

UNITED STATES PATENT OFFICE.

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CARBURETOR.

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My invention relates to a carbureting device and particularly to a carburetor of the constant vacuum type for internal combustion engines.

One object of the invention is to provide a carburetor of improved construction for delivering a mixture of fuel and air in constant proportion under varying conditions of speed and load, and having means for varying at will the ratio of fuel to air and also having means whereby the sensitiveness of the device to variations in suction of the engine may be adjusted.

Another object is to provide a carburetor which will not be affected or damaged by the back firing or by the presence of particles of dust.

It is a further object of this invention to provide a carburetor of this type of such simplified construction that allowable tolerance or departures from exactness in manufacture or machining may be increased without impairing the efficiency of the device, whereby the cost of manufacture may be decreased and the rate of output increased.

A still further object is to provide a carburetor of this type having a short passage of substantially uniform cross section for conducting mixture into the manifold, whereby condensation of the fuel in the carburetor is avoided.

The invention consists in the novel constructions, combinations and devices to be hereinafter described and claimed, for carrying out the above stated objects and such other objects as will appear from the following description.

In the drawings I have illustrated a preferred embodiment of the invention, wherein—

Figure 1 is a central sectional elevation through the carburetor and float chamber.

Figure 2 is a plan section on the line 2—2 of Fig. 1.

Figure 3 is a plan section on the lines 3—3 of Fig. 1.

Figure 4 is a perspective of the air valve or double piston, and

Figure 5 is an enlarged, longitudinal section of the lower portion of the fuel valve.

Like characters of reference designate like parts in the several figures of the drawings.

The carburetor herein disclosed embodies certain improvements over the prior form

of device shown in the application of Philip C. P. Booty Serial No. 281,033 filed March 6, 1919.

Referring to the drawings, 5 designates a tubular carburetor casing closed at its upper end by a cap 6 and provided with an air intake opening 7 at its lower end and a delivery duct 8 leading from the side of the casing at an intermediate point. The casing 5 comprises an upper cylindrical portion 9 and a lower cylindrical portion 10, which are in exact alignment and are preferably of the same diameter. Between the portions 9 and 10 is a portion 11 of somewhat larger internal diameter than that of the portions 9 and 10, such intermediate portion having a delivery duct 8 formed therewith and leading from the side thereof. The portions 9 and 10 are adapted to be drilled and reamed to proper bore by tools inserted through the opening covered by the cap 6. By offsetting the wall of the structure at the intermediate portion 11, as indicated at 12, for example, the reamer is permitted to extend in true axial alignment for operation on the cylinder portion 10, since there is thus no necessity for removing any metal at the point opposite the open inner end of the duct 8.

The casing at the end of the lower cylindrical portion 10 is also offset as indicated at 13 to provide a clearance space so that the boring and reaming tools may be permitted to pass clear through the portion 10 before they are stopped, the necessity for accurate gauging being thus avoided. This serves also to provide a larger air inlet opening to the lower portion of the part 10. The delivery duct is provided with the usual throttle valve 14 and is flanged at its extremity, shown at 15, to permit attachment to the usual intake manifold. In the center of the casing is a fuel nozzle 16 terminating in a fuel orifice 18 and preferably detachably secured by screw threads to a fuel supply duct 19. The fuel supply duct 19 is preferably cast integral with the casing 10 and supplies fuel from the float chamber 20, also preferably cast integral with the casing 10. Plugs 21 and 22 close openings in the fuel passage made therein for convenience in drilling the fuel duct.

The float chamber comprises the usual float 23 which carries the needle valve 24 loosely secured thereto. The needle valve 110

projects downwardly through the inlet tube 25 which is slotted at 26 to permit the entrance of fuel and which is screwed at its lower end into a fitting 27, itself screwed to the bottom of the float chamber 20. The inlet tube 25 is provided with a seat 28 for the needle valve. A hollow member 29 having a threaded opening 30 for the connection of the fuel pipe 31 is held against the fitting 27 by a cap nut 32. The fitting 27 is formed with a central duct 33 and transverse openings 34 and surrounded by a filter screen 35.

Disposed within the casing 10 and slidable along the nozzle 16 is a cone 36 having its larger end toward the air inlet. The cone is adapted to be adjusted vertically within the casing by a link 37 pivotally connected to a rocker arm 38. The rocker arm is secured to a rock shaft 39 which is supported by bearings provided by the wall of the casing below the lower cylinder portion 10, one end of the shaft being provided with another rocker arm 40. The latter arm is connected to a rod 41 which leads by suitable connections (not shown) to a convenient position on the dash or elsewhere, so that an adjustment of the cone may be easily effected. The link 37 is connected to the cone by a ball and socket joint comprising a plug 42 screwed into the cone and having a socket therein within which the ball 43 on the link is adapted to seat. The casing 10 is provided with a suitable housing 44 for enclosing the link 37, arm 38 and a portion of the rock shaft 39.

Slidable within the casing is an air valve 45 comprising at its lower end an annular piston 46 surrounding the cone and serving to close the space between the cone and the wall of the casing, a piston 47 at its upper end and an intermediate connecting structure 48. The connecting structure 48 is preferably cut away so as to leave only a plurality of connecting strips 49 for rigidly uniting the pistons 46 and 47. The cage comprising the piston 47, the valve 46, and the arms or strips 49, is held from rotating by an inwardly extending pin 51 carried by the wall of the casing and engaging a vertical slot 50 in one of the arms 49. The arms 49 are thus prevented from turning into position to obstruct the outlet port. The annular piston 46 is preferably provided with a plurality of peripheral grooves 52 for the purpose of preventing the leakage of any substantial amount of air around the piston. The upper piston 47 may also be similarly grooved, although the matter of leakage past this piston is not important, for reasons hereinafter pointed out. The cone 36 is preferably provided with a plurality of projections 36' which are adapted to engage the lower face of piston 46 and by means of which the air valve may be bodily raised by

raising the cone. This construction is advantageous in starting, as will be hereinafter pointed out.

Secured to the piston 47 is a fuel valve 53 of a diameter corresponding to the fuel orifice 18 and provided with a plurality of grooves 54 of uniform width and uniformly increasing in depth toward the lower end of the valve. The valve 53 is suspended from the piston 47 by means of a transverse pin 55 through the end thereof so as to permit the same to hang freely within the nozzle 16. A removable screw plug 56 retains the valve 53 in place and also permits its removal but does not actually engage the end thereof, being adapted thus not to interfere with the freedom of movement of the valve. The piston 47 is provided with a valve controlled passage 57 for purposes hereinafter pointed out. A pointed valve 58 having a groove 59 therein, communicating with the passage 57, is adapted to control the effective size of this passage.

Operation: The depression created in the carburetor casing by the suction of the motor causes a lifting of the air valve 46 with respect to the cone 36 and a corresponding lifting of the fuel valve until a balance between the pressure on the lower face of the annular piston 46 and the weight of the air and fuel valve is arrived at. The fuel valve is graduated so as to increase the size of the fuel outlet comprising the several grooves 54 substantially in proportion to the lift of said valve in the fuel nozzle. The contour of the cone 36 is such also that the effective size of the opening between the ring 46 and the cone 36 increases substantially in proportion to the lift of said ring or valve 46. Thus the ratio between the size of the air opening and the size of the fuel opening remains constant as the valves are lifted. It is thus apparent that as the throttle 14 is opened so as to cause the valves to move higher and higher, due to the increased depression in the casing, a correspondingly increased amount of fuel and air is forced through the casing, such fuel and air being always of uniform richness.

When it is desired to feed a richer mixture to the cylinders, or when for any reason it becomes necessary to increase the effective size of the fuel opening with respect to that of the air opening in order to get the desired richness of the mixture, this can be effected by a vertical adjustment of the cone 36. When the cone 36 is moved upwardly, with the engine at rest, the valve 46 will, of course, be moved upwardly with the cone, serving to move the pin valve 53 upwardly within the nozzle 16. This adjustment serves to open the valve 53 slightly but does not affect the valve 46 which still rests on the projections 36'. When the engine is started thereafter, the valve 46 is raised by

the suction the same as before with respect to the cone 36, but is moved an increased amount with respect to the cylinder 10. Thus the amount of air admitted after the adjustment of the cone is the same as before the adjustment, but the amount of the fuel is increased. I have specified the adjustment as being made with the engine at rest, but this is merely for ease of explanation. The adjustment can be made and ordinarily would be made with the engine running.

The upper piston 47 is provided so that the responsiveness of the piston 46 to variations in the suction of the engine may be controlled. The piston 47 is not otherwise essential to the operation previously described. If desired, the piston 47 may serve merely as a guide and means of attachment for the fuel valve, suitable openings being made through the piston to permit the free movement thereof in the casing. By providing a controlled passage through the piston, the result above noted is accomplished. By screwing down the valve 58 the effective size of the passage through the piston is decreased and the lag of the air valve behind the variation in suction is increased. If the air passage through the piston is increased, then the air valve is more responsive to variations in suction of the motor. The retardation of the responsiveness of the air valve with respect to variations in suction is desirable because the fuel is more viscous than air and the flow thereof does not respond so readily to variations in suction as that of the air. Inasmuch as the piston 47 is to act merely to retard movement of the valves, a close fit of such piston in the casing is not essential. In any event, in adjusting the valve 58, the leakage past the piston will always be taken into consideration.

By the provision of the piston 47 with its bottom pressure face opposed to the top pressure face of the valve ring 46, the pressure of back-firing in the casing does not drive the air-valve downwardly so as to deliver a blow to the projections 36' and thence to the adjusting levers 38 and 40. The downward pressure of the back-fire is more than balanced by the upward pressure on the lower face of the piston 47, so that in fact the back fire very slightly lifts the air valve.

The connection of the delivery duct to the side of the carburetor casing below the upper casing portion also prevents the presence of dust particles from causing wear of or otherwise interfering with the operation of

the upper piston 47. Dust particles are drawn into the manifold and are afforded no opportunity for lodging in the upper end of the carburetor casing.

In my improved construction, the operation of the piston 47 is entirely independent of any air leaking past the ring piston 46. The nicety of fit between the ring 46 and the casing portion 10 is accordingly dependent only on the necessities with respect to the use of the valve for controlling the amount of air passing to the engine. I have found that the tolerance in this respect is comparatively large without danger of interfering seriously with effective operation.

By providing a casing in which the cylindrical portions are of the same diameter, the construction and machining of the casing is not only much simplified but a uniform passage is provided for the mixture so that no opportunity is afforded for condensation of the fuel within the casing resulting from a retardation of this velocity through a passage of increased cross section.

I claim:

1. In a carburetor, the combination of a casing, an upwardly movable member adapted partially to close the casing at its lower end portion, a valve supported by said member and effectively closing the remainder of the lower end of the casing, means for moving said member upwardly and for holding it in adjusted elevated position, said valve opening upwardly away from said member, and means for preventing the pressure of back-fire in the casing from causing the valve to slam downwardly against said movably supported member.

2. In a carburetor, the combination of a casing, an upwardly movable member adapted partially to close the casing at its lower end portion, a valve supported by said member and effectively closing the remainder of the lower end of the casing, means for moving said member upwardly and for holding it in elevated position, said valve opening upwardly away from said member so that the pressure of back-fire on the upper face of the valve tends to move the valve downwardly against said adjustably supported member, and means having a downwardly-disposed pressure face movable with the valve adapted by a preponderance of pressure of back-fire thereon as compared with the pressure on the valve to move the valve in the direction away from its seat on said adjustably held member.

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