Feb. 7, 1933. P. S. TICE 1,896,499

CARBURETOR

Original Filed Sept. 5, 1929 2 Sheets-Sheet 1

Fig. 2.

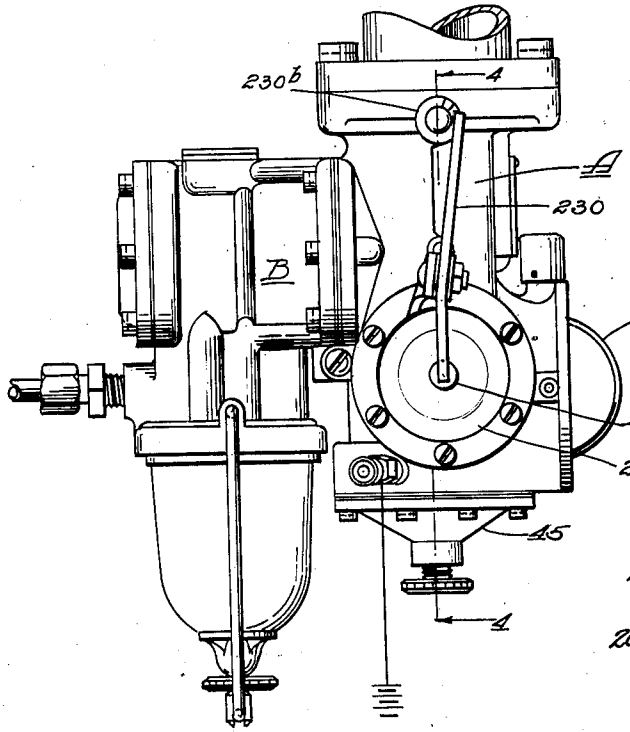


Fig. 7.

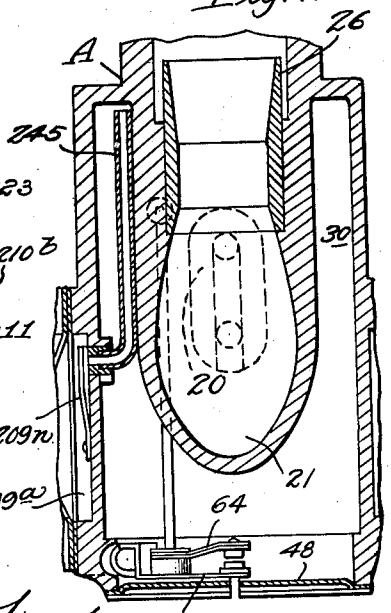


Fig. 1.

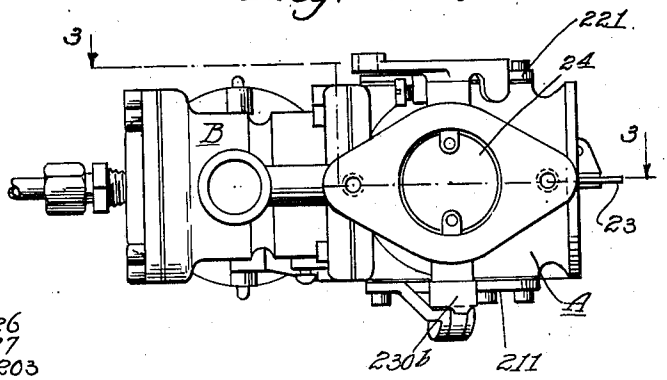
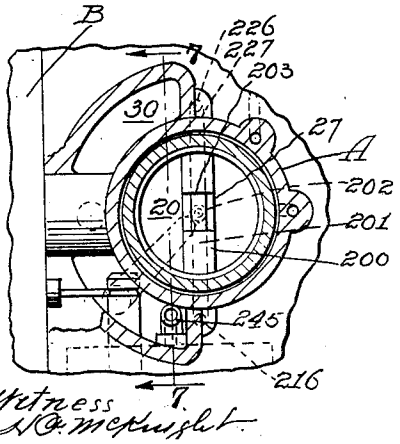


Fig. 6.



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CARBURETOR

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Fig. 3.

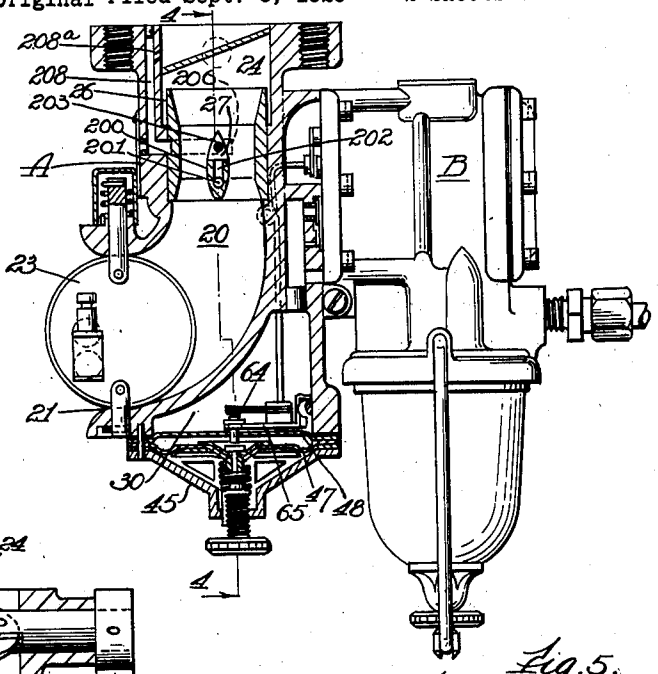


Fig. 4.

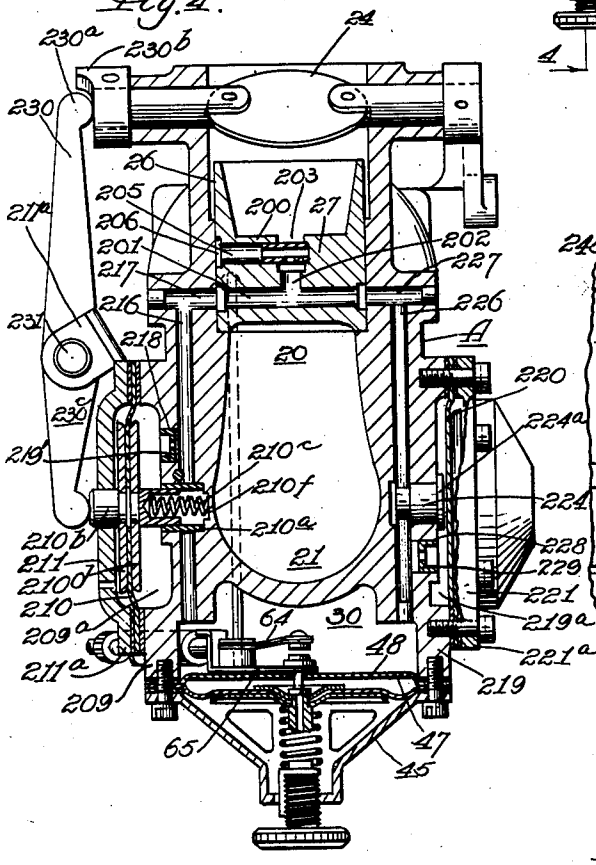
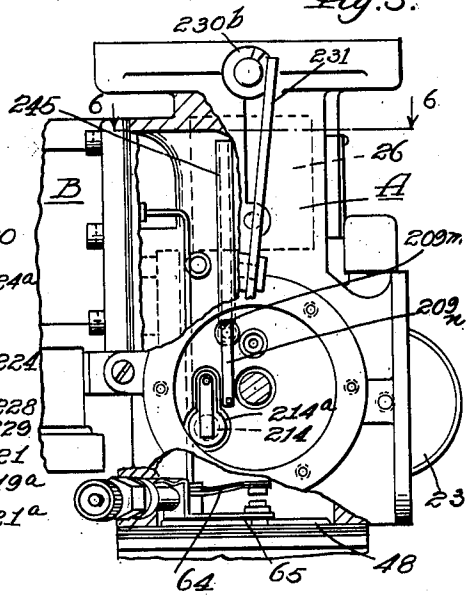


Fig. 5.



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Patented Feb. 7, 1933

1,896,499

UNITED STATES PATENT OFFICE

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CARBURETOR

Original application filed September 5, 1929, Serial No. 390,602. Divided and this application filed October 25, 1930. Serial No. 491,129.

This invention is a division of my pending application Serial No. 390,602, filed September 5, 1929.

The purpose of the invention to be defined in this application is to provide an improved type of carburetor having means for varying the rate of fuel supply momentarily for purposes for which momentary increase of fuel supply is needed. It consists in the elements and features of construction shown and described as indicated in the claims.

In the drawings:

Figure 1 is a top plan view of a carburetor embodying this invention having fuel feeding pump mounted upon it and included in the view.

Figure 2 is a side elevation of the same.

Figure 3 is a section at the line 3—3 on Figure 1.

Figure 4 is a section at the line 4—4 on Figures 2 and 3.

Figure 5 is a side elevation of the carburetor shown mounted on the engine with certain parts broken away to disclose interior parts.

Figure 6 is a section at the line 6—6 on Figure 5.

Figure 7 is a section at the line 7—7 on Figure 5 showing a standpipe arranged for being occupied by fuel injected into it by means shown in Figures 4 and 5 to be fed by hydrostatic pressure to the fuel nozzle under certain running conditions of the engine.

The carburetor construction shown in the drawings comprises a body member, A, having an air and fuel mixture conduit, 20, leading in substantially horizontally from the air inlet, 21, at which the air enters, and continuing with a 90 degree bend upwardly to the upper end of said body member at which the latter is adapted for mounting at the engine intake for discharge into the intake manifold, a choke valve, 23, being provided at the entrance and the throttle valve, 24, being mounted at the upper discharge end.

In the upwardly extending part of said conduit there is mounted a Venturi sleeve, 26, having formed integrally with it a nozzle member, 27, hereinafter more particularly described.

The body member comprises also a fuel accumulating chamber, 30, extending adjacent the upwardly extending part of the air and fuel mixture conduit at the side opposite the air inlet and choke valve, said chamber extending down around and under the convex side of the 90 degree bend mentioned.

The fuel chamber extending to the lower end of the body member, A, is closed at the bottom by a flexible diaphragm, 47, clamped in place by a skeleton cap, 45, with a damping plate, 48, above the diaphragm having a central aperture affording limited access of the fuel to the diaphragm for operating hydrostatically thereon for controlling the opening and closing of an electric switch represented by the contact-carrying members, 64 and 65, of the electric circuit in which is energized the electric pump comprised in the casing, B, and by which the fuel is fed to the carburetor.

Referring to the part of the structure constituting the carburetor proper: The fuel discharge member, commonly called the nozzle, is in the form of a bridge piece, 200, extending diametrically across the Venturi passage at the throat of the latter, said bridge having a longitudinal passage, 201, from which, intermediate the ends of the passage, the bridge is apertured as seen at 202 for upward discharge at a transverse notch, 203, across which there is protruded a short duct member, 204, which constitutes the terminal of a duct, 205, parallel with the passage, 201, said duct, 205, leading in from the groove, 206, in the outer surface of the Venturi sleeve element, said groove extending for 90° around the sleeve for communicating with the passage, 208, formed in the body, A, and leading to a discharge port, 208ª, situated immediately beyond the seating position of the throttle valve, 24.

The purpose of this fuel flow course will be recognized as being to supply fuel to the engine when the throttle is nearly closed as at idling position. For the purpose of momentarily accelerating the discharge of fuel through this idling course, and also for accelerating discharge at the nozzle under certain running conditions, the carburetor is

formed with what are hereinafter referred to as variable capacity chambers.

For the purpose of such variable capacity chambers, the body, A, is formed at opposite sides of the air and fuel mixture conduit with circular protruding bosses, 209 and 219, respectively, having circular recesses, 209^a and 219^a, respectively, which recesses become variable capacity chambers by being closed or covered by flexible diaphragms, 210 and 220, respectively, which are clamped at their margins between the marginal areas of the bosses, 209 and 219, respectively, by cover members, 211 and 221, respectively, having their marginal flanges, 211^a and 221^a, mated with the marginal areas of the bosses for so clamping said diaphragm.

Access for fuel from the fuel chamber, 30, into the variable capacity chambers, 209^a and 219^a, respectively, is afforded by ports, 214 and 224, controlled by check valves, 214^a and 224^a, respectively, opening for flow from the fuel chamber into said variable capacity chambers and seating against reverse flow.

Substantially at the vertical plane of the common axis of the two variable capacity chambers, there are formed in the body member, A, at opposite sides of the air and fuel mixture conduit and inwardly from the variable capacity chambers, respectively, vertically extending ducts, 216 and 226, respectively, which open at their upper ends by transverse ducts, 217 and 227, respectively, for registration with the opposite ends of the longitudinal passage, 201, of the nozzle bridge.

Flow communication from the variable capacity chambers to the ducts, 216 and 226, respectively, is afforded by ports 218 and 228, formed in the inner walls of said variable capacity chambers, respectively, and opening at their inner ends in said ducts, 216 and 226. These ports are desirably supplied with flow-restricting fittings, 219′ and 229, respectively.

The purposes of these variable capacity chambers with their respective flexible diaphragm walls, are, as above stated, to afford momentary acceleration of fuel flow desirable under certain conditions of engine operation. For this purpose in respect to the variable capacity chamber, 209, the diaphragm, 210, has secured to it at the center, a stem, 210^b, by which also there are clamped upon opposite sides of the diaphragm rigid disks, 210^d, limiting its flexure to an annular area outside said disks, and there is provided a spring, 210^c, reacting on the stem for flexing the diaphragm outwardly to give the chamber, 209, maximum capacity. For housing the spring, 210^c, and for guiding the diaphragm stem in its action, there is provided a sleeve, 210^a, for which the inner wall of the chamber, 209, is bored, the bore extending across the duct, 216, and the sleeve being inserted therein blockading the duct at that point.

The inner end of the diaphragm stem, 210^b, dimensioned for slide fit in said sleeve, 210^a, is bored at its inner end for seating and centering the spring, 210^c, whose opposite end is centered in a slight central recess, 210^f, at the inner end of the bore which is occupied by the sleeve, 210^a.

The chamber, 209^a, being thus normally expanded to maximum capacity, and being normally filled with the fuel from the fuel chamber, it will be understood that upon the diaphragm being thrust inwardly for reducing the capacity of the chamber, the fuel will be forcibly discharged from the chamber by way of the restricted port in the fitting, 219′, thus momentarily and instantaneously increasing the fuel discharge, the check valve, 214^a, seating against flow from the variable capacity chamber back to the fuel chamber, insuring that the chamber-reducing movement of the diaphragm will thus eject the fuel toward the nozzle and not drive it back into the fuel chamber.

The diaphragm is operated for this fuel discharging movement by a lever, 230, fulcrumed at 231 on a bracket arm, 211^a, which projects from the closure member, 211, of the variable capacity chamber, 209^a, the lower terminal, 230^c, of said lever bearing against the protruding end of the diaphragm stem, 210^b; and the other end of the lever which extends upward and inwardly toward the throttle lever stem, terminates bearing against the hub of the throttle valve operating lever, 230^a, in position for encounter by a cam projection, 230^b, on said hub in the initial opening movement of the throttle valve, whereby, as may be understood from Figure 4, such initial movement operates the lever in the direction for thrusting the diaphragm, 210, inwardly as described, for reducing the capacity of the chamber and ejecting the fuel therefrom.

In order that the variable capacity chamber may fill completely with the liquid, avoiding trapping of the air at the upper part, there is provided a restricted vent port, 209^m, opening in the fuel chamber, 30. This vent port is utilized for effecting a limited governing of the momentarily increased fuel discharge which is caused by the chamber-reducing movement of the diaphragm, rendering that discharge less forcible when the fuel is relatively hot,—as when the engine has been running and become heated, causing the carburetor to be somewhat heated,—so that it flows more freely under a given impulse than when the fuel is cold as at starting the engine after a long interval of rest.

This governing function is obtained by providing a temperature-responsive valve member which, as shown, is a bi-metallic spring, 209^n, secured at one end to the fixed

wall of the variable capacity chamber, and having the free end lapping valve-wise on the vent port; the two metals of which the strip is composed being related as to rate of expansion by increase of temperature, so that when cold, the valve end of the strip is seated at and closes the vent port; and when the temperature rises to a predetermined degree the flexure of the bi-metallic strip withdraws the valve end from the port correspondingly to the rise of temperature which the strip derives mainly from the fuel which occupies the chamber.

The variable vent which is thus effected for the fuel, permitting its flow back into the fuel chamber under the impulse of the capacity-reducing movement of the diaphragm, causes variation inversely, but to a corresponding degree, of the amount of fuel which the impulse will discharge to the duct leading to the nozzle.

This feature consisting of the temperature-controlled vent for the fuel under the impulse derived from the opening of the throttle, is fully shown in my Patent No. 1,776,988, issued September 30, 1930, in which the vent port opens directly into the fuel chamber. In the present construction there is provided a stand pipe, 245, projecting up in the fuel chamber nearly to the top thereof, with a vent port, 209m, leading into the lower end of said stand pipe so that the fuel discharged through the vent port under the chamber-reducing impulse of the diaphragm, 210, is segregated from the total fuel supply in the fuel chamber, 30, (and may overflow into said chamber), so that it operates for prolonging the extra temporary fuel discharge from the nozzle which is caused by the momentary impulse of the diaphragm, which otherwise would be only instantaneous and of unappreciable duration, as will be obvious upon considering that the discharge would cease when the momentary impulse ceased, unless during that impulse fuel is moved to a position from which it will continue to flow for discharge at the nozzle by pressure other than that momentarily exerted by the diaphragm.

For it will be understood that, the vent serves to reduce the force and velocity of the fuel discharge caused by the momentary impulse of the diaphragm, without reducing the quantity but on the contrary increasing the quantity by the amount discharged through the vent port and free to be returned under hydrostatic pressure due to the height of the standpipe to the variable capacity chamber, and by that hydrostatic pressure caused to maintain the flow through the restricted port in the fitting, 219, to the nozzle, thus prolonging the discharge in compensation for the reduction of velocity, such prolongation or spreading of the extra fuel discharge and consequent enrichment of fuel mixture over several engine cycles, being especially desirable for proper acceleration when the engine is hot and the fuel in the carburetor chamber is considerably heated.

I claim:

1. In a carburetor comprising a fuel accumulating chamber and means for governing the level to which the fuel may accumulate therein, an air and fuel mixing chamber and conduits therefrom leading for discharge at the engine intake; fuel flow connection from the accumulating chamber to the mixing chamber comprising a variable capacity chamber having a movable wall member by whose movement the chamber capacity is varied, said variable capacity chamber having means for free one-way flow through the variable capacity chamber from the accumulating chamber to the mixing chamber; a port arranged for restricting the fuel flow in both directions between the fuel accumulating chamber and the variable capacity chamber; means for momentarily operating the movable wall member for reducing the capacity of the variable capacity chamber for momentary acceleration of fuel flow from said chamber to the mixing chamber, and a stand pipe in the fuel accumulating chamber extending therein above the governed level thereof, said restricted port opening from the variable capacity chamber into the lower part of said stand pipe.

2. In a carburetor comprising a fuel accumulating chamber and means for governing the level to which the fuel may accumulate therein, an air and fuel mixing chamber and conduits therefrom leading for discharge at the engine intake; fuel flow connection from the accumulating chamber to the mixing chamber comprising a variable-capacity chamber having a movable wall member by whose movement the chamber capacity is varied; means for free one-way flow through the variable-capacity chamber from the accumulating chamber to the mixing chamber; a restricted port in the wall of the variable capacity chamber formed for flow through it in both directions, and a stand pipe open to atmospheric pressure into whose lower end said restricted port leads.

3. In a carburetor comprising a fuel accumulating chamber and means for governing the level to which the fuel may accumulate therein, and an air and fuel mixing chamber with conduits therefrom leading for discharge at the engine intake, fuel flow connection from the accumulating chamber to the mixing chamber comprising an auxiliary chamber having free flow communication with the remainder of the fuel connection to the mixing chamber, and one-way flow communication for fuel flow from the fuel accumulating chamber; a stand pipe extending above the governed level of the fuel accumulating chamber and open to atmospheric

pressure above said level, the auxiliary chamber having restricted fuel communication with said stand pipe at the lower part thereof, and means for producing momentary increase of pressure in said auxiliary chamber for accelerating the fuel flow toward the mixing chamber.

4. In a carburetor comprising a fuel accumulating chamber and means for governing the level to which the fuel may accumulate therein, and an air and fuel mixing chamber with conduits therefrom leading for discharge at the engine intake, fuel flow connection from the accumulating chamber to the mixing chamber comprising an auxiliary chamber having free flow communication with the remainder of the fuel connection to the mixing chamber, and one-way flow communication for fuel flow from the fuel accumulating chamber; a stand pipe extending in the fuel accumulating chamber and open to the fluid pressure therein above the governed level of said chamber and having a spillway to a point within the fuel supply, the auxiliary chamber having restricted fuel communication with said stand pipe at the lower part of the latter, and means for producing momentary increase of pressure in said auxiliary chamber for momentary acceleration of the fuel flow toward the mixing chamber.

5. In a carburetor comprising a fuel accumulating chamber and means for governing the level to which the fuel may accumulate therein, an air and fuel mixing chamber and a conduit therefrom leading for discharge at the engine intake; a fuel flow connection from the accumulating chamber to the mixing chamber comprising a variable-capacity chamber having a movable wall member by whose movement the chamber capacity is varied; means for a one-way flow through the variable-capacity chamber from the accumulating chamber to the mixing chamber; a restricted port in the wall of the variable-capacity chamber formed for flow through it in both directions, and a stand pipe into which said restricted port leads.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 22nd day of October, 1930.

PERCIVAL S. TICE.