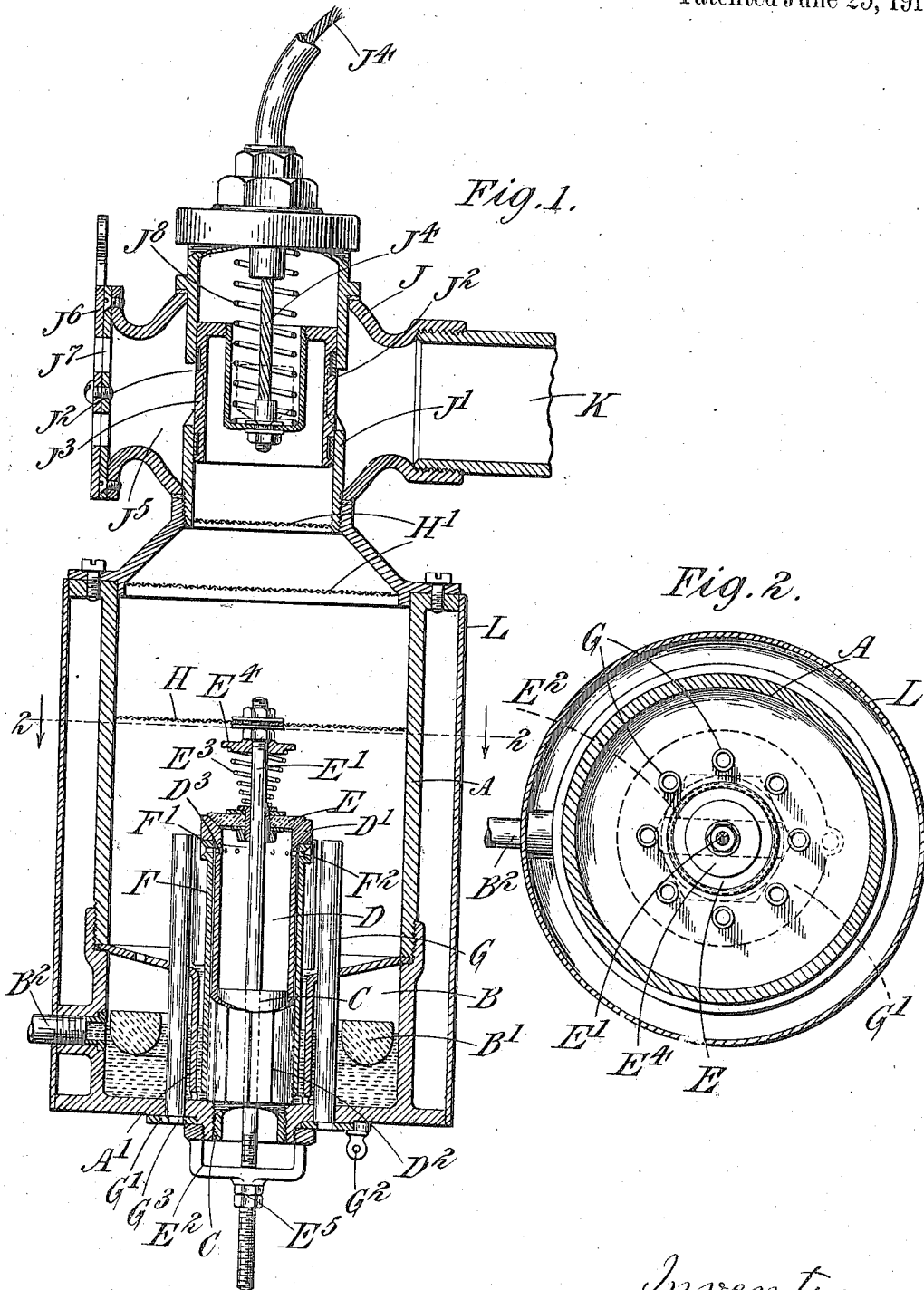


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 CARBURETING APPARATUS FOR INTERNAL COMBUSTION ENGINES.
 APPLICATION FILED JUNE 13, 1917.

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UNITED STATES PATENT OFFICE.

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CARBURETING APPARATUS FOR INTERNAL-COMBUSTION ENGINES.

1,270,486.

Specification of Letters Patent. Patented June 25, 1918.

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To all whom it may concern:

Be it known that I, ROBERT MELVILLE BROWN, a subject of the King of England, residing in London, England, have invented certain new and useful Improvements in Carbureting Apparatus for Internal-Combustion Engines, of which the following is a specification.

This invention is for improvements in or relating to carbureting-apparatus for internal-combustion engines and has for its object to provide a form of carbureter in which the atomizing of the fuel and its intermixture with the air is more efficiently carried out than heretofore; the carbureter is suitable for use with heavy fuel, say, paraffin, or light fuel such as petrol.

According to this invention, the carbureter has one or more fuel-feed capillary passages and a corresponding number of atomizing-conduits for air-admission, so arranged that their discharge-outlets are close to the discharge-outlets of the fuel-conduits but approximately at right-angles thereto and thus discharge the fuel into a surrounding mixing-chamber, and is characterized by the atomizing-conduits on their intake sides having direct communication with the external atmosphere by means which do not communicate with the mixing-chamber at any point between the atomizing-conduits and the point at which the external atmosphere is admitted.

Preferably the mixing-chamber has a closed bottom situated below the atomizing-conduits to catch the heavier particles of fuel-spray and has a return duct to the fuel-supply whereby such surplus fuel is carried back to the fuel-supply.

It has before been proposed to provide fuel-feed capillary passages with transverse passages for atomizing air, but in this arrangement, the air which is intended to pass through the atomizing-conduits is drawn from the surrounding mixing-chamber by a by-pass which extends from and returns to the mixing-chamber through the said conduits.

It has also been proposed to provide a central telescopic air-admission tube with lateral perforations for admitting the air from the interior of the tube into a surrounding chamber, these radial passages being made to pierce longitudinal tapered

fuel-supply grooves which coöperated with a surrounding plate so that the fuel would be discharged into the chamber immediately above the plate in larger or smaller quantities according to the position of the tube, and therefore the capacity of that portion of the tapered groove or grooves situated immediately above the plate; such grooves were not arranged to operate as capillary passages and in order that the fuel would be discharged through them, the level had to be kept near the level of the said plate.

The invention involves various other further details of construction, all of which are hereinafter described and whereof the novel features are pointed out in the claims.

In the accompanying drawings which illustrate one method of carrying out this invention:—

Figure 1 is a central vertical section through the carbureter, and

Fig. 2 is a section of the line 2—2 of Fig. 1.

The same letters indicate the same parts in both figures of the drawings.

The mixing-chamber A has a well A¹ in the bottom which is supplied with fuel from a surrounding float-feed chamber B containing an annular float B¹ which operates a valve (not shown) to admit fuel by a conduit B². The float and its mechanism for operating a valve constitute no part of the present invention and need not therefore be further described.

The bottom of the mixing-chamber A should be perforated at one point to equalize the pressure in the chambers A and B so that there may be no tendency to draw the fuel up from the well A¹ into the mixing-chamber except through the capillary passages. Provided the pressure is equalized between these two chambers, there is no tendency for the fuel to rise in the well through any reduction of pressure in the chamber A, as the float keeps the valve controlling the supply-conduit B² closed except when the level in the chamber B falls below a predetermined limit.

Fixed in the center of the well is a tube C which serves as a support for a second tube D. The tube D has an exterior flange D¹ at the top and exterior grooves D² which extend from the bottom of the tube approxi-

mately to the said flange. Near the under-
 side of the flange is a series of perforations
 D³, one for each groove, the throughway of
 the perforations being set at right-angles
 5 to the tube D each air-tube being further
 centrally alined with its coöperating fuel
 groove. The bottom of the tube D is open
 to the atmosphere through its supporting-
 10 tube C, which extends right through the
 bottom of the well A¹ but the top of the
 tube D has seated on it a valve E. This
 valve has a spindle E¹ which extends down
 15 through the tube and through a bridge piece
 E² which projects downward from the bot-
 tom of the well A¹. The bottom of the
 spindle is thus kept in position by the
 bridge-piece and the top is centralized by a
 20 gauze diaphragm H secured within the mix-
 ing-chamber A. The valve E is free to
 slide on its spindle E¹ and is kept down
 upon the top of the tube D by a spring E³
 which bears at one end against the valve
 25 and at the other end against a collar E⁴ on
 the spindle E¹. At the bottom end of the
 spindle E¹ where it projects beyond the cap
 E², adjusting nuts E⁵ are provided so that
 the pressure of the spring on the valve can
 30 be regulated by screwing the nuts farther
 along the spindle or withdrawing them far-
 ther toward the end of the same. The dia-
 phragm H yields sufficiently to permit of
 this adjustment or the spindle could be
 35 made to slide through it. A third tube F
 is telescoped on to the tube D and is a
 close fit thereon. This tube does not come
 down quite to the bottom of the tube D,
 40 so that the grooves D² at the bottom are
 left exposed to the fuel in the well A¹.
 The upper end of the tube F has a flange
 F¹ similar to the flange D¹ on the tube
 D and perforations F² are provided in this
 45 flange which register with the perforations
 D³ in the tube D. The tube F may be held
 friction-tight in its proper position on the
 tube D, that is, with its perforations F²
 50 in register with the perforations D³, or it
 may be fixed to the tube by a screw or other
 means. Projecting upward from that part of
 the bottom of the mixing-chamber A which
 55 surrounds the well A¹, is a series of upright
 tubes G whose upper ends are situated above
 the level of the perforations D³, F², in the
 tubes D and F, and whose lower ends extend
 down through the float-feed chamber B and
 60 communicate with the atmosphere through
 the bottom of the said float-feed chamber.
 A plate G¹ controlled by a Bowden wire
 (not shown) connected to a finger G² and
 having in it perforations G³ which register
 65 with the tubes G, can be moved to partially
 or wholly close the lower ends of the tubes
 if desired. At the top of the mixing-chamber
 are two

further gauze diaphragms H¹. These are
 shown as mounted on certain parts which
 are detachable from the mixing-chamber,
 but they may be mounted elsewhere and
 may be increased in number if desired.

Above the gauze diaphragms is a throttle-
 valve of known type comprising a spherical
 casing J in the center of which is mounted
 a cylindrical guide-member J¹. The guide-
 70 member is closed at the top but is open at
 the bottom and is provided with a series of
 ports J², which, when open, throw the bore
 of the guide-member into communication
 with the chamber formed between the guide-
 75 member and the spherical casing J. With-
 in the guide-member operates a piston J³
 which is controlled by a Bowden-wire J⁴.
 Communicating with the chamber formed
 within the spherical casing J is a conduit
 80 K which constitutes the induction-conduit
 of the engine, and the throttle-valve so far
 described is a known device. For the pur-
 pose of the present invention, however, an
 auxiliary air-opening is provided at J⁵
 85 whereby air can be admitted from the at-
 mosphere direct to the interior of the spher-
 ical casing J and thence to the induction-
 conduit. This air-opening is controlled by
 a register-plate J⁶ which can be adjusted
 90 to any desired position on a fixed plate J⁷
 which is secured over the air-admission or-
 fice. The plate J⁶ may be provided with op-
 erating means whereby it can be controlled
 during driving.

The operation of this carbureter is as fol-
 100 lows:—

When running, the piston J³ of the throt-
 tle-valve J is pulled back by the Bowden-
 wire J⁴ a sufficient distance to open more or
 105 less of the ports J² so that the engine can
 thus draw mixture from the chamber A
 through the induction-conduit K. The reg-
 ister-plate J⁶ is kept in the closed position
 when the engine is working and only opened
 110 for scavenging purposes or to cool the en-
 gine by admitting pure air to the engine
 when the vehicle is running free.

The fuel always remains at the level of
 the perforations D³ because the grooves D²
 115 are sufficiently fine to draw it up to this
 point by capillary attraction and it is dis-
 charged thence by the rush of air through
 the perforations D³. It will be noted that
 the direction of discharge of the air is at
 120 right-angles to that of the discharge of the
 fuel, and as the fuel will be delivered in fine
 jets owing to the smallness of the bore of the
 conduits D², it will be thoroughly atomized
 by the action of the air blowing through the
 125 perforations D³, which may be termed the
 atomizing-conduits. The fuel is, of course,
 driven out toward the walls of the mixing-
 chamber by the atomizing air and is thus
 spread out radially from the tube D in a
 130 plane approximately at right-angles to the

direction of suction of the engine, and which plane is at a lower level than the upper ends of the air-tubes G. The heavier portions of fuel thus strike the wall of the chamber A and being deposited thereon run back to the well A¹ so that only the finely atomized fuel is carried forward with the extra air which enters the mixing-chamber by the valve E and tubes G. The admission of air by the valve E is effected by the suction of the engine which causes the valve to be lifted against the action of its spring E³. The degree of lift permitted this valve is regulated by the driver by operating the nuts E⁵ according to the working conditions of the day. The air admitted by the tubes G is regulated by the plate G¹ which is operated by the driver as desired.

The gauze diaphragms H, H¹ further eliminate any heavy particles of fuel, so that only a mixture of thoroughly atomized particles is delivered through the throttle J to the engine.

The carbureter A is conveniently heated, and for this purpose is surrounded by a jacket L so that a portion of the exhaust gases or other heating fluid may be passed around it.

Obviously the grooves D² can be formed in the inner face of the outer tube F if desired, or partly in the outer tube and partly in the tube D².

The object of setting the upper ends of the air-tubes G at a level which is above that of the discharge from the atomizing-conduits D³, is to prevent the air entering by these tubes from carrying forward the heavier particles of fuel. The lighter particles will rise and be caught by this incoming air, while the heavier will either strike the wall A, as already stated, or will fall direct to the bottom and thus return to the well A¹. It will be appreciated that it might not be essential in all cases to admit the air by the tubes G above the level of the fuel-discharge, but they should be so placed that the air entering by them does not catch up the larger atoms or particles of fuel but only carries the finely atomized fuel forward to the engine. If the walls A are heated, some of the fuel which strikes them will be vaporized and will thus pass on with the finely divided fuel.

It will be appreciated that what has been described throughout this specification as a plurality of fuel-jets and atomizing-conduits, could, in fact, take the form of a single annular fuel-conduit and a corresponding single annular atomizing-conduit as will be readily understood.

By placing the atomizing-conduits D³ at approximately the height shown in the drawing above the closed bottom of the mixing-chamber constituted by the well A¹ and its upper outward extension, the fuel is pre-

vented from striking the bottom of the chamber, which would produce undue condensation. The spray comes from the conduits D³ in a fan-shape and when the proportions are approximately those shown in the drawing, the lowest portion of this fan is clear of the said bottom of the mixing-chamber.

The valve E is not essential to the apparatus and could be dispensed with, the tube D being then closed at the top so that all the air passing through it has to escape by the atomizing-conduits D³. All that is necessary is that the end of the tube D shall be closed or partially closed so as to offer resistance to the incoming air and thus compel a considerable portion of the air to pass through the conduits D³. If the engine end of the tube D is closed then the resistance of course is absolute, but with the spring-controlled valve E shown, the degree of resistance can be varied by adjusting the tension of the spring E³ by means of the nuts E⁵.

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

1. In a carbureter, the combination of, a mixing-chamber, a fuel-container, an air-admission tube (D) which extends into the mixing-chamber at one end and at the other end is in free communication with the atmosphere, fuel-feed capillary conduits set around the said tube and extending from the fuel-container up the same with their discharging mouths in the direction of the engine-suction, the tube being provided with radial passages situated one at the top of each fuel-feed conduit which radial passages communicate between the interior of the tube and the mixing-chamber, and means at the inner end of the tube beyond the said radial passages to offer resistance to the air drawn in from the outer end of the tube, for the purpose set forth.

2. In a carbureter, the combination of, a mixing-chamber, a fuel-container, an air-admission tube (D) which extends into the mixing-chamber at one end and at the other end is in free communication with the atmosphere, fuel-feed capillary conduits set around the said tube and extending from the fuel-container up the same with their discharging-mouths in the direction of the engine-suction, the tube being provided with radial passages situated one at the top of each fuel-feed conduit which radial passages communicate between the interior of the tube and the mixing-chamber, and a suction-valve (E) which opens in the direction of the engine-suction and is yieldingly-controlled to close the inner end of the tube at a point beyond the radial air-passages, for the purpose set forth.

3. In a carbureter, the combination of, a mixing-chamber, a fuel-container, an air-admission tube (D) which extends into the

5 mixing-chamber at one end and at the other
 end is in free communication with the at-
 mosphere, fuel-feed capillary conduits set
 around the said tube and extending from the
 fuel-container up the same with their dis-
 10 charging-mouths in the direction of the en-
 gine-suction, the tube being provided with
 radial passages situated one at the top of
 each fuel-feed conduit which radial pas-
 15 sages communicate between the interior of
 the tube and the mixing-chamber, and a
 suction valve (E) which opens in the direc-
 tion of the engine-suction and is yielding-
 20 controlled to close the inner end of the tube
 at a point beyond the radial air-passages,
 the stem of which valve is free relatively to
 the valve but carries an abutment for a
 spring above the valve, which spring is in
 25 compression between the valve and the said
 abutment, the said stem being carried down
 through the bottom of the carbureter where
 it is provided with adjusting nuts (E⁵)
 for ready adjustment of the pressure of the
 spring, for the purpose set forth.

4. In a carbureter, the combination of, a
 25 mixing-chamber, an air-admission tube (D)
 which extends into the mixing-chamber at
 one end and at the other end is in free com-
 munication with the atmosphere, a fuel-con-
 30 tainer surrounding the base of the tube but
 through the bottom of which the tube has
 communication with the external atmos-
 phere, a close-fitting sleeve (F) on the tube,
 35 longitudinal capillary passages formed in
 one of the contacting surfaces of the sleeve
 and tube which passages at the bottom have
 communication with the fuel-container and
 40 at the top do not extend so far as the top
 of the tube but are met by transverse radial
 passages which extend through both the
 tube and the sleeve, one such radial passage
 being allotted to each longitudinal passage,
 45 and means at the inner end of the tube be-
 yond the said radial passages to offer re-
 sistance to the air drawn in from the outer
 end of the tube, for the purpose set forth.

5. In a carbureter, the combination of, a
 50 mixing-chamber, an air-admission tube (D)
 which extends into the mixing-chamber at
 one end and at the other end is in free com-
 munication with the atmosphere, a fuel-con-
 tainer surrounding the base of the tube
 55 but through the bottom of which the tube
 has communication with the external atmos-
 phere, a close-fitting sleeve (F) on the tube,
 longitudinal capillary passages formed in
 one of the contacting surfaces of the sleeve
 and tube which passages at the bottom have
 60 communication with the fuel-container and
 at the top do not extend so far as the top
 of the tube but are met by transverse radial
 passages which extend through both the
 tube and the sleeve, one such radial passage
 65 being allotted to each longitudinal passage,
 and a suction valve (E) which opens in the

direction of the engine-suction and is yield-
 70 ingly-controlled to close the inner end of
 the tube at a point beyond the radial air-
 passages, for the purpose set forth.

6. In a carbureter, the combination of, a
 75 mixing-chamber having a bottom for col-
 lecting the heavier particles of fuel-spray,
 the said bottom being so constructed as to
 prevent these from passing by gravity out
 to the external atmosphere and having re-
 80 turn draining means to the fuel-container,
 a fuel-feed capillary conduit extending
 from the fuel-container to a point in the
 mixing-chamber which is above the bottom
 of the said chamber and has its mouth di-
 85 rected to discharge in the direction of the
 engine-suction; an atomizing-conduit having
 its discharge-outlet close to the discharge-
 outlet of the fuel-conduit but approximately
 at right-angles thereto to discharge the fuel
 90 laterally outward into the surrounding mix-
 ing-chamber in the form of a spreading jet
 and having its other end in direct communi-
 cation with the external atmosphere with-
 95 out communicating with the mixing-cham-
 ber at any point between the discharge end
 of the atomizing-conduit and that at which
 the external atmosphere is admitted to the
 atomizing-conduit, the height of the dis-
 100 charge end of the fuel-feed conduit from
 the bottom of the mixing-chamber being
 such as to insure that the said spreading jet
 shall not impinge against this bottom, and
 means for admitting air to the mixing-cham-
 105 ber under the action of the engine-suction,
 the air-admission points being so placed that
 the incoming air does not come into the
 path of the heavier particles of fuel which
 fall to the draining bottom of the mixing-
 chamber, for the purpose set forth.

7. In a carbureter, the combination of, a
 110 mixing-chamber having a bottom for col-
 lecting the heavier particles of fuel-spray,
 the said bottom being so constructed as to
 prevent these from passing by gravity out
 to the external atmosphere and having re-
 115 turn draining means to the fuel-container, a
 fuel-feed capillary-conduit extending from
 the fuel-container to a point in the mixing-
 chamber which is above the bottom of the
 said chamber and has its mouth directed to
 120 discharge in the direction of the engine-
 suction, an atomizing-conduit having its
 discharge outlet close to the discharge-outlet
 of the fuel-conduit but approximately at
 125 right-angles thereto to discharge the fuel
 laterally outward into the surrounding mix-
 ing-chamber in the form of a spreading jet
 and having its other end in direct commu-
 130 nication with the external atmosphere with-
 out communicating with the mixing-cham-
 ber at any point between the discharge end
 of the atomizing-conduit and that at which
 the external atmosphere is admitted to the
 atomizing-conduit, the height of the dis-

charge end of the fuel-feed conduit from the bottom of the mixing-chamber being such as to insure that the said spreading jet shall not impinge against this bottom, and
 5 air-admission tubes (G) projecting from the bottom of the mixing-chamber and extending to a point above the level of the discharge of atomized fuel, for the purpose set forth.

10 8. In a carbureter, the combination of, a mixing-chamber having a central well and a bottom which slopes from the outer walls to the top of the well, a fuel-container be-
 15 neath the said bottom and surrounding the well but having communication therewith, an air-admission tube (D) situated within the well and which extends up therefrom into the mixing-chamber and has free com-
 20 munication through the bottom of the well with the atmosphere, fuel-feed capillary conduits set around the said tube and extending from the well with which they have free communication at their lower ends up
 25 to points on the tube which lie within the mixing-chamber at which points the tube is provided with radial passages one allotted to each capillary conduit, and means at the inner end of the tube beyond the said radial passages to offer resistance to the air drawn

in from the outer end of the tube, for the 30 purpose set forth.

9. In a carbureter, the combination of, a mixing-chamber having a central well and a bottom which slopes from the outer walls to the top of the well, a fuel-container be- 35 neath the said bottom and surrounding the well but having communication therewith, an admission-tube (D) situated within the well and which extends up therefrom into the mixing-chamber and has free communi- 40 cation through the bottom of the well with the atmosphere, a close-fitting sleeve (F) on the said tube, longitudinal capillary passages formed in one of the contacting-sur- 45 faces of the sleeve and tube which passages at the bottom have communication with the well in which the tube is situated and at the top are met by transverse radial passages which extend through both the tube and the sleeve, one such radial passage being al- 50 lotted to each longitudinal passage, and means at the inner end of the tube beyond the said radial passages to offer resistance to the air drawn in from the outer end of the tube, for the purpose set forth. 55

In testimony whereof I have signed my name to this specification.

ROBERT MELVILLE BROWN.