April 28, 1925. 1,535,344

F. H. ROYCE

CARBURETOR

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Fig.1.

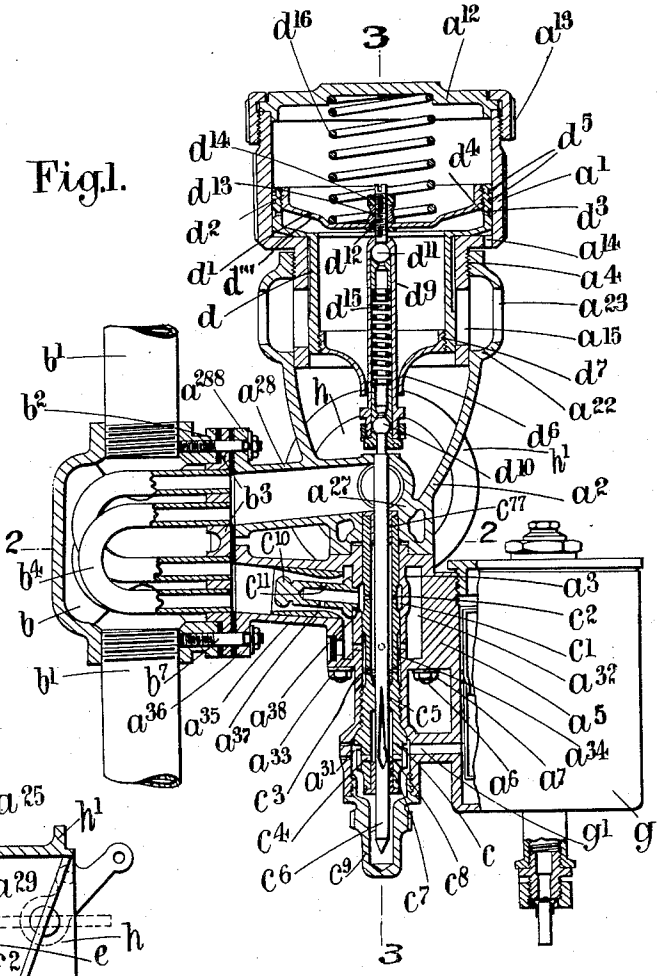


Fig.3.

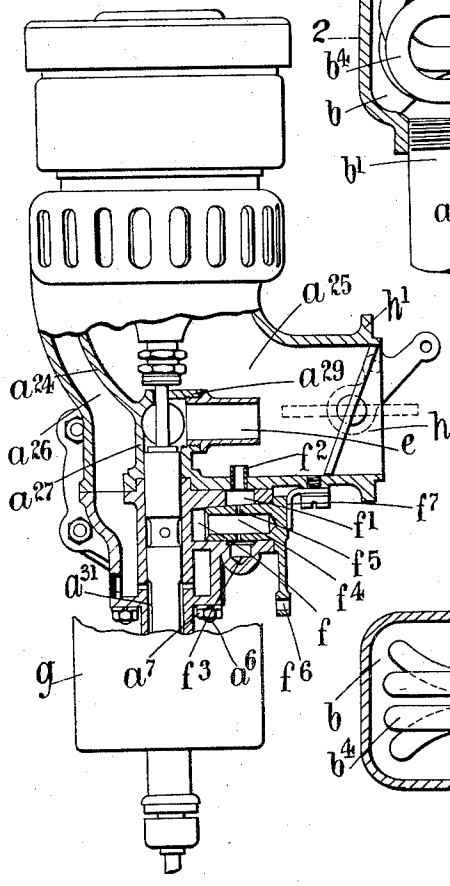
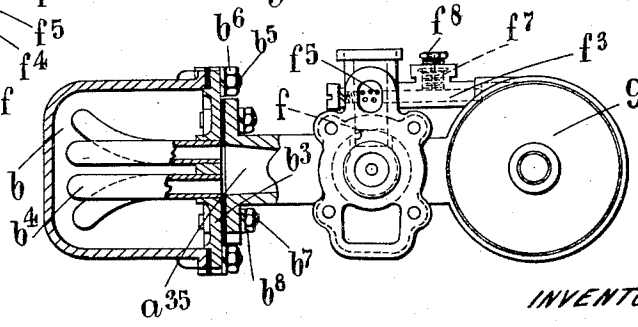


Fig.2.



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UNITED STATES PATENT OFFICE.

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CARBURETOR.

Application filed May 14, 1924. Serial No. 713,285.

To all whom it may concern:

Be it known that I, FREDERICK HENRY ROYCE, residing at Derby, England, a subject of the King of Great Britain and Ireland, have invented certain new and useful Improvements in Carburetors, of which the following is a specification.

This invention has reference to an improved carburetor.

One of the difficulties in an internal combustion multicylinder engine is to evenly distribute the fuel to all the cylinders owing to the fuel being deposited on the walls of the induction pipe. The object of this invention is mainly to overcome this difficulty and generally to produce an improved carburetor.

In a carburetor made according to my invention the fuel is mixed with a small quantity of air drawn from a diffuser nozzle, preferably an automatic variable nozzle, and before any further admission of air to the mixture the latter is heated with a view to vaporizing the fuel, and to such heated mixture the desired quantity of air is subsequently added before admission to the induction pipe.

With such a mixture, even if the vaporized fuel is recondensed in the induction pipe it will be in such fine particles that it will be carried in the current and will not be deposited.

What has been called a diffuser nozzle is that more commonly termed an "air-vented" nozzle, in which the orifice which determines the amount of fuel is placed below the maintained level of the constant level chamber and discharges into a chamber which communicates with the nozzle and with the atmosphere, so that when the associated engine is in operation a mixture of air and fuel commonly termed an "emulsion" is discharged from the nozzle into the main air passage.

In the accompanying drawings an example of my invention is illustrated.

Fig. 1 is a vertical section of the carburetor, Fig. 2 a plan view with the upper part removed and showing the vaporizer in section on line 2—2 of Fig. 1 and Fig. 3 is a part-sectional elevation on line 3—3 of Fig. 1 viewed from the right.

In said drawings a^1 a^2 and a^3 indicate three members forming the main body of the carburetor, the members a^1 and a^2 being threaded and screwed together at a^4 and the members a^2 and a^3 being connected together by means of bosses a^5 formed on each of them with registering holes therethrough through which are passed bolts a^6 secured by nuts a^7.

The upper portion of body member a^1 is of larger diameter than the remainder and is threaded at its upper end where it is closed by the cover a^{12} secured by nut a^{13} and this upper portion forms a chamber (hereinafter called the "piston chamber") in which slides a piston hereinafter described, a^{14} indicates an annular row of holes to admit air pressure for the purposes hereinafter explained. The lower portion of the body member a^1 has circumferential ports a^{15} equi-spaced around it. The body member a^2 has an expanded or enlarged portion a^{22} through the wall of which are formed circumferential equi-spaced ports a^{23}; and below said enlarged portion a^{22} and on the side remote from the induction pipe hereinafter referred to, the said member a^2 is formed with a double wall, the inner part a^{24} of which forms a portion of the wall of the main air passage or conduit a^{25} (Fig. 3) to which air is admitted via the ports a^{23} and the ports a^{15} (when open). A separate air conduit a^{26}, via ports a^{28}, which is never closed, is also formed as a result of the double-walled construction mentioned. a^{27} indicates the upper end or head of a tubular space or passage which extends through the lower portion of body member a^2 and through the body member a^3 to constitute and receive certain passages of the nozzle and the nozzle valve; the said upper end or head being utilized as a connecting means, as hereinafter explained. a^{28} indicates a tubular member extending from and communicating with the head a^{27} of the aforesaid space or passage and having a flange a^{288} formed thereon, and a^{29} indicates an internally-threaded orifice opening out of the side of the tubular member a^{28}.

Referring to the body member a^3, a^{31} indicates the tubular space or passage referred to, and a^{32} an annular air space in direct communication with the conduit a^{26} and communicating, via the circumferential row of holes a^{33}, with an annular space a^{34} around the tube c. a^{35} indicates a tubular projection from the member a^3 having a flange a^{36} formed thereon and containing the choke

tube a^{37} and the nozzle head or nozzle proper c^{10} hereinafter described. a^{38} indicates a threaded hole to receive the nozzle c^{10}.

b indicates a chamber heated by the exhaust gases of the engine and connected at two suitable places to the exhaust system by the pipes b^1 and with a flange b^2 formed thereon. b^3 indicates a perforated plate having cylindrical projections around the edge of each hole and carrying a system of four tubes b^4, each tube opening at one end into the tubular projection a^{35} and at the other end into the tubular projection a^{28}. Two of said tubes are bent laterally as shown in Fig. 2, to prevent them from being shielded from the hot gases by the other tubes. The chamber b is secured to the plate b^3 by means of registering holes through the flange a^{36} and a plate having studs b^5 passing therethrough and secured by nuts b^6. The plate b^3 is secured to the tubular projections a^{28} and a^{35} by means of similar holes through the flange b^2 and plate b^3 with studs b^7 therethrough secured by nuts b^8.

The nozzle is constructed as follows: c indicates the tube previously mentioned, which is formed with an annular groove c^1, three circumferential rows of holes c^2 c^3 and c^4, with a restricted or narrow part c^5. c^6 indicates a rod sliding in the interior of the tube centralized or located by bushes c^7 and c^{77} and fitting the restricted part c^5 of the tube c and (except as hereinafter explained) blocking the passage of fuel therethrough. The bush c^{77} also shuts off the upper part of the space or passage a^{31} from the tube. c^8 indicates a number of elongated tapered grooves formed in the rod c^6, said grooves increasing in depth from the top downwards and bridging the restriction c^5 so that the area of the fuel passage past the restriction is dependent on the position of said rod which is controlled as hereinafter explained. c^9 indicates a cap screwed into and closing the lower end of the space or passage a^{31} and c^{10} the head of the jet having orifices c^{11} and screwed into the hole a^{38}.

d indicates a two-diameter cylindrical member sliding in the body members a^1 and a^2 said member d having an internal thread at each end. d^1 indicates a dished diaphragm having a circular externally threaded flange d^2 screwed into the member d, and d^3 is an annular groove in the wall of member d, a circumferential row of holes d^4 being provided through the wall. d^5 indicates two other annular grooves in the wall of the member d, and d^6 another diaphragm curved from its centre upwards and outwards with an externally threaded flange d^7 at its upper end screwed into the member d. d^9 is a tubular member or elongated sleeve connected at its lower end by means of a ball-and-socket joint d^{10} to the valve rod and at its upper end by a ball-and-socket joint d^{11} to a threaded rod d^{12} which passes through a hole in the diaphragm d^1 and is secured by a nut d^{13} (by means of which the position of the grooves in the valve rod relative to the restriction c^5 can be adjusted) and a lock nut d^{14}. d^{15} indicates a helical spring to prevent slack in the connection, and d^{16} is a helical spring re-acting between the cover a^{12} and the diaphragm d^1.

e indicates a nipple formed with a flange to bear against, and a thread to screw into, the threaded orifice a^{29}.

f is a blind tapered hole bored in body member a^3, and f^1 is an opening furnished with a nipple f^2 let into the throttle chamber, whilst f^3 is a conduit connecting the top of the float tank with the hole f. f^4 indicates a hollow valve having holes f^5 through its wall and actuated by the lever f^6, which is under the control of the driver of the vehicle. f^7 indicates a spring to hold the valve f^6 in position, and f^8 a calibrated plug screwed into a hole opening into the conduit f^3.

g indicates the float chamber and g^1 the conduit therefrom to the nozzle whilst h is the throttle chamber, and h^1 a perforated flange with which the carburetor is bolted to the induction pipe.

The operation of the carburetor is as follows:—When the engine is at rest the parts are in the positions shown in the drawings and the level of fuel in the tube c and annular space a^{34} is as shown. When the engine is turned over, partial vacuum is produced in the throttle chamber via the nipple e, tubular member a^{28}, system of tubes b^4, tubular member a^{35}, choke a^{37}, (hence past the orifices of the nozzle head c^{10}) annular chamber a^{32}, conduit a^{26} and the ports a^{28}. The suction of air past the nozzle orifices sucks the fuel via the nozzle head, annular space c^1, and holes c^2 from the tube c and at the same time sucks air through the same passages via holes c^3, annular space a^{34}, holes a^{33} and chamber a^{32}. The mixture of fuel and air issuing from the nozzle head passes through the system of tubes in the boiler along the tubular member a^{28} to the head a^{27} of the tubular space or passage a^{31} and thence through the nipple e to the throttle chamber. In passing through the system of tubes in the boiler the fuel becomes vaporized, thoroughly diffused, and mixed with air, and the tendency to condense and be deposited in the subsequent pathways is removed or minimized.

As the speed of the engine increases, the depression in the throttle chamber increases, and this depression is communicated via the clearance between the diaphragm d^6 and tube d^9 to the space within the member or piston d, and thence through a small hole d''' in the upper diaphragm d^1 and through the holes d^4, groove d^3 and clearance be-

tween the body member a^1 and flange d^2 to the piston chamber, whereby the said diaphragm d^1 is lifted against the action of the spring d^{16} by air pressure through the holes a^{14}, which lifts the whole of the member d, uncovering ports a^{15}, and at the same time lifting the rod c^6, bringing the large area of the tapered grooves c^8 level with the restriction c^5 and thus increasing the flow of fuel.

The tension of the spring d^{16}, the shape and size of the ports a^{15} and the shape of the grooves c^8 are all proportioned so that at all speeds and throttle openings the desired ratio of fuel and air will be attained. The depression in the throttle chamber is to some extent and, if desired for mixture adjustment purposes, communicated to the float chamber and the various parts adjusted accordingly. The extent to which such depression is communicated can be varied by the driver by means of the valve f^4.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In a carburetor, a body member comprising two cylindrical elements, one within and fitting the other, the outer member having an enlarged part provided with ports, the inner element also being provided with ports, means forming an air passage leading from the space between said elements, and an axially sliding cylindrical member the movement of which closes or uncovers the ports of the said inner element while the ports of the said outer element are always open to the air, the main air supply flowing through the ports of both elements and a subsidiary air supply through the ports of the outer element and said passage.

2. In a carburetor, the combination of a nozzle, and a device for controlling the supply of fuel thereto; said device comprising a suction-operated piston, an axially-movable valve rod, a sleeve between the piston and valve rod, ball-and-socket joints connecting the adjacent ends of the sleeve and said piston and rod, and a spring within the sleeve to prevent slackness of said joints.

In witness whereof I have signed this specification.

FREDERICK HENRY ROYCE.