Sept. 30, 1924. 1,510,366

J. C. WHITEMAN

FUEL MIXER

Filed Aug. 20, 1920 2 Sheets-Sheet 1

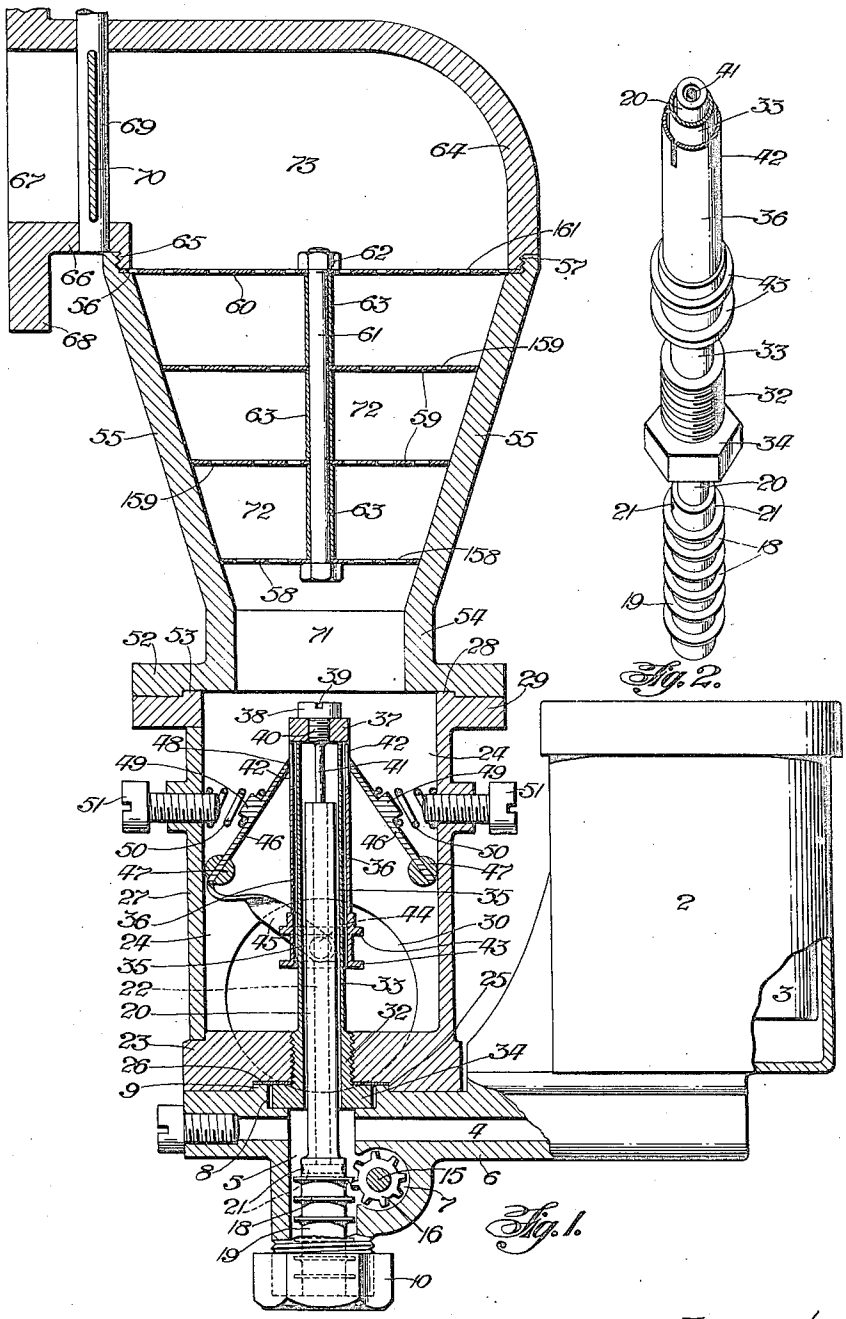

Fig. 1.

Fig. 2.

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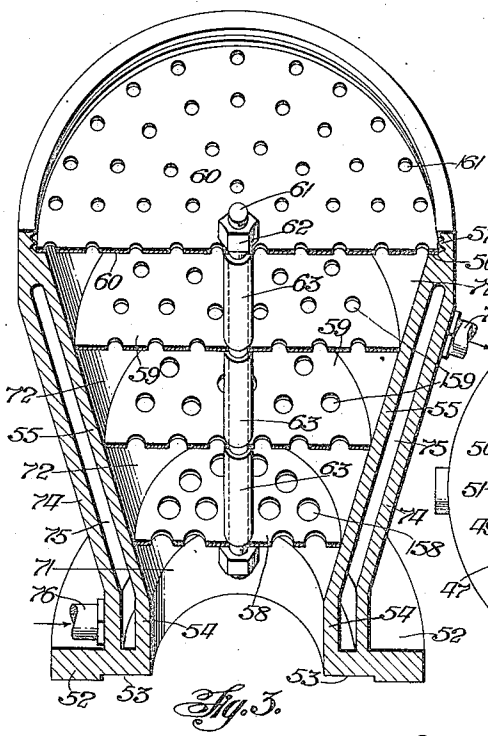

Fig. 3.

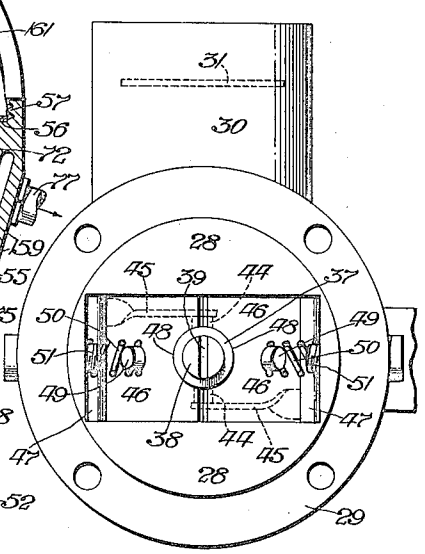

Fig. 4.

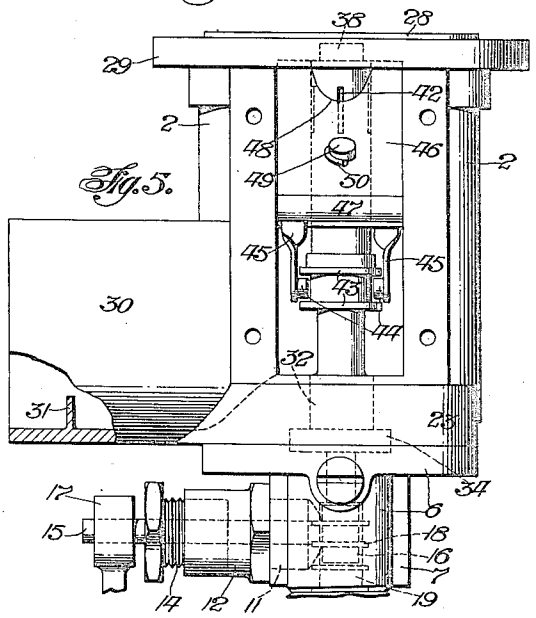

Fig. 5.

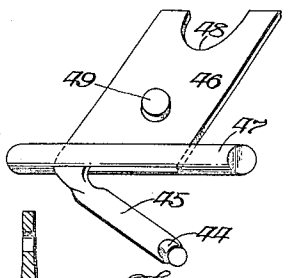

Fig. 6.

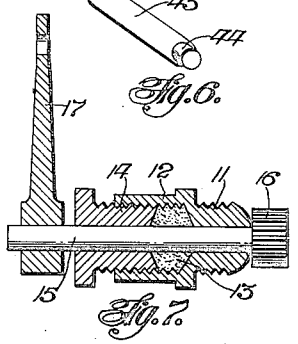

Fig. 7.

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Patented Sept. 30, 1924. 1,510,366

UNITED STATES PATENT OFFICE.

JAMES CARLILE WHITEMAN, OF CHRISTCHURCH, NEW ZEALAND, ASSIGNOR TO WHITEMAN'S "SUPURB" CARBURETTOR COMPANY LIMITED, OF SYDNEY, NEW SOUTH WALES, AUSTRALIA.

FUEL MIXER.

Application filed August 20, 1920. Serial No. 404,885.

To all whom it may concern:

Be it known that I, JAMES CARLILE WHITEMAN, a subject of the King of Great Britain and Ireland, and a resident of the city of Christchurch, in the county of Canterbury, in the Dominion of New Zealand, have invented certain new and useful Improvements in Fuel Mixers, of which the following is a specification.

In the atomization of hydro-carbons in the presence of air for the purpose of providing an air and fuel mixture as fuel for internal combustion engines it is highly desirable to thoroughly co-mingle the air and fuel during their passage from the gasoline or other spirit supply, and it is well recognized that upon efficient vaporization and complete absorption of the hydro-carbons by the air supply largely depends the dryness of the resultant mixture and consequent economical consumption and engine power derived.

In some types of carburetter, it has been proposed to vaporize the fuel by passing it from a nozzle in spray form and causing it to then travel over foraminous or roughened surfaces under the influence of suction from the engine, whereby the hydro-carbonaceous molecules cling to the mechanical supporting surfaces in the path of an induced atmospheric current. The lighter particles of hydro-carbon are evaporated and absorbed by the air current, the heavier ones moving over or travelling along the irregular surfaces, until sufficient thinness or reduction in density is obtained in which condition they are absorbed by the air stream.

The object of the present invention is to provide a carburetion method and apparatus for carrying it into efficient practice, whereby homogeneous mixture of the fuel and air supply is thoroughly effected without unduly retarding the passage of the gases through the carburetter, and whereby the resultant mixture is so dry that maximum engine power and economy are obtained.

Briefly the process or method consists in spraying the fuel into an atmospheric stream induced by suction, in breaking up the globules of hydrocarbon by forcible impact while in atmospheric suspension in distorting the globules by elongation caused through retardation of their accelerated travel towards the source of suction in expanding the globules to bursting point and in repeating these steps until the hydro-carbonaceous globules are so thin or reduced in density that they become completely absorbed by the air supply and the resultant homogeneous mixture is so dry as compared with the usual fuel mixtures, that great economy in fuel and increased power is obtained.

More specifically the method consists in subjecting particles of hydro-carbon, whilst in atmospheric suspension and under the influence of suction, to forcible impact against a plurality of foraminous surfaces comprising perforated partitions of baffle plates arranged in a series of chambers each of which successively increases in area in contradistinction to the progressive reduction in the area of the perforations of each successive partition or baffle plate, whereby thorough co-mingling of the gases during the breaking, distortion and expansion of the globules is caused until they are so thin or reduced in density that complete absorption by the carrying atmosphere obtains and a dry homogeneous mixture is secured. The greater the speed of the engine the greater are the forces of disruption and the impact of the hydro-carbon particles against the partitions and against each other, and the drier is the mixture passing to the engine.

In the apparatus provided the atmospheric stream induced through the carburetter by the suction of the engine is automatically regulated according to the loading of the engine, the fuel supply being proportional to and synchronizing with the air supply. The atmospheric stream and molecules of hydro-carbon carried thereby pass to an atomizing and gas expansion chamber divided by a plurality of perforated partitions or baffle plates into a series of progressively enlarged compartments, the perforations in the partitions or baffle plates being arranged in staggered relationship and progressively reduced in area as the area of the respective compartments increases. The means em-

ployed for controlling the supply of hydrocarbon fuel are operated by the air stream or supply caused by the suction of the engine. The quantity of air and fuel is therefore proportionate at all speeds.

The features of novelty are more particularly pointed out in the appended claims.

Referring to the drawings which form part of this specification:—

Figure 1 is a part sectional view in vertical section of a carburetter according to the invention, portions being broken away for convenience of illustration.

Figure 2 is a part sectional perspective detail view showing a delivery tube, jet tube, and distributing tube assembled.

Figure 3 is a part sectional perspective view of an atomizing and gas expansion chamber provided with an annular heating space.

Figure 4 is a plan of a generating and feed chamber.

Figure 5 is a side elevation of the generating and feed chamber. An access plate has been removed and portions have been broken away for convenience of illustration.

Figure 6 is a perspective view of an inclined shutter and a pivot pin and lever thereof.

Figure 7 is a sectional detail view of a toothed pinion and a stuffing box encircling the spindle thereof.

The invention includes a float chamber 2 having therein a float 3 suitably controlling a fuel duct 4. The duct 4 communicates with a sump 5 formed in a base element 6. Provided in the element 6 is a pinion recess 7 above which is a nut recess 8 having around its circumference an upstanding jointing shoulder 9. The base element 6 has threaded thereon a nut 10 closing the sump 5.

Passing into the base element 6 is the threaded inner end 11 of a stuffing box 12 containing suitable packing 13 compressed by a threaded gland 14. Passing through the stuffing box 12 and gland 14 is a spindle 15 upon the inner end of which is mounted a toothed pinion 16 accommodated in the recess 7. Mounted upon the outer end of the spindle 15 is a suitable control lever 17.

Engaging the toothed pinion 16 are collars 18 carried by the lower closed end 19 of a delivery tube 20 having an open upper end. Formed in the tube 20 are inlet holes or apertures 21 communicating with a vertical passageway 22.

Mounted upon and secured by screws or the like to the base element 6 is the bottom 23 of a generating and feed chamber 24. The bottom 23 is provided with a jointing recess 25 having therein a jointing ring 26 and accommodating the jointing shoulder 9 of the base element. Formed through the bottom 23, concentrically with the jointing recess 25, is a threaded hole. Secured by screws or the like to one side of the chamber 24 is a removable access plate 27. Upstanding from the upper end of the chamber 24 is a jointing shoulder 28 around which is a jointing flange 29. Passing through one side of the chamber 24 is an air intake branch 30 having near its outer end an outflow wall 31.

Threaded into the threaded hole formed in the bottom 23 of the chamber 24 is the threaded lower end 32 of a jet tube 33. Carried by the lower end 32 is a nut 34 accommodated in the recess 8 of the base element 6. Formed between the jet tube 33 and the delivery tube 20 is an annular fuel space indicated at 35.

Slidably embracing the tube 33 is a distributing tube or sleeve 36 having a closed upper end 37. Carried by the upper end 37 is a regulating needle valve having a head 38 provided with a lateral groove 39. Below the head 38 is a body portion 40 threaded into the closed upper end 37 of the tube 36. Integral with the body portion 40 is a shank or modulating pin 41. This descends into the open upper end of the delivery tube 20. Formed in the upper end of the distributing tube 36 is a plurality of exit slots 42. Carried by the lower end of the tube or sleeve 36 is a pair of collars 43.

Engaging the collars 43 are opposite pins 44. Each pin is carried by the inner end of a lever 45 the outer end of which is preferably formed integral with the lower end of an inclined shutter 46. Carried by the lower end of each shutter 46 is a pivot pin 47 extending laterally across and mounted in the feed chamber 24. The upper end of each shutter 46 is provided with a gullet 48 whereby the pair of shutters embrace the upper end of the distributing tube or sleeve 36. Carried by each shutter 46 is a stud 49. Encircling each stud 49 is the inner end of an adjustable helical spring 50. The outer end of each spring 50 is controlled by an adjusting screw 51 carried by the feed chamber 24. The two shutters 46 control the passage of an atmospheric stream induced through the chamber 24 from the intake branch 30 by the suction of the engine. The shutters vibrate or oscillate according to the running of the engine and by their inclination direct the atmospheric current towards the exit slots 42 past which it travels at intensified velocity.

Secured by screws or the like to the flange 29 of the feed chamber 24 is the flange 52 of an atomizing and gas expansion chamber. The bottom of the gas chamber is provided with a jointing recess 53 accommodating the jointing shoulder 28 of the feed chamber 24. Above the flange 52 is a delivery neck 54 integral with which is an outwardly inclined or flared wall 55 having

at its upper end an internal circumferential shoulder 56 above which is an internal thread 57.

Disposed within the atomizing and gas expansion chamber is a lower perforated partition 58 above which is an intermediate perforated partition or partitions 59. Above the intermediate partitions 59 and resting upon the internal shoulder 56 is an upper perforated partition 60. It will be observed (Figure 3) that the perforations 158 in the lower partitions 58 are of larger area than the perforations 159 in the intermediate partitions 59. The perforations are smaller in each successive partition until, in the upper partition 60, the perforations 160 have reached the smallest area. The perforations are disposed in staggered relationship thereby preventing any particle of hydro-carbon having a clear passage from the delivery neck 54 to the upper partition 60. Uniting the perforated partitions is a tie bolt 61 provided with a retention nut 62. Carried by the tie bolt and disposed between the partitions 58, 59 and 60 and spacing them apart is a plurality of tubular distance pieces 63. The number of partitions employed may be varied.

Above the atomizing and gas expansion chamber is a removable cap or dome 64 having around its lower end an external thread indicated at 65. Passing from the cap or dome 64 is a gas outlet branch 66 forming an induction port 67. The gas outlet branch 66 is provided with a flange by which it is suitably secured to the manifold of the engine. Disposed in the branch 66 is a spindle 69 carrying a suitable throttle valve 70 which may, if desired, be situated in the neck 54 of the gas chamber.

Formed by the neck 54 of the gas chamber, between the lower end thereof and the lower perforated partition 58, is a mixing, breaking and stretching compartment 71. Formed within the gas chamber, between the lower perforated partition 58 and the intermediate perforated partition 59 above it, is a multiplication and expansion compartment 72. A similar compartment is formed between each intermediate perforated partition 59 and the partition 59 or 60 above it as the case may be. Formed within the cap or dome 64, above the upper perforated partition 60, is a mixture delivery compartment 73 communicating with the gas outlet branch 66 and controlled by the throttle valve 70.

In the modification shown in Figure 3 the gas expansion chamber may be provided with a jacket or outer shell 74. Communicating with the annular heating space 75 thus formed around the chamber is an inlet pipe 76 and an outlet pipe 77. The inlet pipe receives hot exhaust gases from the exhaust pipe or silencer of the engine. The hot gases may be delivered back to the engine exhaust pipe or silencer by the outlet pipe 77. The jacket 74 and heating space 75 provide a simple means for heating the atomizing and gas expansion chamber.

With this invention gasoline or other fuel is delivered to the float chamber 2 the flow of fuel to and from the chamber being controlled by the float 3 in any ordinary manner. The fuel passes through the duct 4 into the sump 5 and through the inlet holes 21 rising in the delivery tube 20. It also rises in the annular space 35 inside the jet tube 33. The height attained by the spirit depends upon the level of the float 3 in the float chamber 2 as is usual in carburetters.

To start an engine equipped with the invention the lever 17 is operated causing the pinion 16 to rotate and engage the collars 18 of the delivery tube 20 which is lowered in relation to the needle shank 41. An excess flow of fuel is thus permitted to pass from the tube 20 in order that the engine may receive the rich mixture necessary for starting. The carburetter now operates automatically. An air current or stream is induced by the suction of the engine through the air intake branch 30 and passes upwardly beneath the shutters 46 maintaining them open according to the suction and therefore the loading of the engine and against the influence of the helical springs 50. The atmospheric stream is directed by the pair of inclined shutters towards the restricted space formed around and between the upper end of the distributing tube 36 and the upper ends of the shutters. The velocity of the air as it passes the exit slots 42 is therefore increased. The distributing tube or sleeve 36 rises or falls according to the movement of the shutters 46, the air and gasoline or other fuel being automatically proportioned. As the tube 36 rises or falls upon the jet tube 33, and the shutters 46 correspondingly open or close, the slots 42 are opened or are covered by the upper end of the jet tube 33. The quantity of fuel passing through the vertical passageway 22 of the delivery tube 20 may be regulated, according to the size of the engine, by substituting needle valves having shanks 41 of varying sizes and these shanks may be tapered. Should the carburetter flood or require to be flooded for any reason the overflow of spirit is retained within the air intake branch 30 by the out-flow wall 31.

As the vapor from the exit slots 42 is carried upwardly in the air stream induced through the intake branch 30, the particles or globules of hydro-carbon strike forcibly against the lower perforated partition 58. Some of the globules may pass through the perforations in the partition. These will encounter the intermediate partition 59 im-

mediately above the lower partition 58. The perforations in the partitions are arranged in irregular or staggered relationship for this purpose. When the globules strike a partition each is immediately broken by the force of the impact into a series of globulets. The globulets stretch, on account of them being in contact with the partition and under the influence of suction, and elongation continues whilst each globulet is searching for an aperture in the partition through which it may pass. When an elongated globulet passes through an aperture in a partition it is, on account of the inclination of the wall 55, carried rapidly forward in an enlarged compartment by the induced air stream. After passing through a partition and entering a larger compartment the distorted globulet assumes an approximate sphere and expands. The original globule has now obviously been reduced to a series of globulets the density of each of which has been reduced first through distortion by elongation and secondly by expansion. A globule sufficiently thinned or reduced will, like a small bubble, eventually burst by frictional contact in the air stream, but, on account of the reduction in the sizes of the apertures in each succeeding partition and the staggered relationship of the apertures, any globule that may pass through an aperture in any partition will encounter a succeeding partition and be broken into a mass of globulets each of which is in turn elongated and expanded and reduced in density. Or it will burst in attempting to pass through an aperture. Close observation and experimentation has shown that the process or method or carburetion according to the invention is most effective as each particle of hydro-carbon is so reduced during its passage through the atomizing and gas expansion chamber that, when the delivery compartment 73 is reached, it has become completely absorbed by the air stream. A dry homogeneous mixture is thereby obtained and passes in this condition to the induction port 67.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:—

1. A method of carburetion which consists in subjecting the globules of a hydro-carbon vapor whilst suspended in an atmospheric stream and under the influence of suction to a breaking action by forcible impact, to elongation by frictional retardation, and to enlargement by natural expansion in a series of inter-communicating compartments of progressively increased area, until the hydro-carbon particles are so reduced in density as to be absorbed by the atmospheric stream, and delivering the dry homogeneous mixture obtained into a compartment of still greater area in direct communication with the source of suction.

2. A method of carburetion which consists in projecting into a compartment a hydro-carbon vapor suspended in an air stream induced by suction, and subjecting the particles of hydro-carbon to a breaking action by forcible impact, an elongating action by friction and an enlarging action by expansion, multiplying the breaking, elongating and enlarging actions by delivering the gases through a series of inter-communicating compartments of progressively increasing area, and subjecting the gases to heat during the treatment, whereby a dry homogeneous mixture is obtained.

3. In a carburetter, an atomizing and gas expansion chamber divided into a plurality of inter-communicating compartments each successively of increased transverse dimension while of uniform vertical dimension by a series of superimposed or spaced perforated partitions, the perforations of apertures of said partitions gradually reducing in area from one end of said chamber to the other, for the purpose specified.

4. In a carburetter, an atomizing and gas expansion chamber having therein a plurality of super-imposed perforated partitions, the area of each partition being greater than that of the partition preceding it whilst the apertures in each partition are of less area than those formed in the partition preceding it and are staggered in relation thereto.

5. In a carburetter, an atomizing and gas expansion chamber consisting in an outwardly inclined or flared wall, a removable cap or dome carried by the chamber above the wall, a gas outlet branch communicating with the cap or dome, and a plurality of super-imposed perforated partitions disposed within the chamber and forming therein a series of super-imposed compartments inter-communicating with each other through the apertures in the partitions, the area of each partition being greater than the area of that preceding it and the perforations in each partition being of less area than those in the partition preceding it and being staggered in relation thereto.

In testimony whereof I affix my signature.

JAMES CARLILE WHITEMAN.

Witness:

CECIL MCCLASTNER.