Jan. 27, 1942. R. F. BRACKE ET AL 2,271,116

CARBURETOR

Original Filed July 27, 1938 6 Sheets-Sheet 1

Fig. 1.

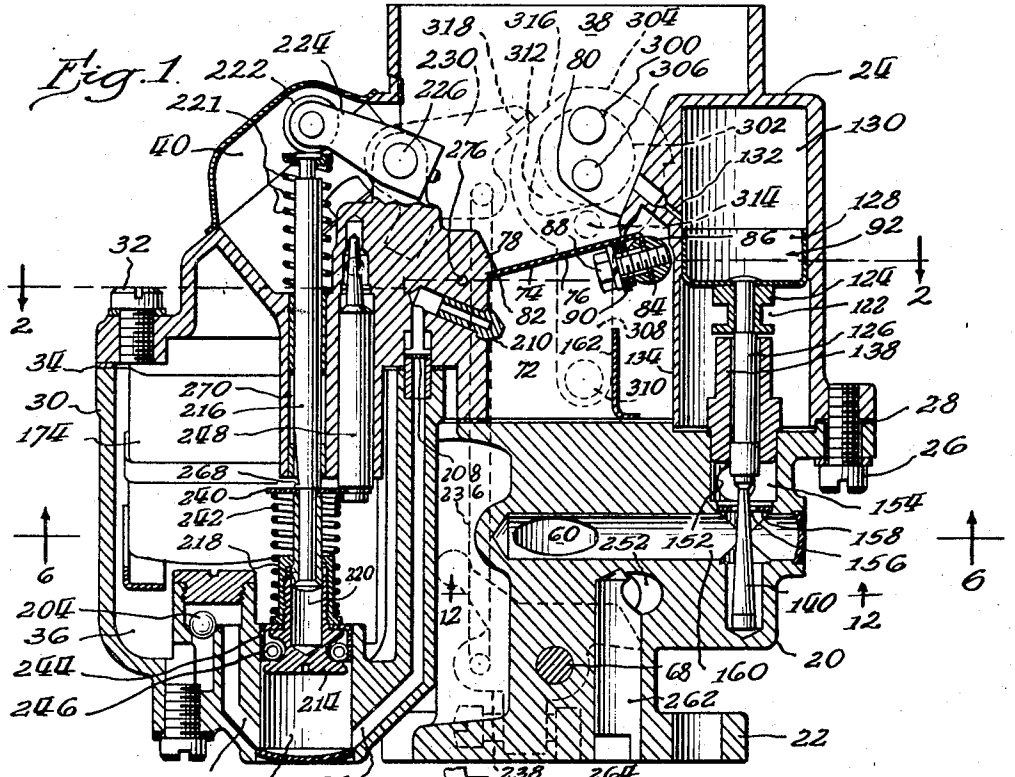
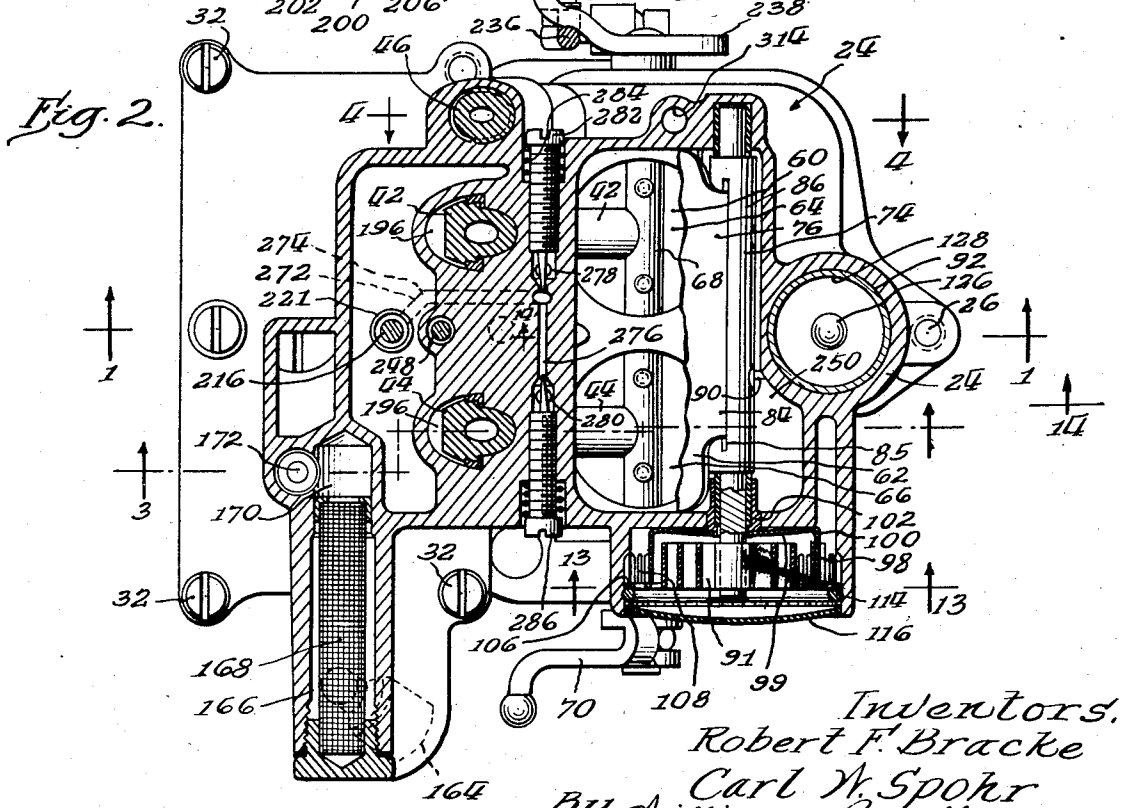


Fig. 2.



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CARBURETOR

Original Filed July 27, 1938 6 Sheets-Sheet 2

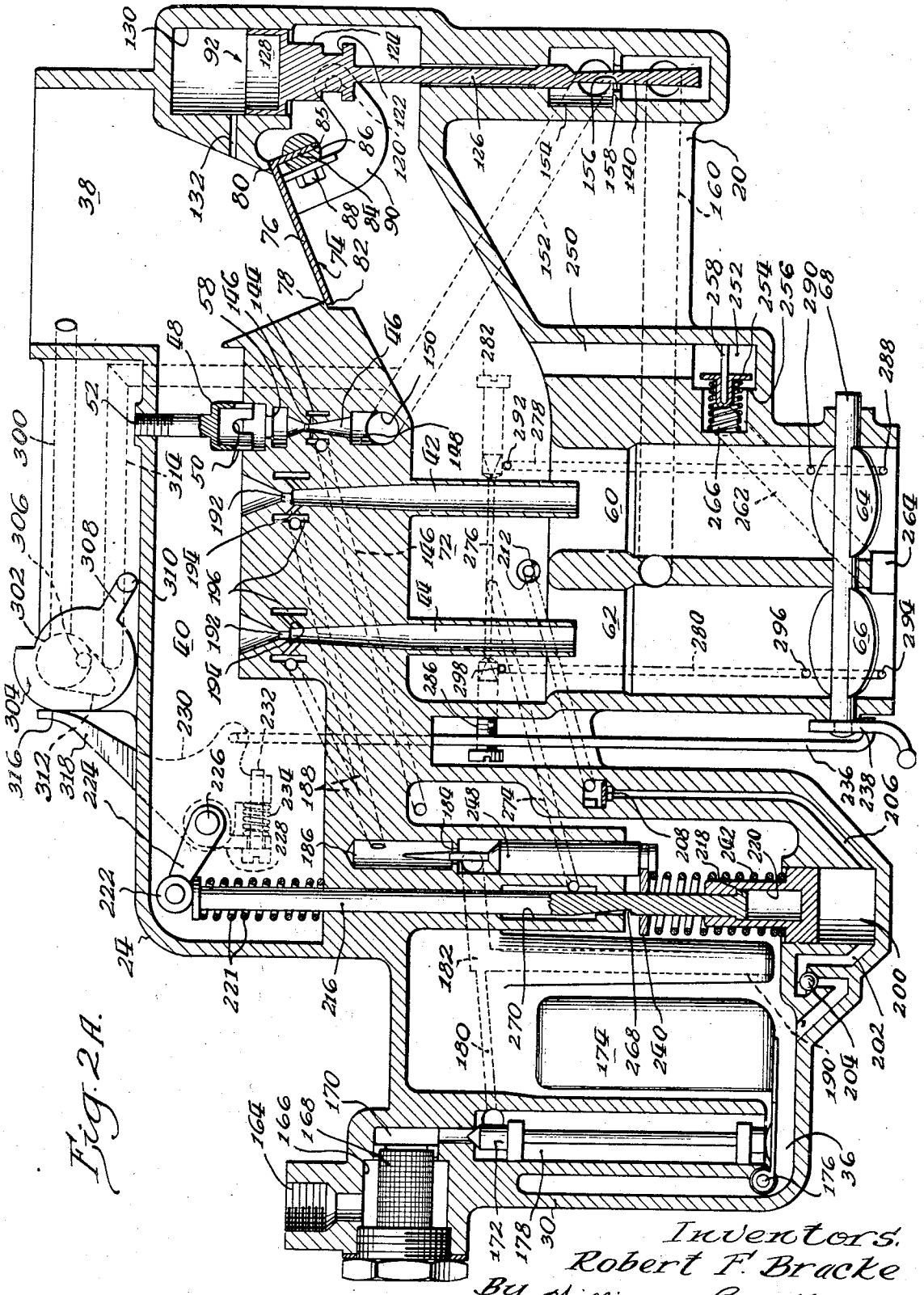


Fig. 2A.

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CARBURETOR

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Fig. 3.

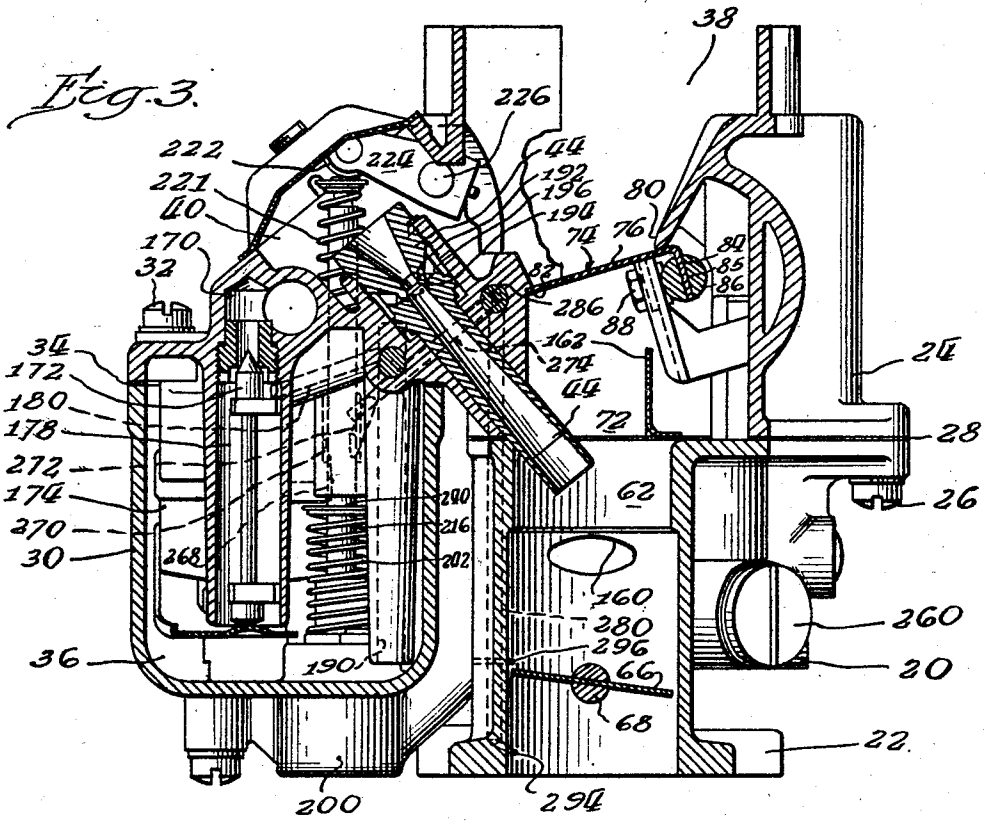
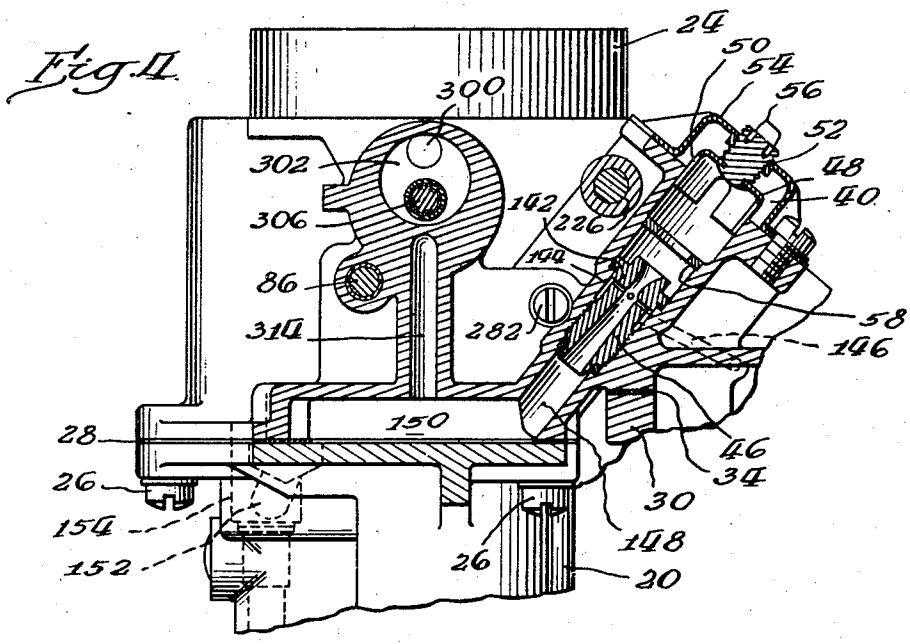


Fig. II.



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CARBURETOR

Original Filed July 27, 1938 6 Sheets-Sheet 4

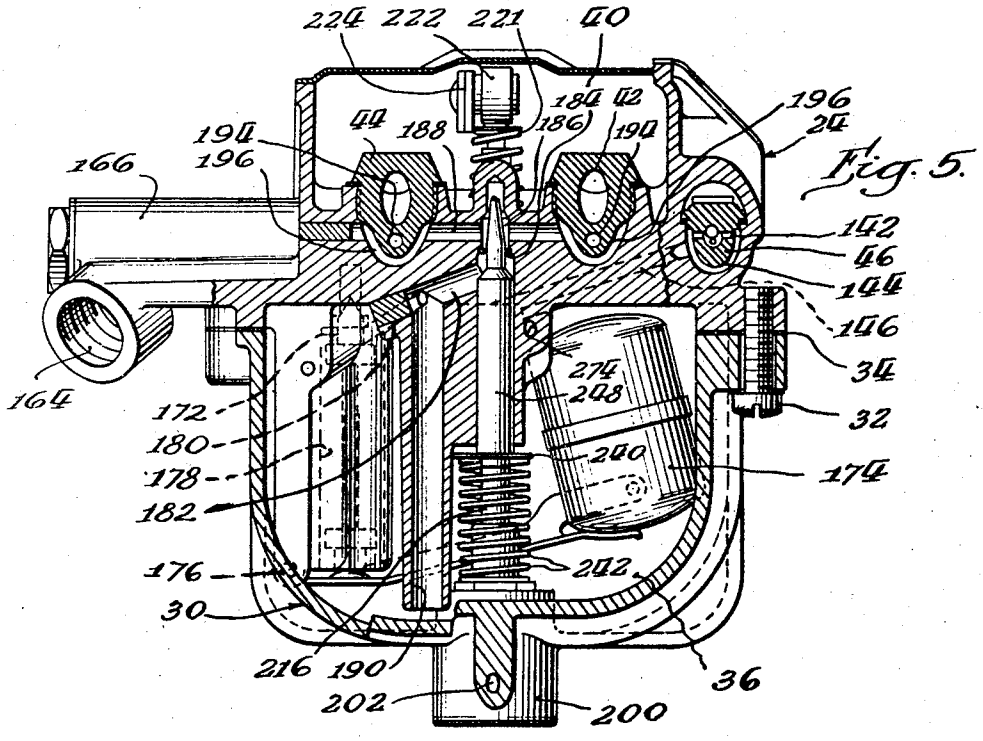


Fig. 5.

Fig. 6.

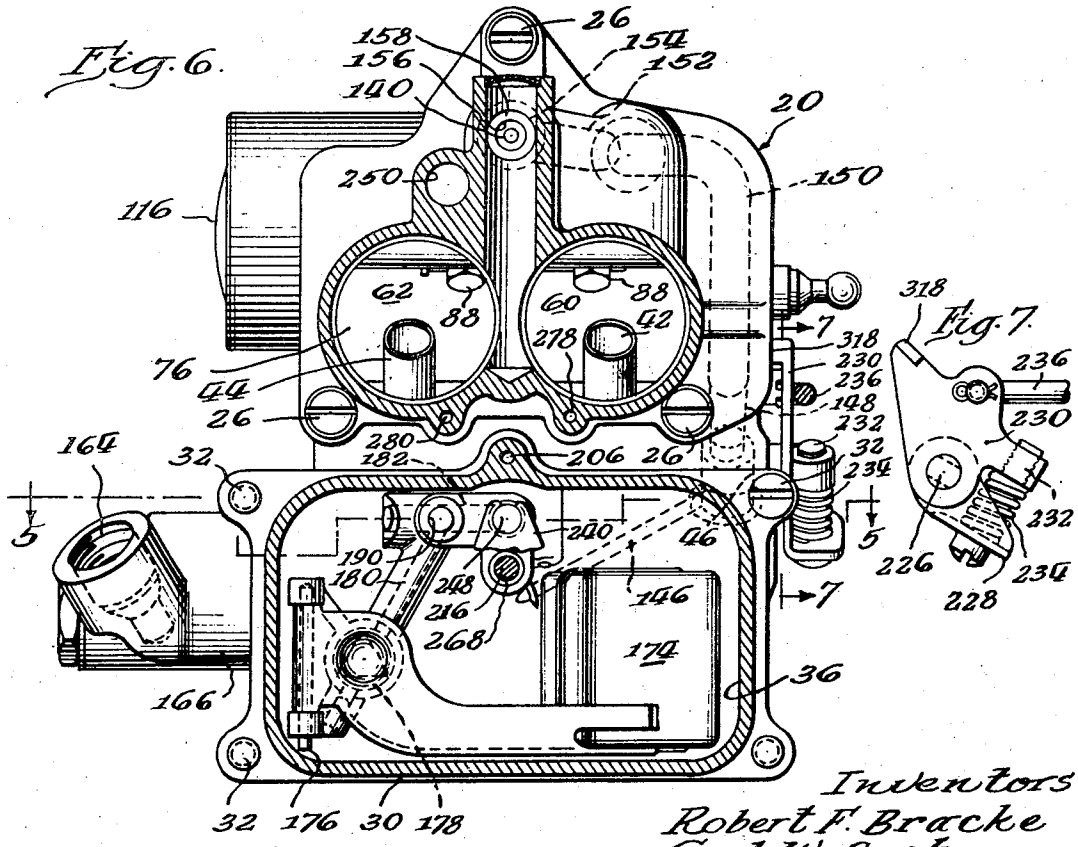


Fig. 7.

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CARBURETOR

Original Filed July 27, 1938 6 Sheets-Sheet 5

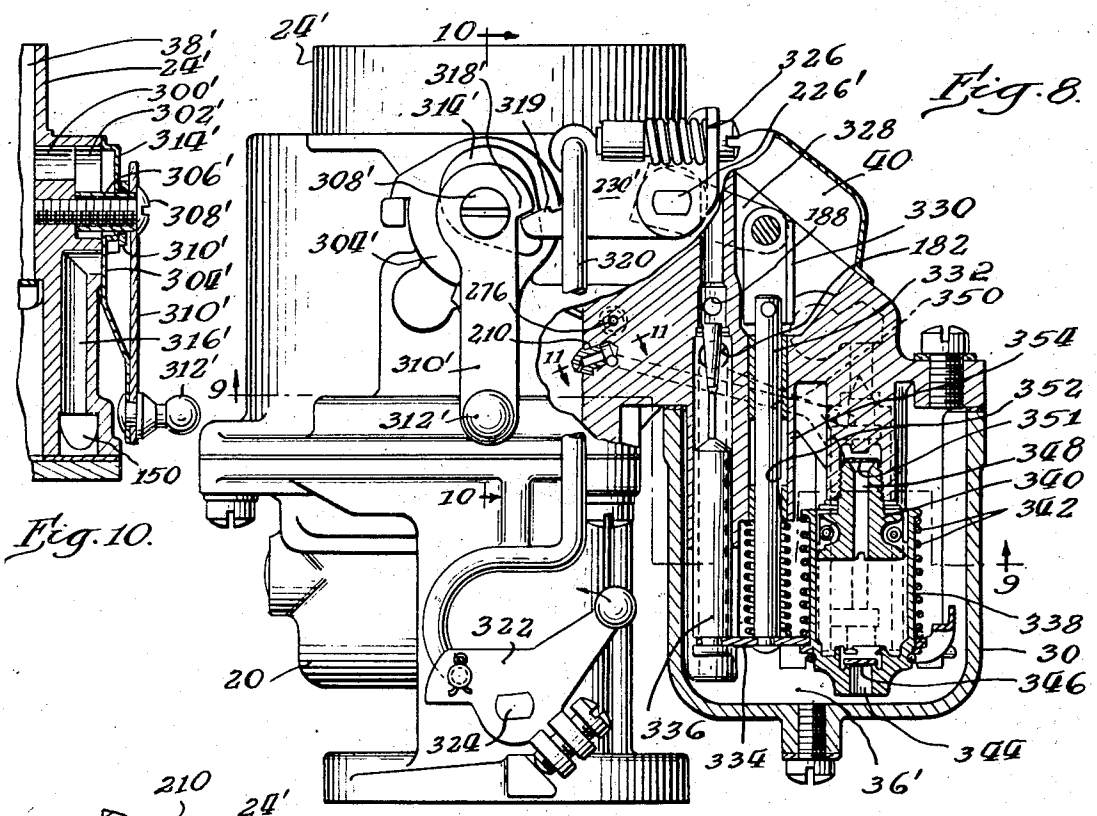


Fig. 8.

Fig. 10.

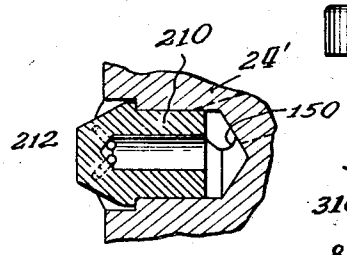


Fig. 11.

Fig. 9.

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CARBURETOR

Original Filed July 27, 1938 6 Sheets-Sheet 6

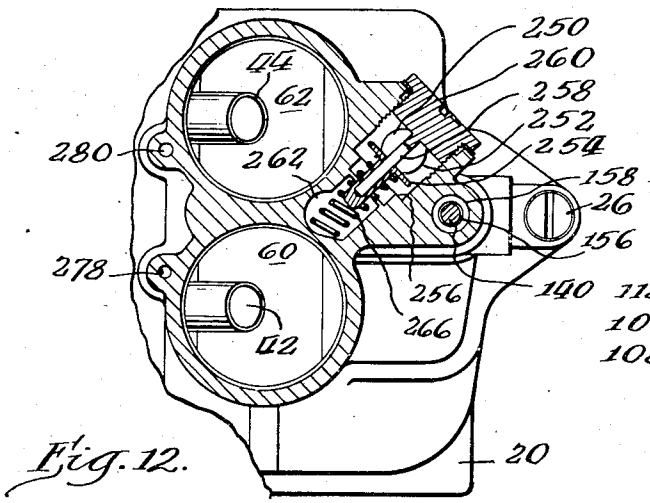


Fig. 12.

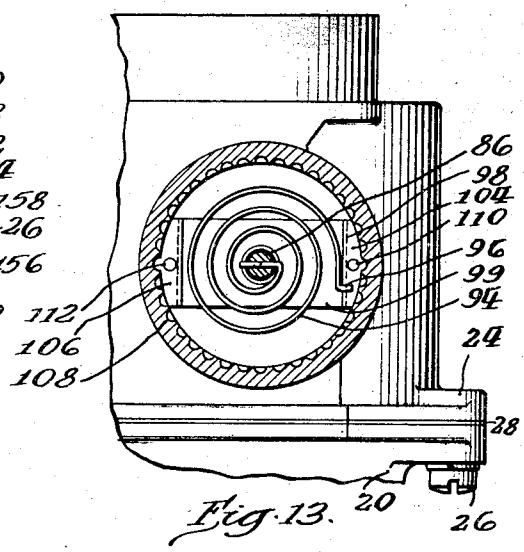


Fig. 13.

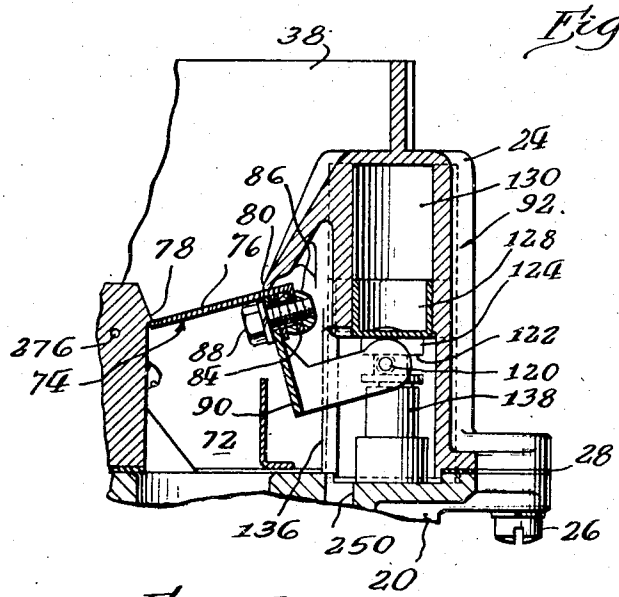


Fig. 14.

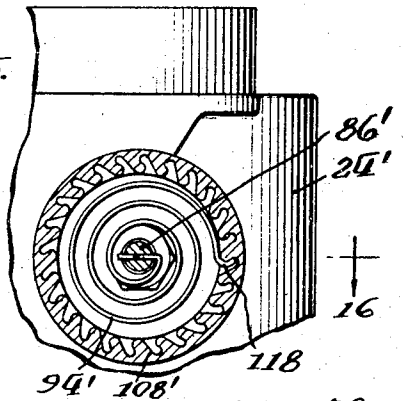


Fig. 15.

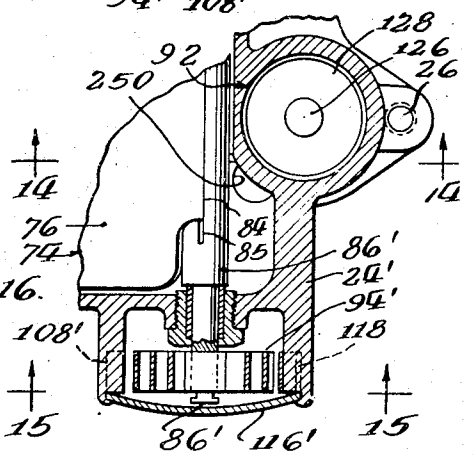


Fig. 16.

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Patented Jan. 27, 1942 2,271,116

UNITED STATES PATENT OFFICE

2,271,116

CARBURETOR

Robert F. Bracke and Carl W. Spohr,
Chicago, Ill.

Original application July 27, 1938, Serial No. 221,486. Divided and this application January 22, 1940, Serial No. 314,904

1 Claim. (Cl. 261—64)

Our invention pertains to carburetors and is more particularly concerned with carburetors of the fuel lift type. This application is a division of our copending application Serial No. 221,486 filed July 27, 1938.

An object of our invention is to provide a carburetor which will facilitate starting of a hot engine.

Another object of our invention is to provide a carburetor which will improve the starting characteristics of a cold engine.

Another object of our invention is to provide a carburetor which will give good acceleration.

Another object of our invention is to provide a carburetor wherein the fuel in the carburetor float bowl will be maintained at a relatively low temperature.

Another object of our invention is to provide an improved arrangement of the nozzle Venturi tubes and booster Venturi tube.

Another object of our invention is to provide improved means for adjusting the carburetor whereby it may be calibrated more accurately at the factory.

Another object of our invention is to provide improved means for adjusting the carburetor whereby it may be calibrated more accurately at the factory.

Another object of our invention is to provide an improved arrangement of the booster Venturi tube and conduits associated therewith to eliminate condensation of gasoline in these passages.

Another object of our invention is to provide an improved accelerator pump which will require less servicing than the accelerator pumps heretofore used.

Another object of our invention is to provide an improved carburetor which is inexpensive to manufacture, trouble-free in use, and which will give more efficient and satisfactory engine operation under all conditions.

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

In the drawings, Figure 1 is a vertical sectional view of a carburetor embodying our invention. This view is taken on the line 1—1 of Figure 2;

Figure 2 is an irregular horizontal sectional view taken on the line 2—2 of Figure 1;

Figure 2—A is a diagrammatic representation of the carburetor shown in Figures 1 and 2;

Figure 3 is an irregular vertical sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a vertical sectional view of the upper part of the carburetor shown in Figures 1, 2 and 3 and is taken on the line 4—4 of Figure 2;

Figure 5 is an irregular vertical sectional view taken on the line 5—5 of Figure 6;

Figure 6 is a horizontal sectional view taken on the line 6—6 of Figure 1;

Figure 7 is a detailed view, taken on the line 7—7 of Figure 6, showing the adjustment for the economizer pin and idling system cut-off;

Figure 8 is a partial side elevation and partial sectional view of a modified form of our invention. The part of Figure 8 which is shown in section is taken on the irregular line 8—8 of Figure 9;

Figure 9 is an irregular generally horizontal sectional view of the carburetor shown in Figure 8 and is taken on the irregular line 9—9 of Figure 8;

Figure 10 is a sectional view taken on the line 10—10 of Figure 8, showing the choke control mechanism;

Figure 11 is a sectional view of the accelerator pump jet and is taken on the line 11—11 of Figure 8;

Figure 12 is a sectional view showing the detail of the hot starting valve and is taken on the horizontal line 12—12 of Figure 1;

Figure 13 is a detailed sectional view of the air valve control spring and is taken in the vertical plane indicated by the line 13—13 of Figure 2;

Figure 14 is a vertical sectional view of the air valve control mechanism and is taken on the line 14—14 of Figure 2;

Figure 15 is a vertical sectional view of a modified form of air valve control spring and is taken on the line 15—15 of Figure 16; and

Figure 16 is a horizontal sectional view taken on the line 16—16 of Figure 15.

Referring particularly to Figure 1 of the drawings, we have illustrated our carburetor as comprising a casting 20 having a flange 22 adapted to be attached to the intake manifold of an internal combustion engine. A second casting 24 is attached to the upper end of the casting 20 by screws 26 or any other suitable means and the usual gasket 28 is interposed between the castings 20 and 24 to insure an air-tight joint. A third casting 30 depends from the casting 24 and is attached thereto by screws 32, the usual gasket 34 being interposed between the castings 30 and 24 to provide a liquid and gas-tight joint.

It is to be noted that the casting 30 has the float bowl 36 formed therein and that any heat conducted to the float bowl from the engine must cross the joint between castings 20 and 24 and the second joint between castings 24 and 30 before it reaches the float bowl. We have found

that this construction materially reduces the amount of heat transmitted from the engine to the float bowl and that the gaskets 28 and 34 may be made of any usual material and of any usual thickness, it being unnecessary to provide thick gaskets of special heat insulating material.

As best shown in Figure 3 the casting 24 has an inlet 38 at its upper end through which air is admitted to the carburetor. This inlet may be provided with any suitable air cleaner if desired. The inlet 38 communicates with a chamber 40 from which air is supplied to the two nozzle Venturi tubes 42 and 44 and also to the booster Venturi tube 46 (Figure 4). With this arrangement any eddies which might occur in the chamber 40 will affect equally the nozzle Venturi tubes 42 and 44 and the booster Venturi tube 46, thereby maintaining a proper balance between these Venturi tubes under all conditions of operation. Air passing to the booster Venturi tube 46 must first pass through a metal cup 48 having slots 50 and attached to a plug 52 threaded in the cover 54 for the chamber 40. The plug 52 is provided with bores 56 for receiving the prongs of a spanner wrench whereby the cup 48 may be adjusted to admit greater or less air to the booster Venturi tube 46 only by a person equipped with the proper tool. The purpose of this particular arrangement is to permit ease of adjustment at the factory and by a service station which is properly equipped, but to prevent tampering by unskilled individuals. The air passing to the booster Venturi tube 46 must also pass through a disk 58 having an orifice of predetermined size.

The nozzle Venturi tubes 42 and 44 discharge into the upper ends of a pair of throttle bores 60 and 62 respectively provided with throttle valves 64 and 66 mounted on a common shaft 68 provided with a lever 70 adapted to be connected to the usual hand and foot controls of an automobile.

The upper ends of the throttle bores 60 and 62 open into a rectangular chamber 72 at the upper end of which is located an air valve 74. The air valve 74 constitutes an important feature of our invention and comprises a sheet metal valve member 76 which is substantially rectangular in shape and which in the closed position closely fits the seat provided by overhanging lips 78 and 80. Because of the rectangular shape of the chamber 72, the ends of the valve member 76 may closely fit the ends of the chamber to prevent leakage therepast and in this manner the amount of air which is admitted to the chamber 72 is regulated by the space between the forward edge 82 of the valve member and the adjacent side wall of the chamber 72, thus providing for more accurate control of the volume of air admitted to the chamber 72 and the throttle bores 60 and 62.

The valve member 76 has an extension 84 bent at right angles to the main part of the valve member and adapted to be received in the slot 85 provided in its supporting shaft 86. The extension 84 has generally vertical slots for receiving the screws 88 which extend freely through that portion of the shaft 86 which is to the left of the extension 84 as viewed in Figure 14 and are threaded into that portion of the shaft 86 which is to the right of the extension 84 as viewed in this figure. These screws 88 also pass freely through the adjacent portion of the lever 90 which connects the air valve shaft with the dashpot indicated generally by reference numeral 92.

The foregoing arrangement permits easy assembly and adjustment of the air valve, it being only necessary to assemble the parts and tighten up lightly on the screws 88. The valve member 76 may then be adjusted by sliding its extension 84 in the slot in the shaft 86 so that the rectangular surface of the valve member 76 contacts with valve seats 78 and 80 when the valve is in closed position. The screws may then be tightened to lock the valve member 76 in this position on its shaft 86.

The mechanism for urging the valve to closed position is best shown in Figures 2 and 13. The end of the shaft 86 has a short slot for receiving the inner end of the spiral spring 94 which we have found to have particularly desirable characteristics for operating the air valve of our improved carburetor. The other end of the spring 94 is bent outwardly as indicated at 96 in Figure 13 and is received in a suitable slot provided in the arm 98 of a generally U-shaped member 100 having a base 99 provided with a central opening pivoted on a forward extension of a bushing 102 surrounding the shaft 86 where it passes through a wall of the casting 24.

The extreme ends of the U-shaped member 100 extend radially outward as indicated at 104 and 106 (Figure 13) and are provided with points adapted to be received in suitable recesses 108 formed in the surrounding portion of the casting 24. To adjust the tension of the spring 94 pins are inserted in the holes 110 and 112 formed in the arms 104 and 106 respectively and the pins are then pushed radially inward toward the shaft 86 withdrawing the points of the arms from the recesses 108. While the points are thus retracted the U-shaped member 100 may be rotated about the shaft 86 to increase or decrease the tension on the spring 94. When the U-shaped member 100 has been positioned to give the desired tension on the spring 94, pressure is released on the pins extending into the holes 110 and 112, whereupon the arms of the U-shaped member will expand radially and move the points into the adjacent recesses 108 thereby locking the spring in this adjusted position.

Referring to Figure 2, it will be seen that the U-shaped member 100 is retained in place by a C-spring 114 expanded into a suitable annular groove formed in the adjacent portion of the casting 24. In order to prevent inexperienced persons from tampering with the air valve spring adjustment, we preferably provide a welsh plug 116 which completely encloses the air valve spring 94 and its adjusting mechanism.

In Figures 15 and 16 we have shown a modification of the spring arrangement for the air valve. This modification has the advantage that it is simpler and less expensive and is equally as advantageous as the form shown in Figures 2 and 13. In Figures 15 and 16 the air valve shaft 86' is slotted at one end to receive the inner end of the spiral spring 94', the outer end of this spring being curved as indicated at 118 for reception in the slots 108' in the casting 24'.

The extreme end of the shaft 86' is preferably pinched together as clearly indicated in Figure 16 to retain the spring 94' in place in the slot in this shaft. Since it is contemplated that any adjustment of the air valve spring will

be made at the factory at the time the carburetor is assembled, a welsh plug 116' is provided to enclose the mechanism and prevent tampering with the spring adjustment.

Referring particularly to Figures 1 and 14, it will be noted that the lever 90 atached to the air valve shaft is provided with pins 120 which extend into the annular groove 122 provided in a collar 124 located on the piston rod 126 attached to the dashpot piston 128 whereby movement of the air valve causes a corresponding movement of the dashpot piston.

The dashpot piston 128 is located in a cylinder 130 formed in the casting 24. This cylinder is provided with an atmospheric vent 132 which opens into the cylinder a short distance above the upper end of the piston 128 when the latter is in its lowermost position which corresponds to a closed position of the air valve 74. That part of the casting 24 which forms the cylinder 130 is provided with a depending skirt 134 which extends into a depression formed in the upper surface of the casting 20, thereby determining the relative position of the two castings and providing accurate alignment between the same. This skirt 134 has a slot 136 (Figure 14) to admit the end of lever 90 and also to maintain the space below the piston 128 in free and open communication with the mixing chambers whereby the pressure below the piston 128 is the same as that existing in the mixing chambers. The piston rod 126 of the dashpot piston passes through a guide 138 and carries at its lower end a metering pin 140 which controls the booster Venturi tube in a manner which we shall now describe.

The air entering the booster Venturi tube 46 and flowing through the restricted throat thereof creates a suction which is communicated to the float bowl 36 by means of radial passages 142, annular space 144, and duct 146. The booster Venturi tube 46 discharges the air passing therethrough and any vapor which may have been withdrawn from the float bowl into an inclined passage 148 communicating with a horizontal passage 150. It is to be noted that the passage 150 is merely a recess formed in the lower edge of the casting 24 and that the lower side of the passage 150 is formed by the gasket interposed between the castings 24 and 20. This manner of forming the passage 150 is advantageous in reducing the cost of manufacture.

From Figures 4 and 6 it will be apparent that the passage 150 is L-shaped and communicates with a downwardly directed passage 152 leading to a chamber 154 which communicates by way of a metered orifice 156 in a plug 158 with a horizontal duct 160 which communicates with both throttle bores 60 and 62 as clearly indicated in Figure 6. The tapered metering pin 140 is located in the orifice 156 and variably restricts this orifice and the flow through the booster Venturi tube 46 in accordance with the position of the air valve 74.

The particular arrangement of air valve, dashpot, and booster control of our invention has several important advantages. Since the lower side of the dashpot piston 128 is exposed to the suction existing in the mixing chambers, and the upper side of this piston is exposed to atmospheric pressure when the air valve 74 is closed or nearly so, the effect of this piston 128 is to impose an additional load on the air valve and thus assist in maintaining a higher degree of suction in the mixing chambers when the engine is operating at idle. After the air valve has opened sufficiently to move the piston 128 to a position where it closes the atmospheric vent 132, this additional load is removed from the air valve. It will be understood that the piston 128 has a clearance of approximately four one-thousandths of an inch, so that after the piston 128 has been raised sufficiently to cover the atmospheric vent 132, both sides of this piston are exposed to equal pressures.

We have previously pointed out that the valve member 76 may be easily adjusted to form a perfect contact with its seats 78 and 80 and that the edges of the valve member 76 fit closely against the ends of the rectangular chamber in which the valve member is located and thus prevent leakage therepast during all positions of the valve. Since the only flow past the air valve is between the free edge of the valve member 76 and the seat 78, a relatively large movement of the air valve is necessary in order to permit an appreciable inflow of air. This in turn means a relatively large movement of the metering pin which controls the booster Venturi tube and gives excellent calibration of the booster Venturi tube over a very sensitive range. The fact that the free edge of the air valve controls the admission of air to the mixing chamber is important since the particular design of air valve and the particular design of dashpot control cooperate to maintain a relatively high degree of suction in the mixing chamber during idle operation and speeds immediately thereabove and thus insure sufficient flow through the booster Venturi tube to maintain the desired suction in the carburetor float bowl.

Attention is also directed to the particular location of the booster Venturi tube and the passages connecting this Venturi tube with the float bowl and the mixing chamber of the carburetor. The booster Venturi tube 46 is located above the carburetor float bowl and is connected thereto by an inclined passage 146 which is free from pockets in which liquid fuel could collect. The point at which the booster Venturi tube discharges into the throttle bores is lower than the booster Venturi tube, and the passages 148, 150 and 152 which connect the discharge end of the booster Venturi tube with the chamber 154 extend in a generally downward direction and are free from pockets in which liquid fuel could accumulate.

We have found that our novel arrangement of air valve 74, nozzle Venturi tubes 42 and 44, and throttle valves 64 and 66 provides a superior combustible mixture. It will be noted from Figure 3 that the air valve 74 inclines downwardly to the left as viewed in this figure so that when the air valve is partially open the incoming air is directed against the left-hand wall of the mixing chamber. The fuel feeding Venturi tubes, on the other hand, are downwardly inclined to the right and discharge toward the right-hand wall of the throttle bores as seen in this figure. The throttle valves are inclined downwardly to the right to a slight extent when in full closed position, and to a greater extent in part throttle position. A baffle plate 162 is preferably located below the air valve 74 to prevent the creation of eddy currents which would interfere with the function of the air valve.

Our improved carburetor has an inlet 164 adapted to be connected with any suitable source of fuel supply which in the present automobile is the main fuel tank usually located at the rear of the vehicle. Fuel admitted through the intake 164 passes into a filter chamber 166 containing a

screen 168 through which the fuel must pass. After impurities have been removed by the screen 168, the fuel flows into a chamber 170 immediately above the float valve 172 controlled by a float 174 pivotally mounted on the pin 176.

The fuel flowing past the valve 172 enters the upper end of a cylindrical passage 178 which opens at its lower end into the float bowl 36. The upper end of the cylindrical passage 178 communicates with the throats of the nozzle Venturi tubes 42 and 44 by way of passages 180, 182, orifice 184, passages 186 and 188. Passage 182 also communicates with a point adjacent the bottom of the float bowl by way of the vertical passage 190. It will be understood that each nozzle Venturi tube has its throat provided with a step 192 below which are the discharge ends of radially inclined passages 194 which communicate with an annular chamber 196. Each annular chamber in turn is connected to one of the fuel supply passages 188.

The particular arrangement of passages connecting the inlet 164 with the float bowl 36 and the float bowl and inlet with the nozzles 42 and 44 is claimed in the copending application of Robert F. Bracke, Serial No. 220,516, filed July 21, 1938.

We have provided our improved carburetor with an accelerator pump comprising a cylinder 200 located in the bottom of the float bowl 36 and supplied with the fuel through an inlet passage 202 controlled by a ball valve 204. Fuel discharged from the cylinder 200 flows through an outlet passage 206, past a check valve 208 to a jet 210 having a pair of diverting orifices 212, each orifice being directed toward one of the throttle bores.

A piston 214 is mounted in the cylinder 200 and is reciprocated by a piston rod 216 having an enlarged head 218 located in a bore 220 in the piston 214. The piston rod 216 is normally held in its upper position by a spring 221 and is moved downwardly by the roller 222 carried by a lever 224 attached to shaft 226 pivotally mounted in the casting 24. An arm 228 (Figure 7) is attached to one end of the shaft 226 and is adjustably connected to a lever 230 which is freely mounted on the shaft 226. The adjustable connection between the arm 228 and lever 230 comprises a screw 232 which passes freely through the arm 228 and threadedly engages the lever 230. A relatively heavy spring 234 surrounds the screw 232 and is interposed between the arm 228 and lever 230 in such manner as to maintain tension on the screw 232 and thus impose sufficient frictional resistance to rotation of this screw to maintain the desired adjustment of the parts. A rod 236 connects the lever 230 with the arm 238 attached to one end of the throttle valve shaft.

Opening movement of the throttle valve shaft causes a downward movement of piston rod 216 whose lower end slides freely in the bore 220 of the piston 214. The downward movement of the piston rod 216, however, carries with it the plate 240 which compresses spring 242 whose lower end rests upon the piston 214 and thereupon urges this piston downwardly in the cylinder 200. The piston 214 has a sealing member 244 which is held in engagement with the cylinder wall by an annular spring 246 so that downward movement of the piston discharges fuel from the cylinder 200 through passage 206, past check valve 208 and thence through the orifices in the jet 210.

Attached to the plate 240 is a metering pin 248 having a tapered upper end which lies in the orifice 184 and serves as a means for controlling the quantity of fuel supplied to the nozzle Venturi tubes 42 and 44 under different conditions of engine operation. One of the important functions of the adjustment shown in Figure 7 is to shift the position of this metering pin with respect to the orifice 184.

All fuel lift carburetors having booster Venturi tubes provide an inherently rich mixture for starting and this increases the difficulty of starting a hot engine provided with such a carburetor. In order to overcome this difficulty with the prior art carburetors, we have provided special means for reducing the richness of the starting mixture supplied to the internal combustion engine provided with our novel carburetor.

Referring particularly to Figures 2, 2—A and 12, it will be seen that we have provided a passage 250 which communicates with the mixing chamber at a point below the dashpot 92 as is most clearly shown in Figure 2 and leading to a valve chamber 252 containing a check valve 254 adapted for engagement with a seat 256 and guided in its movement by a pin 258 formed on a plug 260. A second passage 262 connects the valve chamber 252 with the throttle bores 60 and 62 at a point below the throttle valves 64 and 66 as clearly indicated by reference numeral 264 in Figure 2—A.

When the engine is not operating, the spring 266 which is confined between one end of the chamber 252 and the valve 254 holds this valve in open position as clearly shown in Figures 2—A and 12, and thus provides relatively free communication between the intake manifold and the mixing chamber even though the throttle valves 64 and 66 be in closed position. This means that by leaving the throttle valves closed, a relatively large volume of lean mixture is supplied to the engine, since the metering pin 248 is in its uppermost position and reduces the quantity of fuel supplied to the nozzle Venturi tubes 42 and 44, thereby reducing the volume of fuel discharged into the mixing chamber by these nozzle Venturi tubes. As soon as the engine fires, the suction created by the operation of the engine closes and the valve 254 against the resistance of its spring 266 and retains this valve closed throughout part throttle engine operation.

We have also provided a novel mechanism for supplying fuel to the engine while idling, this system being specially designed to provide easy starting of a hot engine. We shall now describe this novel idling system.

Referring to Figures 1, 2—A, and 3, it will be noted that one side of the operating rod 216 of the accelerator pump is cut away as indicated at 268 to permit fuel in the float bowl 36 to enter the annular chamber 270 surrounding the rod 216 when the rod is in the raised position which it assumes when the throttle valves are closed. The passages 272 and 274 connect the chamber 270 with a transverse passage 276 leading to vertical passages 278 and 280. A needle valve 282 is interposed between one end of passage 276 and passage 278 whereby the quantity of fuel supplied to passage 278 may be varied at will. A spring 284 holds the needle valve 282 in adjusted position. A similar needle valve 286 is interposed between the other end of passage 276 and vertical passage 280.

The lower end of the passage 278 communicates with the throttle bore 60 below the throttle

valve 64 by way of a small hole 288 and a second small hole 290 connects the passage 278 with the throttle bore 60 immediately above the throttle valve 64 when the latter is in closed position. A very small drill hole 292 connects the upper end of the passage 278 with the mixing chamber and prevents the creation of a siphoning action. The other vertical passage 280 is similarly provided with openings 294 and 296 connecting with the throttle bore immediately below and above the throttle valve 66 and is also provided with a small anti-siphoning opening 298.

The carburetor is so designed that when the throttle valve is wide open and the engine is being turned over by the electric starter, the carburetor delivers a lean mixture to the internal combustion engine unless the choke mechanism to be hereinafter described is in operating position. The lean mixture thus supplied to the engine for starting purposes facilitates starting a hot engine. On the other hand, if the prior art carburetors were designed to supply such a lean mixture during starting, the mixture supplied to the engine during normal operation would be so lean that the engine would not accelerate properly when the throttle valve is opened slightly. In other words, the engine would not accelerate properly to "touch throttle" operation. A feature of our invention lies in the design of our idle system which overcomes this difficulty.

It is to be noted that the openings 290 and 296 communicate with their respective throttle bores immediately above the upper sides of the throttle valves therein when these valves are in closed or substantially closed position. Thus, in starting a hot engine with the throttle valves closed, air is drawn into the openings 290 and 296 and a mixture of air and fuel is delivered by the lower openings 288 and 294 to the intake manifold of the engine. As soon, however, as the throttle valves are opened a slight amount, the upper edges of these valves are above the openings 290 and 296 whereupon these openings, as well as the openings 288 and 294, become fuel delivery openings and thereby increase the quantity of fuel supplied to the engine. In touch-throttle operation, the movement of the throttle valves which converts the upper openings 290 and 296 from air inlet openings to fuel delivery openings thereby supplies sufficient additional fuel to the engine to provide the desired increase in engine power. It is to be noted that the float bowl 36 is located ahead of the throttle bores when the automobile is traveling in a forward direction so that the inertia of the fuel tends to increase the quantity supplied to the engine during acceleration of the automobile.

After the throttle valves have been opened an amount corresponding to a predetermined road speed, such for example as forty miles per hour on the level, the accelerator pump operating rod 216 moves to a position to cut off communication between the float bowl and the annular chamber 270, whereupon the openings 288, 290, 294, and 296 cease to function and all of the fuel requirements of the engine are supplied by the nozzle Venturi tubes 42 and 44 except during an accelerating movement of the throttle valve sufficiently great to actuate the accelerator pump.

We have also provided novel means to facilitate starting of the engine when cold. Referring particularly to Figures 1, 2—A and 4, a passage 300 connects the carburetor inlet 38 with a circular chamber 302 which is closed by a plate 304 mounted on a pivot 306. The plate 304 has a downwardly projecting portion 308 provided with a knob 310 adapted to be connected with the usual manual control on the instrument board of the automobile. When the knob 310 is moved toward the right, as indicated by the small arrow in Figure 1, the pear-shaped depression 312 in the plate 304 is shifted to establish communication between the passage 300 and the upper end of a duct 314 whose lower end communicates with the passage 150 which connects the booster Venturi tube 46 with the mixing chamber. In this position of the plate 304, air is admitted to the passage 150 thereby reducing the flow of air through the booster Venturi tube 46 and thus reducing the ability of this booster Venturi tube to create suction in the carburetor float bowl with the result that the nozzle Venturi tubes and the idling system supply the engine with an unusually great quantity of fuel, thereby facilitating starting of the engine when cold.

The plate 304 has a cam-shaped edge 316 adapted to engage the part 318 of the lever 230 when the plate 304 is shifted to operative position. Such engagement moves lever 230 about its pivot and causes a corresponding opening of the throttle valve, thereby automatically supplying additional combustible mixture to the internal combustion engine.

In Figures 8, 9 and 10 we have shown a modified form of carburetor which is similar to the form previously described, except for the details of the cold starting mechanism and the accelerator pump and connections therefor. Referring particularly to Figures 8 and 10 in which we have shown in detail a preferred form of cold starting or so-called choking mechanism, it will be seen that the passage 300' connects the carburetor inlet 38' with a chamber 302' closed by a sheet metal member 304' pivotally mounted on a sleeve 306' surrounding a screw 308'. An ordinary lock washer 310' is interposed between the member 304' and a handle 310' which engages the head of the screw 308'. The lock washer 310' forms a convenient and inexpensive means of firmly holding the member 304' in sealing engagement with the adjacent surfaces of the casting 24'.

In the drawings, the parts are shown in the inoperative position. When it is desired to provide an excessively rich mixture, as when the engine is cold, the knob 312' on the handle 310' is shifted to the left, as viewed in Figure 8, by the usual linkage (not shown) which connects this handle with the instrument board of the automobile. When the lower end of the handle 310' is thus moved to the left, the irregular cup-shaped depression 314' provided by the member 304' is moved to establish communication between the chamber 302' and a passage 316' to admit air to the passage 150. This admission of air to the passage connecting the discharge of the booster Venturi tube 46 with the mixing chamber reduces the flow through the booster Venturi tube and thereby reduces its ability to create a suction in the carburetor float bowl. The pressure existing in the carburetor float bowl is accordingly higher than normal and the nozzle Venturi tubes and idling system, therefore, receive additional quantities of fuel so that the engine receives an unduly rich mixture which facilitates starting in cold weather.

The upper end of the handle member 310' is provided with a shoulder 318' for engaging the projection 319 on a lever 230' pivotally mounted

on shaft 226' and connected with the throttle valves by link 320 and throttle valve shaft 324 and adapted to be connected to the usual manual and foot controls.

The lever 230' is connected to the shaft 226' through the adjusting means 326 similar to that of the previous embodiment and a lever 328 rigid with the shaft 226' is connected by link 330 to a rod 332 carrying a plate 334. This plate carries the metering pin 336 for controlling the quantity of fuel supplied to the nozzle Venturi tubes. The plate 334 has an opening in which is located the accelerator pump cylinder 338 which reciprocates relative to a fixed piston 340, a spring 342 being interposed between the plate 334 and a flange formed at the upper end of the cylinder whereby upward movement of the plate 334 tends to raise the cylinder 338 to expel fluid therefrom.

The lower end of the cylinder 338 is provided with a port 344 normally closed by a disk valve 346 which is urged to its seat by gravity and also by any back flow of fuel which may occur. The fixed piston 340 is hollow, providing a passage 348 communicating with a second passage 350 leading to the accelerator jet 210. A check valve 351 prevents back-flow of fuel to the accelerator pump. The accelerator pump operating rod 332 has a notch 352 formed in one side thereof to control communication between the interior of the float bowl 36' and the annular chamber 354 which supplies fuel to the idling system which is identical with that previously described.

Our invention is not limited to the details shown in the drawings, but may assume numerous forms and is limited solely by the scope of the appended claim.

In a carburetor of the class described, the combination of a mixing chamber, an inclined nozzle for supplying fuel to said chamber, a float bowl from which said nozzle is supplied with fuel, a booster Venturi tube for maintaining suction in said float bowl, a passage for supplying air to said booster Venturi tube, said passage having portions of different cross-section, a slotted cup closely fitting one portion of said passageway and extending into the other portion thereof, an adjustable support for said cup to vary the position of the cup in said portions and thereby vary the amount of air supplied to said booster Venturi tube, a passage connecting said Venturi tube with said mixing chamber, an inlet for said last-named passage intermediate said booster and chamber, a cold starting valve for opening and closing said inlet, means for operating said valve, a rectangular air inlet for said mixing chamber, a sheet metal valve closely fitting said inlet, said valve being inclined oppositely to said nozzle and having a free edge adjacent said nozzle, a shaft having a slot adjustably receiving a bent portion of said last-named valve, a spiral spring for urging said shaft to valve-closing position, means for adjusting said spring, a dashpot connected to said valve shaft, and a throttle valve inclined in the same direction as said nozzle.

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