Aug. 20, 1935. P. CAMERON 2,011,997

CARBURETOR

Filed March 5, 1934

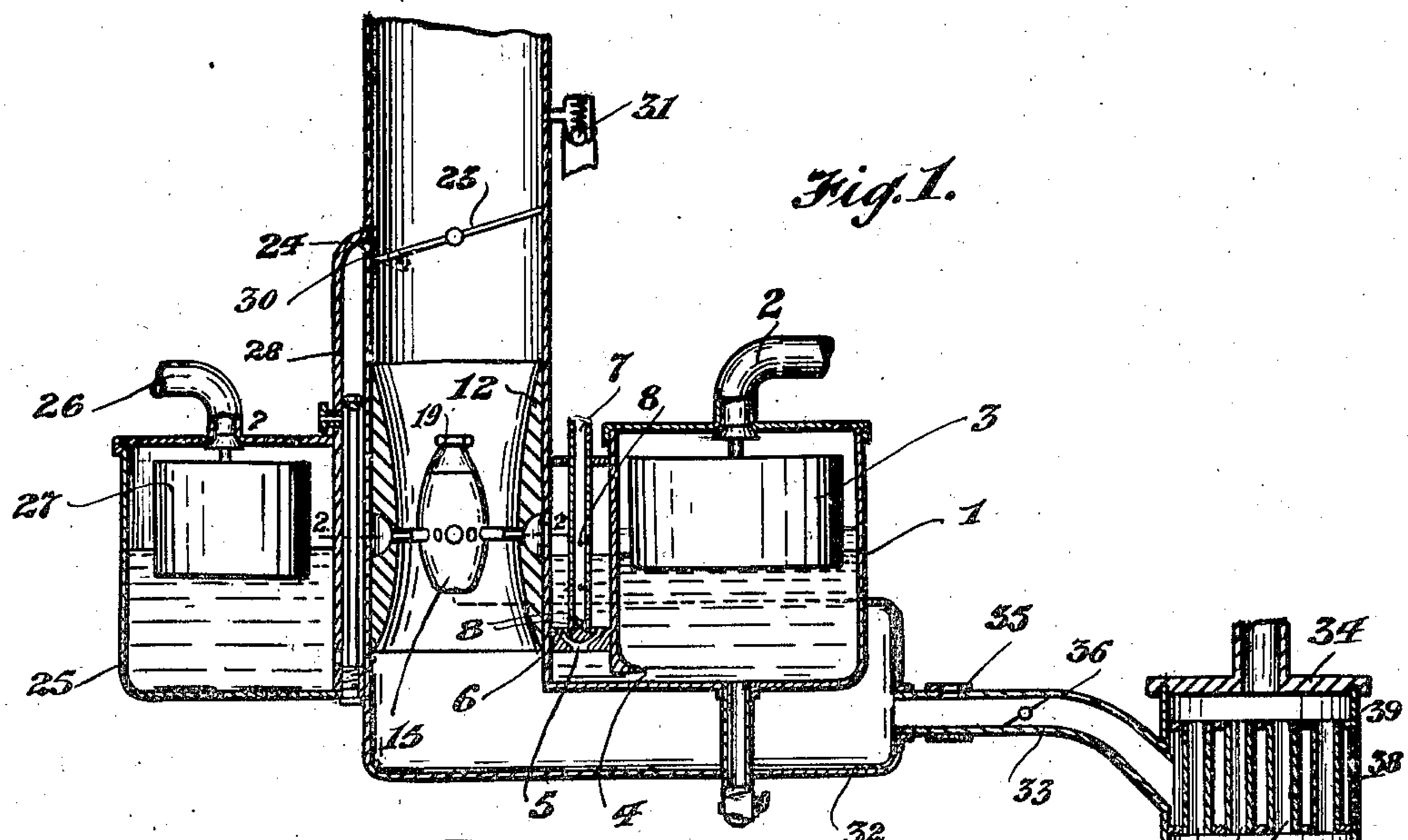

Fig. 1.

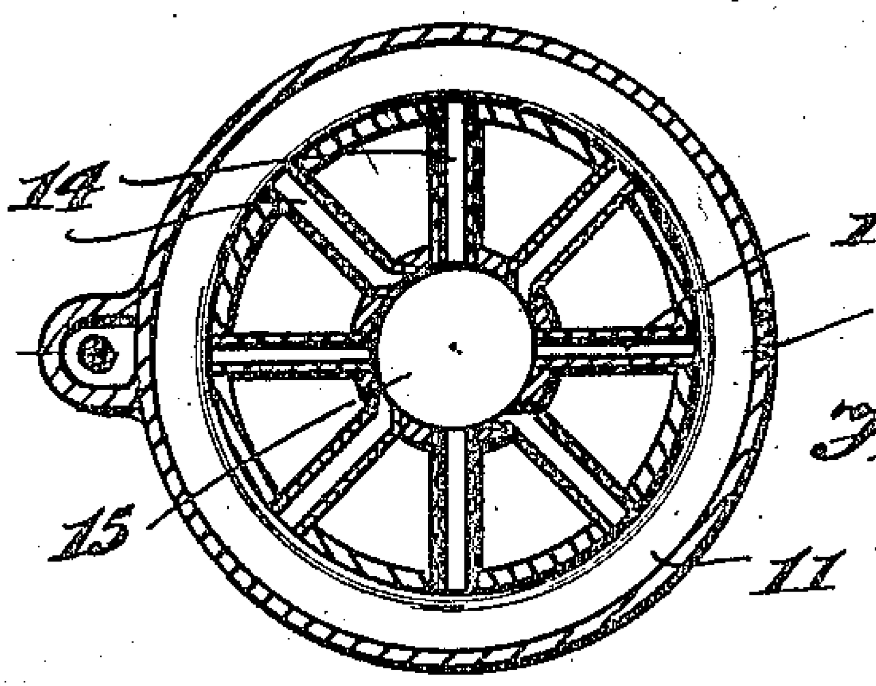

Fig. 2.

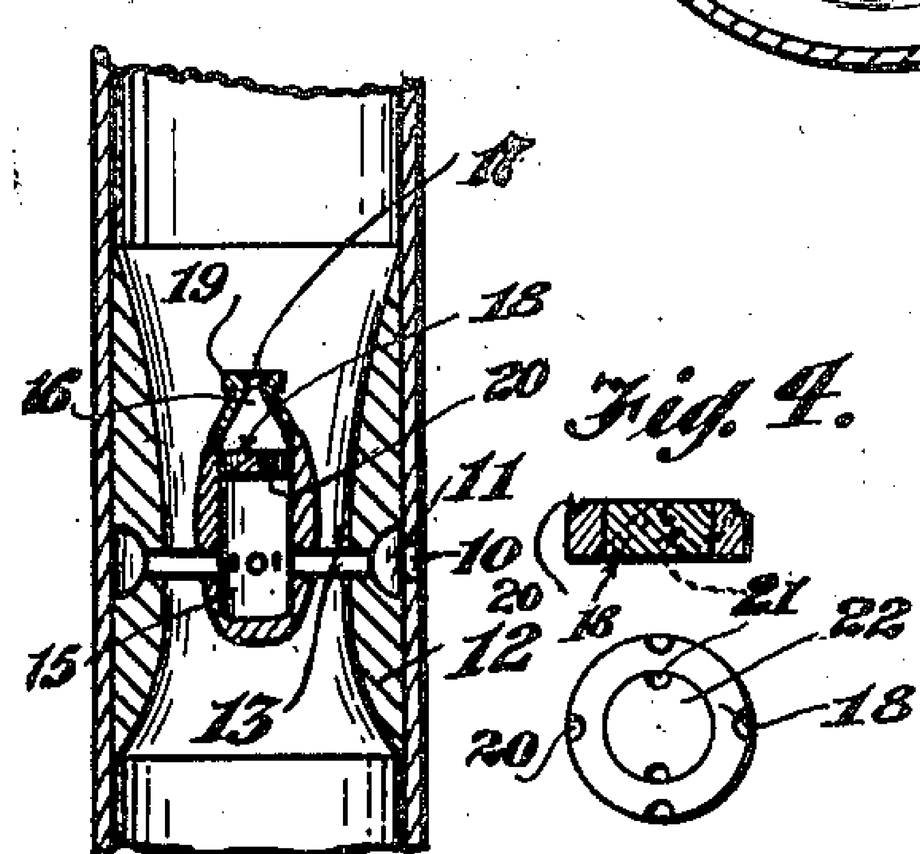

Fig. 4.

Fig. 5.

Fig. 3.

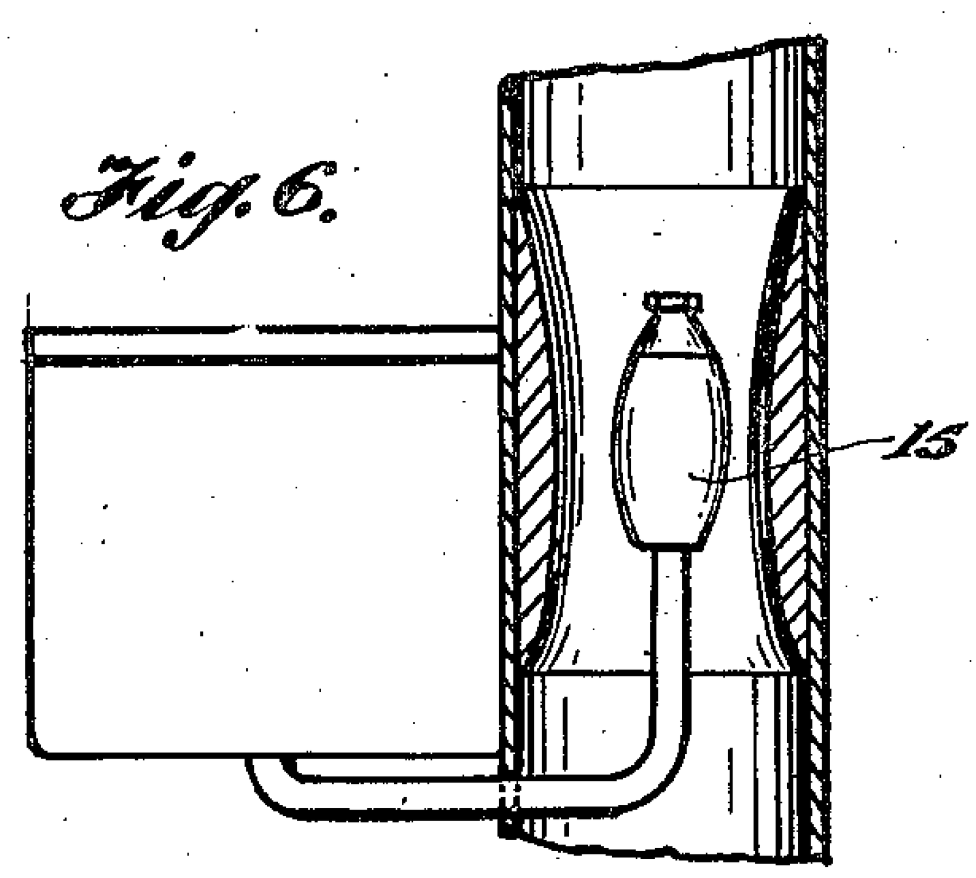

Fig. 6.

P. Cameron
INVENTOR

By: Marks & Clerk
Attys.

Patented Aug. 20, 1935

2,011,997

UNITED STATES PATENT OFFICE

2,011,997

CARBURETOR

Peter Cameron, Edinburgh, Scotland

Application March 5, 1934, Serial No. 714,193
In Great Britain March 11, 1933

12 Claims. (Cl. 261—18)

This invention relates to carburetors for use in internal combustion engines.

One of the objects of the invention is to provide a carburetor which will more completely atomize the fuel than heretofore and give more homogeneous air-fuel mixtures.

Another object of the invention is to provide a carburetor which will atomize heavier grade fuels.

Another object of the invention is to provide a carburetor which will atomize Diesel oil and other heavy grade fuels.

Further objects will become apparent from the description in the specification and are set forth in the claims at the end hereof.

The preferred embodiments of the invention will now be described by way of example with reference to the accompanying diagrammatic drawing in which:—

Fig. 1 is a sectional elevation of the improved carburetor.

Fig. 2 is a section to an enlarged scale on the line 2—2 Fig. 1.

Fig. 3 is a sectional elevation of the choke tube and turbulence chamber.

Fig. 4 is an elevation partly in section of the atomizing disc.

Fig. 5 is a plan of Fig. 4.

Fig. 6 is an elevation partly in section of a modification.

Referring to the drawing the float chamber 1 is supplied with heavy fuel by a pipe 2 and has a float 3 operating the usual needle valve to keep a constant level. The fuel is led through duct 4 to a jet or nozzle 5 having a plurality of holes 6 therein. A tube 7 is connected to a suitable supply of hot air and has a plurality of holes 8 through which the hot air is sucked.

The mixture of fuel and air is led by a duct 10 to an annular passage 11 around the choke tube 12 situated in the induction pipe 13. The duct 11 is connected to a number of small tubes 14 radially or tangentially arranged which enter a chamber 15 called the turbulence chamber situated axially of the choke tube 12.

Any number of tubes 14 may be employed, but as an example, I have found that eight such tubes are very suitable. Four of these are arranged so as to form a cross in such a manner that the streams issuing therefrom impinge. The four other tubes are arranged also in a cross but their ends are turned at an angle to the radial direction thus giving a spiral or helical flow to the fuel. The tubes may be arranged in any other manner, for instance, they may be tangential or at an angle to the radii or they may be arranged to impinge other than diametrically, thus creating turbulence or a spiral or helical direction of flow or both.

The turbulence chamber 15 is substantially cylindrical and terminates in a conical or contracting chamber 16 with an orifice 17 at its apex which forms the jet or nozzle 19 through which the fuel issues into the induction pipe.

At the junction of the cylindrical and conical portions an atomizing disc 18 is situated having two or more spiral or helical grooves 20 at its periphery and two or more oppositely directed spiral or helical inner passages 21 at or about its centre. The spiral or helical grooves form passages between the disc and the cylindrical walls of the nozzle. If desired the inner passages 21 may be formed as helical slots in a second disc 22 which is inserted and secured suitably in a central hole in the main atomizing disc 18.

In order to create turbulence or a swirling motion of the fuel in the spiral or helical passages before issuing into the conical or converging chamber 16 according to one arrangement the cylindrical walls of the turbulence chamber 15 are provided with threads, grooves, steps, ridges, or the like (not shown), which may be inclined at any suitable angle to the axis or may be at right angles thereto. Further, instead of providing the threads, grooves, steps, ridges, or the like upon the walls of the turbulence chamber they may be provided upon the walls of the spiral or helical grooves (not shown) in the periphery of the disc.

Similarly, when the inner passages 21 are formed in spiral or helical grooves in a second disc 22 the threads, grooves, steps, ridges, or the like may be provided upon the walls of the circular hole in the first disc or upon the walls of the spiral or helical slots in the periphery of the second disc. In this manner one side of the passage is smooth while the other is rough thus creating turbulence in the stream of liquid as it issues into the conical chamber.

Again, according to another arrangement the threads, grooves, steps, ridges, or the like may be provided upon both sides of the spiral or helical passages and they may be either inclined in opposite directions or in the same direction. By suitably arranging the angles they will tend to give a rotational movement to the streams as they issue into the conical chamber.

By creating this turbulence in the streams I find that more complete atomization can be obtained of the liquid fuel as it issues from the orifice of the jet.

It is to be understood that these threads, grooves, steps, ridges, or the like may be applied to any jets giving a spiral or helical direction to said fuel prior to issuing from said jet whether the streams within said jet are inclined in the same or the opposite directions.

The conical portion of the nozzle 19 may be made separately from the cylindrical portion of the chamber 15 and screwed together or otherwise secured. It has been found that four helical grooves in the periphery and two helical passages in the disc 18 give very efficient results but any other number may be employed as long as the amount of fuel passing through one set is greater than the amount passing through the other oppositely inclined set in order to give a resultant spiral swirl in one or other direction. If all the spiral or helical passages are inclined in the same direction the amount passing through the two sets is immaterial.

The air drawn through the choke by the suction of the engine will draw liquid through the helical grooves and passages within the nozzle thus causing spiral or helical streams of fuel inclined in the same or opposite directions to converge and meet within a conical or converging chamber 16 at the end of the nozzle and thus issue as a homogeneous spray of completely atomized particles whereby each particle is surrounded by its requisite quantity of air. Particles coming in contact with the air are vaporized, thus producing a homogeneous air-fuel mixture.

The outside of the conical nozzle is preferably provided with threads, grooves, steps, or other devices so as to create a slight turbulence in the air as it passes through the choke just in the region of the orifice of the nozzle, and any usual means for warming the air before passing the jet may be employed. Further, the air may be given a swirling motion by means of vanes or the like before coming in contact with the fuel.

The tubes or ducts 14 may be in the form of vanes or the like so as to present a large superficial area to the hot air passing through the choke or induction pipe, the heated vanes heating the fuel passing therethrough and also imparting a swirling movement to the said air. Each vane may have one or a plurality of passages. The vanes also give a swirling motion to the air.

The induction pipe is provided with a butterfly valve 23 and a smaller orifice 24 is provided just above the valve for idling on petrol which is supplied from a float chamber 25 fed from a petrol pipe 26 and having a float 27 with a valve as usual. The orifice 24 is connected by a duct 28 having a jet therein to the float chamber 25 to draw up petrol when the valve 23 is closed.

Just below the valve when closed a second orifice 30 is provided which is connected to the tube and jet 28 or to a separate tube and jet, if desired, to form a suitable bridging device so that, on opening the throttle sufficient petrol is given to carry over the engine until heavy fuel is being taken in sufficient quantities from the jet or nozzle 19 to keep the engine running freely.

In the induction pipe 13 above the valve 23 is provided an automatic spring loaded valve 31 which opens automatically to admit air into the induction pipe and thence to the cylinders by the vacuum created when the throttle valve 23 is suddenly closed and the engine is running at speed. This prevents the engine drawing on the mixture and fuel. The air is preferably heated by any suitable means.

Surrounding the lower portion of the heavy fuel carburetor chamber 1 is a heating jacket 32 which is connected to the bottom of the induction pipe so that no air can be drawn therethrough without passing through the said jacket 32. The end of the jacket is connected by a pipe 33 to an exhaust heater 34. The pipe 33 is provided with a sleeve 35 which has orifices therein which by turning can be made to coincide with orifices in the pipe 33 so as to admit unheated air if desired. Further a strangler valve 36 is provided for starting purposes.

The heater 34 has a number of vertical tubes 37 through which the exhaust gases pass while the air enters through a number of perforations 38 in the plate 39 and passes through the spaces between the tubes into the pipe 33. The exhaust gases pass away through the pipe 40.

It is to be noted that the fuel entering the turbulence chamber 15 is already mixed with a certain amount of air and that this mixture which is given a pre-spiralling motion or pre-turbulence is then given a further spiralling motion by the atomizing disc 18 so that it issues into the area of reduced pressure around the choke tube having a spiral or helical direction of discharge whereby it is evenly spread all over the area of the induction pipe as a homogeneous spray of completely atomized particles whereby each particle is surrounded by its requisite amount of air for complete combustion. Particles coming in contact with the heated air are vaporized thus producing a homogeneous air-fuel mixture.

If desired, the heavy fuel may be admitted to the chamber 15 without the admixture of air by shutting off the tube 7.

According to a modification the atomizing disc may be omitted and the turbulence or spiralling, or both, of the fuel may be produced by the arrangement of tubes 14.

In accordance with another modification for light fuels the heavy fuel chamber is removed and petrol is taken direct to the chamber 15 without passing through the tubes 14, which are eliminated. No air is mixed with the fuel but it is given a spiral or helical direction of flow as it issues into the area of reduced pressure in the choke tube.

Although the turbulence chamber has been illustrated as being situated axially of the choke tube it may, if desired, be situated in other positions.

It is found that paraffin and even Diesel oil and other heavy grade fuels are completely atomized by the carburetor made according to my invention and that an ordinary engine designed to run on petrol will run successfully on the air-fuel supplied by it.

It is to be noted that in all cases the fuel is given turbulence with or without a spiral or helical direction of flow prior to issuing from the jet or nozzle into the choke tube where the area surrounding the jet is below the pressure of the atmosphere due to the suction of the engine.

It is further to be noted that the fuel issues from the jet or nozzle into the choke tube as a series of very fine particles of uniform size and uniformly distributed through the choke thus enabling the requisite quantity of air to surround each particle prior to being converted into a homogeneous gas containing the correct proportion of air.

What I claim is:—

1. A carburetor for internal combustion engines for atomizing heavy fuel comprising in combination two float chambers one for heavy and one for light fuel, a choke tube, a turbulence chamber situated in said choke tube, a jet at the end of said chamber, an annular passage around said choke tube, tubes leading from said passage across the said choke tube to said turbulence chamber, ducts connecting said annular passage to said heavy fuel float chamber, means at the end of said turbulence chamber for giving a spiral or helical direction of flow to said fuel prior to issuing from said jet into said choke tube, and means for atomizing said light fuel.

2. A carburetor for internal combustion engines for atomizing heavy fuel comprising in combination two float chambers one for heavy and one for light fuel, a choke tube, a turbulence chamber situated in said choke tube, a jet at the end of said chamber, an annular passage around said choke tube, tubes leading from said passage across the said choke tube to said turbulence chamber, ducts connecting said annular passage to said heavy fuel float chamber, means for mixing air with said heavy fuel prior to entering the turbulence chamber and a contracting chamber at the end of said turbulence chamber ending in an orifice, said tubes being arranged to impart turbulence and a spiral or helical direction of flow to said fuel prior to issuing into said choke tube, and means for atomizing said light fuel.

3. A carburetor for internal combustion engines for atomizing heavy fuel comprising in combination two float chambers one for heavy and one for light fuel, a choke tube, a turbulence chamber situated in said choke tube, a jet at the end of said chamber, an annular passage around said choke tube, tubes leading from said passage across the said choke tube to said turbulence chamber, ducts connecting said annular passage to said heavy fuel float chamber, and means for mixing air with said heavy fuel prior to entering the turbulence chamber, means at the end of said turbulence chamber for giving a spiral direction of flow to said air-fuel mixture prior to issuing into said choke tube, a duct leading from said light fuel float chamber to said induction pipe, a jet in said duct and orifices in said induction pipe connected to said duct for idling and bridging between light and heavy fuel.

4. A carburetor for internal combustion engines for atomizing heavy fuel comprising in combination two float chambers one for heavy and one for light fuel, a choke tube, a turbulence chamber, situated in said choke tube, a jet at the end of said chamber, an annular passage around said choke tube, tubes leading from said passage across the said choke tube to said turbulence chamber, ducts connecting said annular passage to said heavy fuel float chamber, means for heating said heavy fuel and for supplying heated air to said choke tube, means at the end of said turbulence chamber for giving a spiral or helical direction of flow to said fuel prior to issuing from said jet, and means for atomizing said light fuel.

5. A carburetor for internal combustion engines for atomizing heavy fuel comprising in combination two float chambers one for heavy and one for light fuel, a choke tube, a turbulence chamber situated in said choke tube, a jet at the end of said chamber, an annular passage around said choke tube, tubes leading from said passage across the said choke tube to said turbulence chamber, ducts connecting said annular passage to said heavy fuel float chamber, means for heating said heavy fuel and for supplying heated air to said choke tube, a disc-like member at the end of said turbulence chamber having helical passages therein for giving a spiral or helical direction of flow to said fuel prior to issuing from said jet, and means for atomizing said light fuel.

6. A carburetor for internal combustion engines for atomizing fuel, comprising in combination a float chamber, a choke tube, a turbulence chamber in said choke tube, a duct leading from said float chamber to said turbulence chamber, means for imparting a spiral or helical direction of discharge to a plurality of streams of fuel from said turbulence chamber, means for imparting an opposite spiral or helical direction of discharge to a plurality of other streams of fuel from said turbulence chamber, and a converging chamber wherein said streams converge and meet prior to issuing into said choke tube.

7. A carburetor for internal combustion engines for atomizing fuel, comprising in combination a float chamber, a choke tube, a turbulence chamber in said choke tube, a duct leading from said float chamber to said turbulence chamber, a converging chamber having a jet opening substantially centrally into said choke tube, a disc-like member situated at the junction of said converging chamber and said turbulence chamber, a plurality of holes in said disc inclined in one direction, and a plurality of other holes in said disc inclined in the opposite direction, adapted to give a resultant spiral or helical swirl to the fuel prior to issuing from said jet.

8. A carburetor for internal combustion engines for atomizing fuel, comprising in combination at least one float chamber, a choke tube, a turbulence chamber situated in said choke tube, an annular passage around said choke tube, tubes leading from said passage across the said choke tube to said turbulence chamber, ducts connecting said annular passage to said float chamber, a converging chamber situated at the end of said turbulence chamber, a jet at the end of said converging chamber, a disc-like member situated at the junction of said converging and turbulence chambers, and two sets of passages in said disc-like member inclined in opposite directions, the flow of fuel through said passages being unequal in order to produce a spiral or helical direction of flow to said fuel prior to issuing from said jet.

9. A carburetor for internal combustion engines for atomizing light fuel comprising in combination a float chamber, a choke tube, a turbulence chamber in said choke tube, a converging chamber at the end of said turbulence chamber, a duct leading fuel to said turbulence chamber, a disc-like member situated between said chambers, and two sets of helical passages inclined in opposite directions in said disc-like member, said converging chamber converging to an orifice issuing into said choke tube.

10. A carburetor for internal combustion engines including in combination at least one float chamber, a turbulence chamber connected to said float chamber, an induction pipe, a choke tube situated in said induction pipe and surrounding said turbulence chamber, means for heating the fuel in said float chamber and for supplying heated air to said induction pipe,

means for imparting a spiral or helical direction of discharge to a plurality of streams of fuel from said turbulence chamber, means for imparting an opposite spiral or helical direction of discharge to a plurality of other streams of fuel from said turbulence chamber, and a converging chamber wherein said streams converge and meet prior to issuing into said choke tube.

11. A carburetor for internal combustion engines including in combination at least one float chamber, a turbulence chamber connected to said float chamber, an induction pipe, a choke tube situated in said induction pipe and surrounding said turbulence chamber, means for heating the fuel in said float chamber and for supplying heated air to said induction pipe, a converging chamber having a jet opening substantially centrally into said choke tube, a disc-like member situated at the junction of said converging chamber and said turbulence chamber, a plurality of holes in said disc inclined in one direction, and a plurality of other holes in said disc inclined in the opposite direction, adapted to give a resultant spiral or helical swirl to the fuel prior to issuing from said jet.

12. A choke tube, a turbulence chamber, a contracting chamber in communication with said turbulence chamber, a disc-like member situated between said two chambers, two sets of helical apertures inclined in opposite directions situated in said disc-like member through which streams of fuel pass to impinge on one another, and an orifice at the end of said contracting chamber through which the fuel issues into said choke tube with a resultant swirl.

PETER CAMERON.