2 has a relatively thin portion exposed to the outside ambient air to provide a minimum amount of exposed surface to external radiation of heat or to the transfer of heat to the fuel system therein by convection from the ambient air surrounding the carburetor. Furthermore, since this section is made of high heat conductivity material, such as aluminum, there is a constant flow of heat from the portions of section S2 immersed in the fuel bowl to the coolest portion of section S2 adjacent to the venturi portion 7. This provides

a means for extracting heat from the fuel bowl to lower the temperature of the fuel within the bowl.

Another significant feature of the construction is that the fuel system section S2 can be pretested by itself prior to assembly with the other sections for checking its fuel metering performance and the operation of the accelerating pump. This eliminates the necessity of assembling carburetor components prior to testing required by prior constructions, as, for example, where the fuel well is in the fuel bowl section.

FIG. 14 illustrates a modification wherein the nozzle passage, designated 105*a* to distinguish it from passage 105 of FIG. 10, is an uphill instead of downhill passage. In this modification, a passage 321 may be provided in the fuel system section S2 interconnecting the space within the dust cover 41 of air horn section S3 and the mixture conduit to equalize the pressure under cover 41. In other respects, the FIG. 17 modification is the same as the embodiment of the carburetor shown in FIGS. 2–16.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A carburetor comprising a first integral structure formed of a low heat conductivity material and having a fuel bowl portion and a mixture conduit, a second integral structure formed of high heat conductive material and including a fuel feed assembly for said carburetor and a venturi section coextensive with said mixture conduit, said fuel feed assembly extending into said fuel bowl, and means insulatingly spacing said first structure from all portions of said second second structure.

2. A carburetor comprising a first integral structure formed of a plastic material and having a fuel bowl portion and a mixture conduit, a second integral metallic structure including a fuel feed section for said carburetor and a venturi section coextensive with said mixture conduit, said fuel feed section extending into said fuel bowl and spaced from the walls thereof, and means heat insulatingly spacing said first structure from all portions of said second metallic structure.

3. A carburetor comprising a first integral structure

formed of a low heat conductivity material and having a mixture conduit and a fuel bowl portion, a second integral structure including a fuel feed section for said carburetor and a first extension part for said mixture conduit, a third integral structure including a second extension part for said mixture conduit, and means fixing said second structure between said first and third structures with said fuel feed section within and spaced from the walls of said fuel bowl and with said first and second extension parts coextensive with said mixture conduit, said fixing means including structure heat insulatingly spacing said second structure from all portions of said first and third structures.

4. A carburetor comprising a first integral structure formed of a heat insulating plastic material and having a mixture conduit and a fuel bowl portion, a second integral structure including a fuel feed section for said carburetor and a venturi section, a third integral structure including an extension part for said mixture conduit, and means fixing said second structure between said first and third structures with said fuel feed section within and spaced from the walls of said fuel bowl and with said venturi section and said extension part coextensive with said mixture conduit, said fixing means including structure heat insulatingly spacing said second structure from all portions of said first and third structures.

5. A carburetor comprising a first integral structure formed of plastic material and having a mixture conduit and a fuel bowl portion, a second integral metallic structure including a fuel feed section for said carburetor and a venturi section, a third integral structure including an extension part for said mixture conduit, means fastening said second structure between said first and third structures with said fuel feed section within and spaced from the walls of said fuel bowl and with said venturi section and said extension part coextensive with said mixture conduit, and means heat insulatingly spacing said second structure from all portions of said first and third structures.

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