May 7, 1929. G. B. SCHLEY 1,711,748

CARBURETOR

Filed Feb. 6, 1920

Fig. 1.

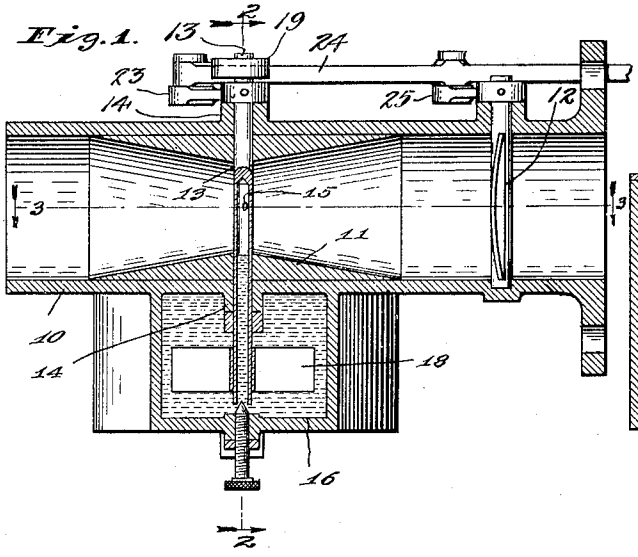


Fig. 2.

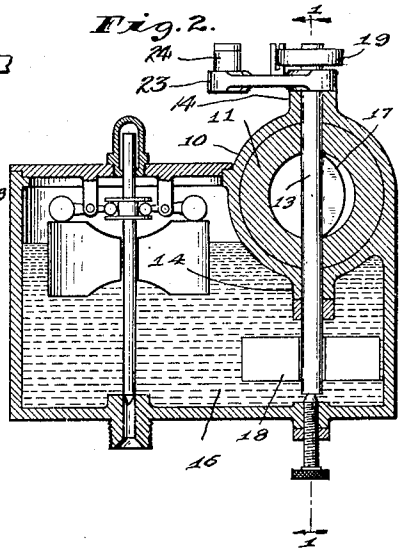


Fig. 3.

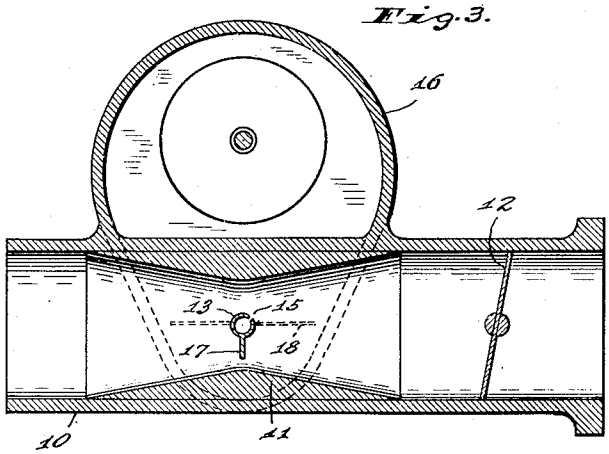
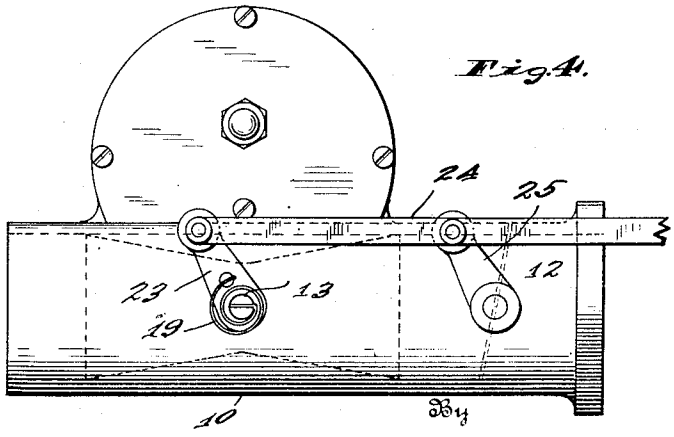


Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE B. SCHLEY, OF INDIANAPOLIS, INDIANA.

CARBURETOR.

Application filed February 6, 1920. Serial No. 356,613.

It is the object of my invention to produce a simple carburetor which will avoid "loading" (or the formation of too rich a mixture) at high speeds, but instead will give a proper mixture throughout the range; and which will be dependent upon both throttle position and flow of air.

In accomplishing this result, I provide within the carburetor, preferably at the venturi, a fuel nozzle which discharges into the air stream at an angle which varies with respect to the direction of air flow, so that there is superposed upon the sucking action due to the reduced pressure from the venturi a variable Pitot-tube action dependent on such angle. This Pitot-tube action may either increase or decrease the sucking action due to the Venturi tube, depending upon the angle of the fuel nozzle, and may sometimes increase it and sometimes decrease it as such angle varies. I control this angle by a vane which is responsive to the air flow; and add to this vane control a further control depending upon the position of the throttle.

The accompanying drawing illustrates my invention: Fig. 1 is a vertical longitudinal section through a horizontal-type carburetor embodying my invention, it being taken on the line 1—1 of Fig. 2; Fig. 2 is a transverse section, on the line 2—2 of Fig. 1; Fig. 3 is a horizontal longitudinal section on the line 3—3 of Fig. 1; Fig. 4 is a plan of the carburetor of Fig. 1.

The carburetor has any usual air tube 10 provided with the usual venturi 11 and controlling throttle 12. A fuel nozzle opens into the air passageway at the contracted part of the venturi 11. As shown, this fuel nozzle comprises a vertical shaft 13 having suitable bearings 14 in the walls of the air tube 10 and projecting both above and below such air tube. The shaft 13 is hollow from its lower end to a point above the center of the venturi; and is provided within the venturi, preferably at about the center thereof, with an outlet opening 15, which is the fuel discharge jet. The angle of discharge of this fuel jet with respect to the direction of air flow varies as the shaft 13 is turned to vary the Pitot-tube effect on such jet. The lower end of the tube 13 dips into a float bowl 16, in which liquid fuel is maintained at a substantially constant predetermined level; and when air is passing through the air tube 10 fuel from this float bowl 16 is drawn up through the hollow lower end of the shaft 13 and discharged through the jet 15 into the passing air stream. My invention does not concern itself with the details of the float-bowl construction or with the adjustment of the fuel supply to the fuel nozzle, as these may be anything desired; though conventional liquid-maintaining and fuel-controlling mechanisms are illustrated.

Within the venturi 11 I mount on the rotatable shaft 13 a laterally projecting vane 17, which is acted upon by the current of air passing through the air tube 10 and so tends to rotate the shaft 13. This rotation is in a counterclockwise direction as seen in Fig. 3, the air flow being from left to right. As the shaft 13 is thus turned, the angle between the discharge of the fuel jet 15 and the direction of air flow past such jet along the air tube 10 is increased, to diminish the sucking Pitot-tube effect on such fuel jet or increase the discharge-retarding Pitot-tube effect on such jet, or perhaps change the Pitot-tube effect from a sucking effect to a discharge-retarding effect, depending upon the location of such jet 15 with respect to the vane 17. I prefer to provide dash-pot paddles 18 on the lower end of the rotatable shaft 13 within the liquid in the float bowl 16, to damp the oscillations which might otherwise occur in the movement of the shaft.

I provide a spring 19 to oppose the turning action of the vane 17 on the shaft 13. This spring is conveniently located at the upper end of the shaft 13; and is conveniently a spiral spring, as shown in Fig. 4 having one end connected to the shaft 13 so that the vane-produced movement of said shaft tends to wind said spring. The other end of the spring is connected to a swinging arm 23 which though shown as being pivoted on the same axis as the shaft 13 is free from such shaft so that the two may move separately. This swinging arm 23 is connected by a link 24 to the operating arm 25 of the throttle 12, so that as such throttle is moved from closed

toward open position (or clockwise in Figs. 3 and 4) it moves the arm 23 in the direction to wind up the spring 19 from its outer end and so to increase the tendency of the spring to oppose the vane-produced turning of the shaft 13. That is, as the opening of the throttle is increased by being moved clockwise as shown in Figs. 3 and 4, the arm 23 is also moved in the clockwise direction (Fig. 4), which winds up the spring and so tends to decrease the angle between the direction of air flow past the nozzle and the direction of the fuel-discharge from the nozzle.

In operation, the parts are in the position shown when the throttle is closed and the associated engine is not working. When the engine is in operation, however, the reduced pressure within the venturi 11 draws up fuel from the float bowl 16 through the hollow lower end of the shaft 13 and discharges it through the jet 15 into the passing air stream. Such discharge of fuel depends on a reduced pressure due in part to the venturi action and in part to the superposed Pitot-tube action; and as the latter depends upon the variable angle of discharge of the jet 15 with respect to the air flow, it augments or diminishes the venturi-produced suction according to such angle, augmenting it if such angle is less than a right angle (as it is shown in Fig. 3) and diminishing it if such angle is more than a right angle. The angle of discharge at the jet 15 varies with the velocity of air-flow through the tube 10 on account of the action of the air on the vane 17, assuming the throttle position remains unchanged. Because of this action, the proportion of fuel to air is cut down as the air velocity increases, with respect to what it would be if the angle of fuel discharge remained stationary. This gives a rather rich mixture for low speeds, and a leaner mixture for higher speeds. This action is limited, however, because as the shaft 13 turns, the action of the air pressure on the vane 17 diminishes because of the variation in the angle of such vane, and becomes zero when the vane extends lengthwise of the air passageway. In consequence, because the spring 19 always exerts some pressure, the vane 17 never quite reaches a position where it extends exactly lengthwise of the air passageway, but stops short of such lengthwise position; and if the air velocity increases beyond that which produces this limiting position no further variation in the angle of fuel discharge occurs and likewise no further improverishment of the mixture. In other words, the mixture is made leaner as the air velocity increases to a predetermined point, and for higher air velocities is not made leaner. This is a very desirable action, because a richer mixture is desired at very high speeds.

The air-velocity control is exactly as has just been explained for any given throttle position. When the throttle is moved, however, the tendency of the spring 19 to move the shaft 13 against the vane action is increased as the throttle is opened and decreased as the throttle is closed. As a result, opening of the throttle decreases the angle of fuel discharge with respect to the direction of air-flow, and closing the throttle increases such angle; or in other words, the angle of fuel discharge with respect to air-flow is varied in inverse sense to the extent of throttle opening. Thus for a given air velocity through the tube, more fuel is discharged from the jet 15 with wide-open throttle than with the throttle partially closed. This is of advantage in increasing the richness of the mixture at heavy loads, as in ascending a grade. Also, it is of advantage in producing a temporarily richer mixture during acceleration upon opening of the throttle, until by the increased engine speed the action of the air on the vane 17 has cut down such richness.

I claim as my invention:

1. In a carburetor, the combination of an air tube, a fuel nozzle discharging into said air tube, said fuel nozzle being movable to vary its angle of discharge with respect to the direction of air flow to vary the Pitot-tube effect on the fuel discharge, a throttle controlling the flow through said air tube, and means operatively interconnecting said throttle and said nozzle for moving said nozzle to vary such angle in inverse sense to the extent of opening of said throttle, said interconnecting means including a spring connecting member whereby the nozzle may be moved without moving the throttle.

2. In a carburetor, the combination of an air tube, a fuel nozzle discharging into said air tube, the angle between the direction of fuel discharge from the nozzle and the direction of air flow past the nozzle being variable, a throttle controlling the flow through said air tube, and means operatively interconnecting said throttle and said nozzle for moving said nozzle to vary such angle in inverse sense to the extent of opening of said throttle, said interconnecting means including a spring connecting member whereby the nozzle may be moved without moving the throttle.

3. In a carburetor, the combination of an air tube, a fuel nozzle discharging into said air tube, said fuel nozzle being movable to vary its angle of discharge with respect to the direction of air flow to vary the Pitot-tube effect on the fuel discharge, means responsive to the velocity of air flow through said tube for moving said nozzle to vary such angle, a throttle controlling the air flow through said air tube and variable means controlled by the throttle and resisting the effect of the velocity-responsive means.

4. In a carburetor, the combination of an

air tube, a fuel nozzle discharging into said air tube, the angle between the direction of fuel discharge from the nozzle and the direction of air flow past the nozzle being variable, a throttle controlling the flow through said tube, and means controlled jointly by the throttle position and by the velocity of air flow through said air tube for controlling said angle.

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this 4th day of February, A. D. one thousand nine hundred and twenty.

GEORGE B. SCHLEY.