March 26, 1929. J. M. KING 1,706,492

CARBURETOR

Original Filed Nov. 23, 1923

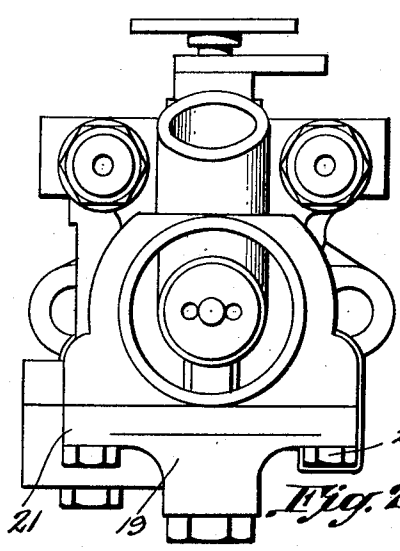

Fig. 2.

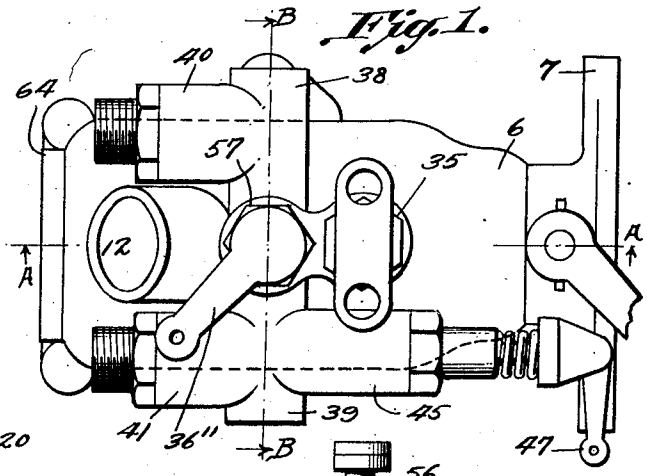

Fig. 1.

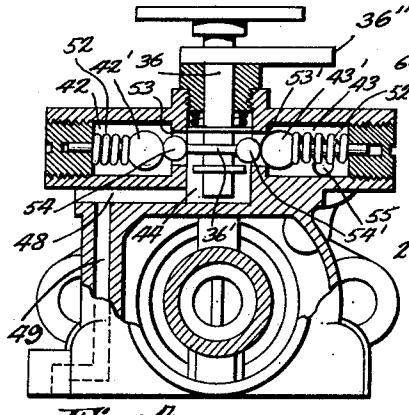

Fig. 4.

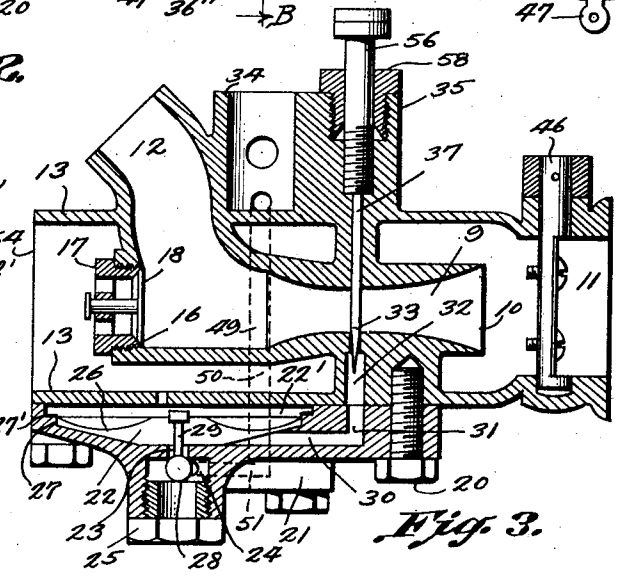

Fig. 3.

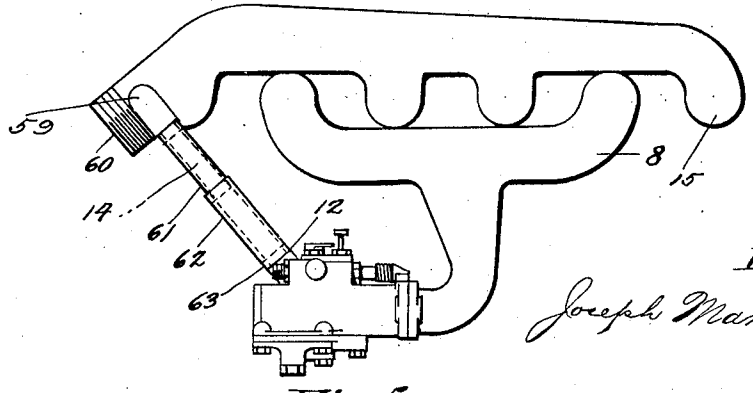

Fig. 5.

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UNITED STATES PATENT OFFICE.

JOSEPH MARION KING, OF DETROIT, MICHIGAN.

CARBURETOR.

Application filed November 23, 1923, Serial No. 676,516. Renewed September 26, 1928.

My invention relates to carburetors for internal combustion engines, especially that type adapted to carburet the air with the heavier hydrocarbon fluids; and the objects of my improvement are, first, the adequate vaporization of the fuel without the use of excessive heat; second, the employment of a single fuel receptacle adapted to supply in reciprocal succession hydrocarbon fuels of unlike gravities; third, means to prevent the flow of fuel sequential to the fuel-intake stroke of an engine piston, and fourth, provision to regulate the temperature of the vaporizing medium.

Attention is here directed to my pending application for patent, carburetor, filed December 31, 1920, Serial No. 434,339. The present invention accomplishes with one fuel receptacle that which requires two in the former; and it will be observed that no temperature control is shown, nor is there any means provided in the former invention to prevent an excess flow of fuel caused by an intermittent low pressure at the fuel orifice following the inspirating stroke of the piston.

I attain these objects by the mechanism illustrated in the accompanying drawing, in which—

Figure 1 is a plan view of a carburetting device embodying the invention.

Figure 2 is an end elevation.

Figure 3 is a longitudinal section on the line A—A of Figure 1.

Figure 4 is an end elevation partly in section on the line B—B of Figure 1 and also showing the fuel receptacle removed.

Figure 5 is a diagrammatic view illustrating the carburetting device attached to an engine's intake and exhaust manifolds.

Similar numerals refer to similar parts throughout the several views.

The body 6 of the device is practically an annular conduit adapted by means of a flange 7 to connect with the intake manifold 8; an inner and practically annular conduit 9 is integrally cast with the body 6 and is practically concentric therewith, one end 10 of which opens into the outlet 11 of the outer conduit 6 while the other end 12 is formed into an elbow and projects through the upper side wall 13 of the body 6 and is adapted to connect with an exhaust pipe 14 leading from the exhaust manifold 15; an opening 16 is formed in the elbow-end 12 in which is positioned by means of screw threads a valve receptacle 17 and valve 18, the said valve being adapted to close when the pressure in the inner conduit 9 is greater than atmospheric pressure and to open when such pressure is less than that of the atmosphere.

A fuel receptacle 19 adapted to engage the under side of the body 6 by means of cap screws 20 is practically annular in form and provided with bosses 21 for the cap screw attachment; the fuel chamber 22 is of an ajutage form, and centrally is provided with an opening 23 which communicates with a chamber 24, the end of which is closed by a screw cap 25; a disk diaphragm 26, preferably of thin metal is mounted on an annular ledge 27 formed in the receptacle 19 and is held in fluid-tight relation therewith by means of a gasket 27′ and constitutes a partition between the fuel chamber 22 and an air space 22′. While the air space 22′ is closed at the top by the bottom of the wall 13 of the body 6, a small opening, however, is made in the body 6 communicable with the air space 22′ and atmospheric pressure.

A valve seat is formed on the under side of opening 23 and is provided with a valve 28, preferably of the ball type, which mounted on a stem 29 is centrally attached to the diaphragm 26; a fuel passage 30 is longitudinally formed in the fuel receptacle 19 leading from the fuel chamber 22 to a vertical passage 31 which communicates with a like passage 32 formed in the body 6 and which in turn connects with a smaller vertical passage 33 which opens to the interior of the annular conduit 9.

On the top side of the body 6, diametrically opposite to the fuel receptacle 19 is formed a series of bosses, cast integrally with the said body; bosses 34 and 35, vertically positioned, are adapted to receive a fuel-change valve mechanism 36 and a fuel-set valve 37 respectively; bosses 38 and 39, each leading laterally from opposite sides of boss 34 to longitudinal bosses 40 and 41 are provided with fuel passages 42 and 43 which, issuing from a chamber 44 formed in boss 34 lead to like passages formed in bosses 40 and 41 respectively; bosses 40 and 41 are machined to engage fuel line connections, the heavier distillate and gasoline respectively; a priming valve, not shown, mounted in a longitudinal boss 45 adjacent to bosses 34 and 35

is adapted to permit the flow of gasoline from the passage way 43 to an orifice, not shown, on the interior side wall 13 at a point approximately on a line passing laterally through the throttle-valve shaft 46 when the priming lever 47 is moved.

A fuel passage 48 is laterally formed from the fuel chamber 44 to a vertical like passage 49 along the side of the body 6, which ultimately connects with a similar vertical passage 50 formed in the fuel receptacle 19, and communicable with a horizontal fuel passage way 51 leading to the fuel chamber 24.

Ball valves 42′ and 43′, rigidly fixed on stems, which are concentrically mounted in passage ways 42 and 43 are adapted to alternate the admission of fuel to chamber 44 from the fuel passages 42 and 43 respectively when acted upon by the cam 36′ of the change valve mechanism 36. Helical springs 52 and 52′ surrounding the valve stems tend to hold the valves with yielding resistance against their seats 53 and 53′; balls 54 and 54′ are interposed between the cam 36′ and the ball valves 42′ and 43′ to facilitate the opening of the said valves. The opening 55 illustrates the communication between the gasoline passage way 43 and the priming valve occluded by boss 45.

Stem 56, constituting the fuel-set valve is suitably threaded to engage the tapped opening in the boss 35 and is adapted to regulate the opening of the passage way 33. Suitable gland and inclosing nuts, 57 and 58 are provided for the change-valve mechanism 36 and the fuel-set valve 56 respectively.

The progress of the fuel in the device from the fuel source is as follows: The kerosene or other heavier distillate supply line is made communicable with the fuel connection in boss 40 and the gasoline line is connected with boss 41. The lever 36″ is now moved forward, i. e. toward the flange 7. This position of the change-valve mechanism 36 will show the valve opening 53, i. e. the kerosene closed and the gasoline side 53′ of the passage way 43 open. The gasoline from its source entering the device at boss 41 passes through passage 43 to chamber 44, thence along passage 48 to the vertical passage 49, thence to passage 50 and thence to passage 51; from passage 51 the flow is to chamber 24. When fluid under pressure is passed through the inner conduit 9 a low pressure is formed over the orifice 33; this causes the diaphragm to concave, which in turn unseats the ball valve 28 and admits the fuel to the chamber 22 and thence the course of the fluid is along the passage 30 to the vertical passage 31, 32 and 33 to the interior of the conduit 9, where it is atomized if the actuating medium is cool or vaporizes it if hot. Should the lever 36″ be drawn back 90°, i. e. in the position illustrated in the drawing, Fig. 1, the heavier distillate would be admitted and would follow a similar path as described for the gasoline.

An elbow 59, by means of screw threads is mounted in the exhaust manifold 15 near the manifold-exit 60 so as to receive the effect of each exhaust impulse; a portion of the elbow extends into and partly obstructs the exhaust-manifold passage and is provided with an opening to receive the exhaust gases; pipe 14 connects the elbow 59 with the opened end 12 of the annular conduit 9. A pipe 61 is mounted on the elbow 59 and surrounds pipe 14, being concentric therewith; another pipe 62, similarly in line and surrounding pipe 14 is slidably mounted on pipe 61, the end thereof being equipped with a closely fitting collar 63, thus forming an air jacket around pipe 14; the arrangement being adapted to regulate the temperature of the exhaust gases entering the carburetor; viz, when gasoline is used as a permanent fuel medium the slidable pipe 62 is moved upward so as to expose a portion of the pipe 14 to the cooling effect of circulating air.

In order to insure smooth engine-operation, each cylinder receiving a homogenous fuel-mixture charge it is essential that the elbow 59 shall be positioned in the exhaust manifold 15 where it will receive the maximum effect of each exhaust impulse—the pressure, not only due to the heat content of the gases, but to that also due to piston-velocity.

Experimentation has shown that there is a low pressure which immediately follows the intake stroke in a carburetor of the type herein disclosed, caused by the instant cooling of the exhaust gases remaining in the carburetor, the exhaust pipe 14, the manifold 15 and throughout the exhaust gases' passage way. The inception of this low pressure synchronizes with the closing of the intake valve; there should be an atmospheric balance at this time to prevent a continuity of fuel-flow. Without provision to establish this balance the air is improperly carburetted, smoke is given off in the exhaust gases, the spark plugs and cylinders are befouled, excessive heat is caused in the engine and a marked diminution in power is in evidence. This condition is more pronounced in low speeds, especially when an engine is "idling", and it is not possible to adjust the fuel-set valve 56 to correct this condition except at one predetermined speed; therefore means to prevent that excess flow of fuel is embodied in this device as illustrated in valve 18. When the exhaust gases are impelled by piston action through the Venturi or annular conduit 9 the valve 18 closes under such pressure and thereby does not perturb the fuel-flowing influence of the gases. Immediately following this cycle the tendency to low pressure is offset by atmos-

pheric pressure which causes the valve 18 to open and establish equilibrium in the conduit. With this provision an engine operates without discoloration of the exhaust gases, with more power and cleaner plugs and cylinders.

The manner of operation is as follows:

The lever 36″ is moved forward in the direction of the flange 7; the priming lever 47 is moved longitudinally with the carburetting device, in either direction, and the engine-shaft is rotated either mechanically or manually. The engine starts from the priming and continues operating on gasoline; when sufficient heat has been developed in the engine, the lever 36″ is moved through 90° toward the opening 64 which is adapted to engage a stove or hot air connections, i. e. moved to the position illustrated in the view of drawing Fig. 1, when the engine will continue operating on kerosene or other heavier hydrocarbon that may be employed as a fuel.

While a novel fuel receptacle is here illustrated and claimed it is obvious that the single receptacle may be substituted with the conventional gravity bowls, therefore I wish to be protected in the essence of this invention so far as is shown to be new in the art to which it appertains.

Attention is particularly directed to the fact, first, that the fuel ingress to the vaporizing mechanism is directly within the exhaust gases passage way—the Venturi or annular conduit 9; second, that no other means influencing the said vaporizing mechanism than the piston-impelled gases is employed to actuate the flow of fuel thereto from a fuel source, and third, no other means is used to properly meter or regulate the flow of fuel to facilitate the varying conditions of speed and load of an engine. The vena contracta or venturi as the fuel-flow actuating mechanism is here employed instead of the obsolete spray-tube because of its superior function to produce low pressure, its maximum efficiency being at its smallest diameter, where it will be observed the fuel opening is positioned in this device.

What I claim as new is:

1. A carburetting device for internal combustion engines comprising an outer and an inner conduit, a fuel source and a throttling valve, the outer conduit having an air inlet and a fuel-mixture outlet, the inner conduit having an exhaust-gases inlet, a fuel inlet, a fuel-exhaust-gases outlet and therein a venturi adapted to cause the flow and metering thereof of fuel from the said fuel source to the said fuel-mixture outlet when subjected to the influx of exhaust gases, and means to prevent a fuel-flow sequential to the closing of the intake-valve.

2. A carburetting device for internal combustion engines comprising an outer and an inner conduit, fuel receptacle, a throttling valve and a fuel needle-valve, the outer conduit having an exhaust-gases inlet communicable with the interior of an engine's exhaust manifold, a fuel inlet, a fuel-exhaust-gases outlet and therein a venturi adapted to cause the flow and metering thereof of unlike fuels from the said fuel receptacle to the interior of the said inner conduit and thence to the said fuel-mixture outlet when the said venturi is subjected to the influx of exhaust gases, and means to prevent a fuel-flow sequential to the intake-stroke of an engine.

3. A carburetting device for internal combustion engines comprising an outer and an inner conduit, fuel receptacle and a throttling valve, the outer conduit having an air inlet and a fuel-mixture outlet, the inner conduit having an exhaust-gases inlet communicable with the interior of an engine's exhaust manifold, a fuel inlet, a fuel-exhaust-gases outlet, a venturi provided in the said inner conduit and adapted to cause the flow and metering thereof of fuel from the said fuel receptacle to the interior of the said inner conduit and thence to the said fuel-mixture outlet when the said venturi is subjected to the intermittent influx of exhaust gases and means to alternate the flow of unlike fuels, and a device to prevent a fuel flow sequential to the intake-stroke of an engine.

4. A carburetting device for internal combustion engines comprising an outer conduit having an air inlet and a fuel-mixture outlet and an inner conduit approximately concentric therewith having an inlet communicable with the interior of an engine's exhaust manifold and an outlet to the said fuel-mixture outlet, the effluent end of the outer conduit adapted to engage an engine's intake manifold, receptacle for unlike fuels and means to alternate the flow thereof, a throttling valve and a venturi provided in the said inner conduit and adapted to cause the flow and metering thereof of fuel to the said fuel-mixture outlet when the said venturi is subjected to the intermittent influx of exhaust gases, and means to prevent a fuel-flow sequential to the intake-stroke of an engine.

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