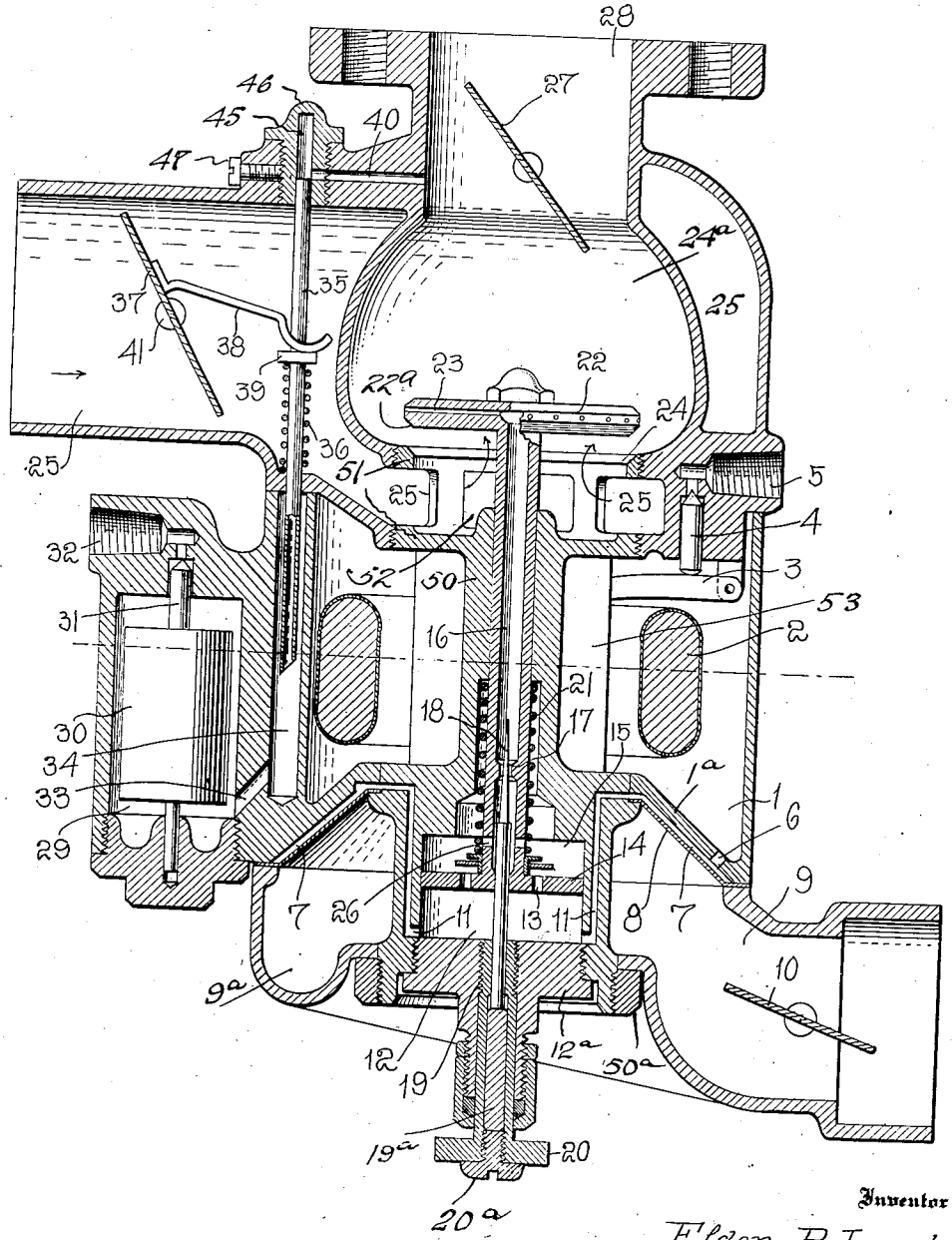
E. P. LAMB.

CARBURETER.

APPLICATION FILED JUNE 7, 1918.

1,376,343.

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CARBURETER.

1,376,343. Specification of Letters Patent. Patented Apr. 26, 1921.

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To all whom it may concern:

Be it known that I, ELDEN P. LAMB, a citizen of the United States, residing at Camden, in the county of Knox and State of Maine, have invented certain new and useful Improvements in Carbureters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to carbureters designed for use with internal combustion engines.

The general object of the invention is to use a light or highly volatile liquid fuel for starting and subsequently discontinue the use of the light fuel and substitute a heavy fuel for continuing the operation of the engine.

With this and other more specific objects in view the invention comprises certain novel constructions, combinations and arrangements of parts, as will be hereinafter more fully described and claimed.

The drawing shows a vertical sectional view through the carbureter.

This improved carbureter comprises, as an entirety, a casing having a mixing chamber, two fuel reservoirs, one for light and one for heavy fuel, a passage for air to be carbureted, said passage conducting the air laterally into the upper portion of the casing and through an air inlet in the lower part of the mixing chamber, a choke valve for the air passage and a means controlled by the choke valve for admitting the light fuel to the mixing chamber above the air inlet or for cutting off the supply of light fuel from said mixing chamber according to the extent to which the choke valve is opened; also a means for atomizing or delivering the heavy fuel in a multiplicity of jets, or fine spray, within the air current entering the mixing chamber, and a heat interchanging apparatus for heating said heavy fuel prior to its entering into the spraying or atomizing means.

In the preferred embodiment illustrated, the casing of the carbureter comprises three principal parts: (1) An upper part inclosing the mixing chamber and air inlet passage; (2) a middle part containing the fuel reservoirs; (3) a lower part comprising a chamber for receiving hot gas, preferably gases of combustion from the engine exhaust. The three principal parts referred to are clamped together by a central tubular body passing completely through the member containing the hot gas or heat interchanging chamber and the fuel reservoirs-containing member, said tubular body being threaded into the part containing the mixing chamber, and carrying a threaded nut on its lower end by which the said three principal parts may be clamped together. The middle part of the casing comprises a reservoir 1, intended to contain fuel oil of the heavier type, and incloses a float 2, controlling a lever 3, which actuates a needle valve 4 adapted to regulate the flow of the fuel oil through the inlet 5, from a source of supply into the reservoir 1. Within the upper part or member of the casing is a mixing chamber 24^a from which an outlet 28 for carbureted air leads to the manifold of the engine, and within the outlet 28 is the usual throttle valve 27.

The fuel reservoir 1 is formed in a separate casting having a central opening and a frusto-conical bottom 1^a. Within a central opening in the member containing the reservoir 1 is a tubular body 50, having threaded flanges 51 by which said tubular body is secured to the upper member of the casing, equally spaced lateral openings 52 between said flanges, and longitudinal stiffening ribs 53. The lower portion of the tubular body 50 extends below the bottom of the reservoir 1 and is chambered as indicated at 12 and 15 constituting a fuel chamber exterior of the reservoir 1, adapted to be heated by hot gases. Below the frusto-conical bottom 1^a of the reservoir 1, parallel therewith, and lying closely adjacent thereto, is a thin wall 8, formed, preferably, of metal of high heat conductivity and spaced from the frusto-conical bottom 1^a so as to confine a thin film of fuel entering from said reservoir 1, through an opening 6, the space between the wall 8 and the frusto-conical bottom 1^a, constituting a film chamber 7 for heavy fuel. From the film chamber 7 ducts 11 lead through the wall of the extension on the tubular member 50 into the said chamber 12.

Surrounding the lower portion or extension of the tubular member 50 containing the chambers 12, 15, is a chamber 9^a, for heated air or gases, that may be received

through the conduit 9, which is controlled by the butterfly valve 10. The shell of the chamber 9^a may be secured in place, as previously stated, by a nut 50^a threaded onto the lower end of the tubular member 50.

Slidably guided within the bore of the tubular member 50 is a hollow stem 16 having at its lower end within the chamber 12, 15, a piston 14 provided with orifices 13, and at its upper end an atomizing valve 22 having a conical surface or seat 22^a adapted to fit upon a corresponding conical seat 24 on the upper end of said tubular member 50. Opening just above the conical surface 22^a in the said valve 22 is a series of radial ducts 23 which communicate with the upper end of the bore in the hollow stem 16, the lower end of said bore in the hollow stem 16 opening into the space 15 above the piston 14 by means of lateral orifices 26. A spring 21 surrounding the stem 16 bears upon piston 14 and tends to force the piston 14, stem 16 and valve 22 downward, normally causing the valve to seat. In operation, hammering of the valve is prevented by the perforated piston 14, acting in conjunction with the chamber 12, 15, as a dash pot.

Threaded into the bottom of the tubular member 50 is a large plug 12^a, and threaded centrally in said plug 12^a is an adjusting member 19 having a knurled head 20. The adjusting member 19 is bored and counterbored. A needle valve or metering valve 18 is seated in the bore of member 19 and projects upward into the stem 16, the stem of said needle valve fitting snugly the bore in the lower end of the hollow stem 16. The upper end of said valve constitutes a long tapering portion that coöperates with the constriction 17 in the said stem. The lower end of the needle valve rests upon a plug 19^a within the counterbore of the member 19, said plug being supported by a screw 20^a.

Fuel admitted from the reservoir 1 through the orifice 6 into the chamber 7 spreads out in a thin film, and when the engine is running is constantly in contact with the hot metallic layer 8 heated by exhaust gases filling the heating chamber 9^a. Thus heat is interchanged between the hot gases in the chamber 9^a and the thin film of fuel in the chamber 7. The fuel so heated finds its way through the ducts 11 into the space 12 beneath the piston 14 and is drawn up through the orifice 13 in the piston 14 into the space 15 and thence into the interior of the stem 16, through the lateral orifices 26, past the constriction 17 around the tapering end of the needle valve 18 and out through the ducts 23 into the mixing chamber 24^a; the air current, drawn through the air inlet 25 by the suction of the engine, passing through the orifices 52 in the sides of the tubular member 50 and up through the air inlet into the mixing chamber 24^a past the ends of the radial ducts 23 in the valve 22. The air passage 25 completely surrounds the upper end of the tubular member 50 so that air enters through the evenly spaced orifices therein from all sides. The heated fuel is thus thoroughly mingled with air and passes on to the engine.

The construction thus far described bears a general similarity to the construction shown in United States Patent No. 1,257,888 issued to the applicant but is new in certain details that are hereinafter claimed.

The hot gases used for heating the film of heavy oil or other fuel in the chamber 7 and in the chamber 12, 15, which is surrounded by the chamber 9^a, are intended to be extracted from the burned gases exhausted from the motor. At starting, therefore, it is desirable to employ a lighter fuel, more easily vaporized when cold. For this purpose the auxiliary chamber 29 is employed, said chamber containing the float carrying a needle valve 31 controlling the inflow of the lighter fuel through the opening 32.

The auxiliary chamber 29 communicates by means of a duct 33 with a tubular chamber 34, so that, normally, the lighter fuel from the chamber 29 fills the tubular chamber 34 to the same level as the fuel maintained in the reservoir 29. The member containing the chambers 29 and 34 may be formed, preferably, integral with the walls of the chamber 1.

Passing transversely through the air conduit or passage 25, hitherto referred to, and which extends laterally from the upper member of the casing, is a slidable tube 35, held, normally, yieldingly upward by the spring 36 so that the lower end of the tube 35 is not immersed in the fuel in the tubular chamber 34. A choke valve 37 in the air conduit or passage 25 is mounted on a shaft 41 and carries an arm 38 which bears upon a collar 39 on the tube 35 so that as the choke valve 37 is closing it depresses the tube 35 until the lower end of said tube is immersed in the lighter oil or fuel in the tubular chamber 34. The upper end of the tube 35 is slidably mounted in a passage 45 in plug 46, which is held in position by a screw 47. Extending at right angles to the passage 45 is a passage 40 opening into the mixing chamber or the conduit 28 adjacent its connection with the mixing chamber 24^a, and between the air inlet and the engine intake. The tube 35 is slidably mounted in the passage 45 in such manner, and is of such length that, when depressed by the actuation of the choke valve 37, it opens the passage 40 and thereby establishes communication between the fuel in the tubular chamber 34, and the passage 28 to the engine manifold, above the air inlet to the mixing

chamber, by way of the tube 35, which is open at both ends.

When the tube 35 is depressed against the tension of the spring 36, the passage of the air through the conduit 25, mixing chamber 24^a, and vapor passage 28, into the engine cylinder, due to the suction of the piston draws the light fuel upward through the tube 35 and passage 40 where it commingles with the air passing through the mixing chamber and passage 28. The choke valve 37 is adapted to be manually controlled. It is customary in the starting of a motor to approximately close the air intake passage for the purpose of producing a richer mixture of air and fuel passing to the motor, and the action of closing, or partially closing, the choke valve serves to depress the tube 35 into the lighter fuel and to thereby provide an easily ignitible mixture for starting. As the motor gains speed, the choke valve is opened, which raises the tube 35 out of the lighter oil, the motor having by this time generated sufficient heat in the exhaust for heating the heavier fuel, and the motor from this time on is supplied with the heavier fuel previously heated.

By the described means it will be seen that the supply of the light oil at starting, the cutting off of the light oil, and the supplying of the heavier oil, are accomplished by only the manipulation of the usual means employed for controlling the supply of air through a carbureter as ordinarly employed.

Having described the invention in such manner as to enable those skilled in the art to which it appertains to make and use the same, what I claim is:

1. A carbureter having a fuel reservoir, a mixing chamber, an air inlet for the mixing chamber, a fuel port opening into the mixing chamber, a choke valve for controlling the quantity of air admitted to the mixing chamber, a fuel duct having one end adapted to be submerged in the fuel of the fuel reservoir, and a connection between the choke valve and said duct constructed and arranged to establish communication between the fuel in the fuel reservoir and the mixing chamber in response to movement of the choke valve toward closing position, and to cut off said communication in response to movement of the choke valve toward open position.

2. A carbureter having a fuel reservoir, a mixing chamber, an air inlet for the mixing chamber, a fuel port opening into the mixing chamber, a choke valve for controlling the quantity of air admitted to the mixing chamber, a fuel duct having one end adapted to be submerged in the fuel of the fuel reservoir, and a connection between the choke valve and said duct constructed and arranged to submerge one end of said duct in the fuel of the fuel reservoir in response to movement of the choke valve toward closing position, and to withdraw the end of said duct from the fuel in said fuel reservoir in response to movement of the choke valve toward open position.

3. A carbureter having a fuel reservoir, a mixing chamber, an air inlet for the mixing chamber, a fuel port opening into the mixing chamber, a choke valve for controlling the quantity of air admitted to the mixing chamber, a fuel duct comprising a slidable tube open at both ends and adapted to have its lower end immersed in the fuel of the fuel reservoir and thereby establish communication between the fuel in the reservoir and the fuel port opening into the mixing chamber, coöperating means on the sliding tube and the choke valve whereby movement of the choke valve into closing position slides said tube so that its end dips into the fuel of the reservoir and establishes communication between said fuel and the mixing chamber and whereby movement of the choke valve toward open position causes the tube to rise from the liquid and cut off such communication.

4. A carbureter having a fuel reservoir, a mixing chamber, and air inlet for the mixing chamber, a fuel port opening laterally into the mixing chamber, a passage intersecting said fuel port, a tube slidable in said intersecting passage and having its lower end adapted to be immersed in the fuel of the fuel reservoir, said tube having its opposite ends open, a choke valve for controlling the quantity of air admitted to the mixing chamber, and mechanical connections between the choke valve and said tube constructed and arranged so that movement of the choke valve toward closing position causes the said sliding tube to move its lower end into the fuel of the fuel reservoir and its other end to open the lateral duct leading into the mixing chamber, and whereby movement of the choke valve toward open position causes a reverse movement of said tube and a cutting off of communication between the fuel in the fuel reservoir and the mixing chamber.

5. A carbureter having a mixing chamber, a fuel reservoir, an air inlet port at the lower side of said mixing chamber, an air passage extending laterally and communicating with said air inlet port, a fuel inlet passage to the mixing chamber extending laterally and discharging into the mixing chamber above the air inlet port, a passage intersecting the said fuel inlet passage, a fuel conducting tube slidable in said passage that intersects the laterally extending fuel passage into the mixing chamber and is adapted to open and close it, said fuel conducting tube extending transversely through the laterally extending air passage and into the fuel reservoir, a choke

valve in the air passage, and a connection between the choke valve and the slidable fuel conducting tube of such character that closing movement of the choke valve causes the tube to descend into the fuel of the reservoir and open the fuel passage into the mixing chamber, and opening movement of the choke valve causes the tube to rise out of the fuel in the fuel reservoir and close the fuel passage into the mixing chamber.

6. A carbureter having a mixing chamber and a fuel reservoir, an air inlet port in the mixing chamber, an atomizing valve having a normal tendency to close said air inlet, said atomizing valve having a tubular stem provided with a fuel inlet arranged to dip into the fuel in said fuel reservoir, radial passages in the valve adapted to discharge fuel into the air passing through said inlet port, said tubular stem having a constricted portion in its bore, a tapering fuel metering valve entering the lower end of said hollow stem and coöperating with said constricted portion so as to increase or decrease the size of the fuel passage through said stem according as the said atomizing valve ascends or descends in response to the movements of an engine.

7. A carbureter having a mixing chamber provided with an air inlet port, a tubular member coaxial with the inlet port, said tubular member having lateral ports equally spaced below said inlet port, an air conduit surrounding said tubular member and ports and communicating with an air passage extending laterally from the chamber, an atomizing valve having a tendency to close said inlet port, said valve having a hollow stem adapted to receive fuel, and radial passages extending from the bore of said stem to the edge of the valve.

8. A carbureter having a mixing chamber and a main fuel reservoir provided with a reëntrant frusto-conical bottom, a central chambered member depending below said conical bottom and partially surrounded by it, a thin heat conducting wall spaced from the lower side of said frusto-conical bottom and so arranged as to confine a film of fluid fuel, means to admit fuel from the main reservoir into the film confining space, means to admit fuel from the film confining space into the central chambered member, a hot gas chamber surrounding the central chambered member, the thin heat conducting wall constituting a portion of the wall of said hot gas chamber, and means whereby heated fuel in the central, exterior chamber, may be drawn into the mixing chamber.

9. A carbureter having a mixing chamber provided with an air inlet port, a main fuel reservoir, and a central chambered member depending beneath the fuel reservoir, passages adapted to conduct the fuel from the main reservoir to the said chambered member, an atomizing valve adapted to control the air inlet port to the mixing chamber, said atomizing valve having a central hollow stem provided with a piston at its lower end adapted to fit said central depending chamber, said piston having a passage to permit fluid to pass from one side of it to the other and said stem having a fuel inlet communicating with said chamber.

10. A carbureter comprising a casing having a mixing chamber, and separate fuel reservoirs, a lateral air passage leading to an air inlet port in the mixing chamber, means for conducting fuel from one of said reservoirs into the mixing chamber and atomizing it, means for heating said fuel by hot gases during its passage into the said fuel conducting means, a fuel duct leading from another fuel reservoir to the mixing chamber above the air inlet port, a choke valve in the lateral air passage, and connections between the choke valve and fuel duct responsive to the closing movement of the choke valve to effect communication between the fuel and the mixing chamber, and responsive to an opening movement of said valve to cut off communication between said fuel and mixing chamber.

11. A carbureter comprising a casing having a mixing chamber and separate fuel reservoirs, a lateral air passage leading to an air inlet port in the mixing chamber, means for conducting fuel from one of said reservoirs into the mixing chamber, a fuel duct leading from another fuel reservoir to the mixing chamber above the air inlet port, a choke valve in the lateral air passage, and connections between the choke valve and fuel duct responsive to the closing movement of the choke valve to effect communication between the fuel and the mixing chamber, and responsive to an opening movement of said valve to cut off communication between said fuel and mixing chamber.

In testimony whereof I affix my signature.

ELDEN P. LAMB.