No. 816,669. PATENTED APR. 3, 1906.

E. B. LUDWIG.

CARBURETING LAMP.

APPLICATION FILED FEB. 6, 1903. RENEWED SEPT. 5, 1905.

2 SHEETS—SHEET 1.

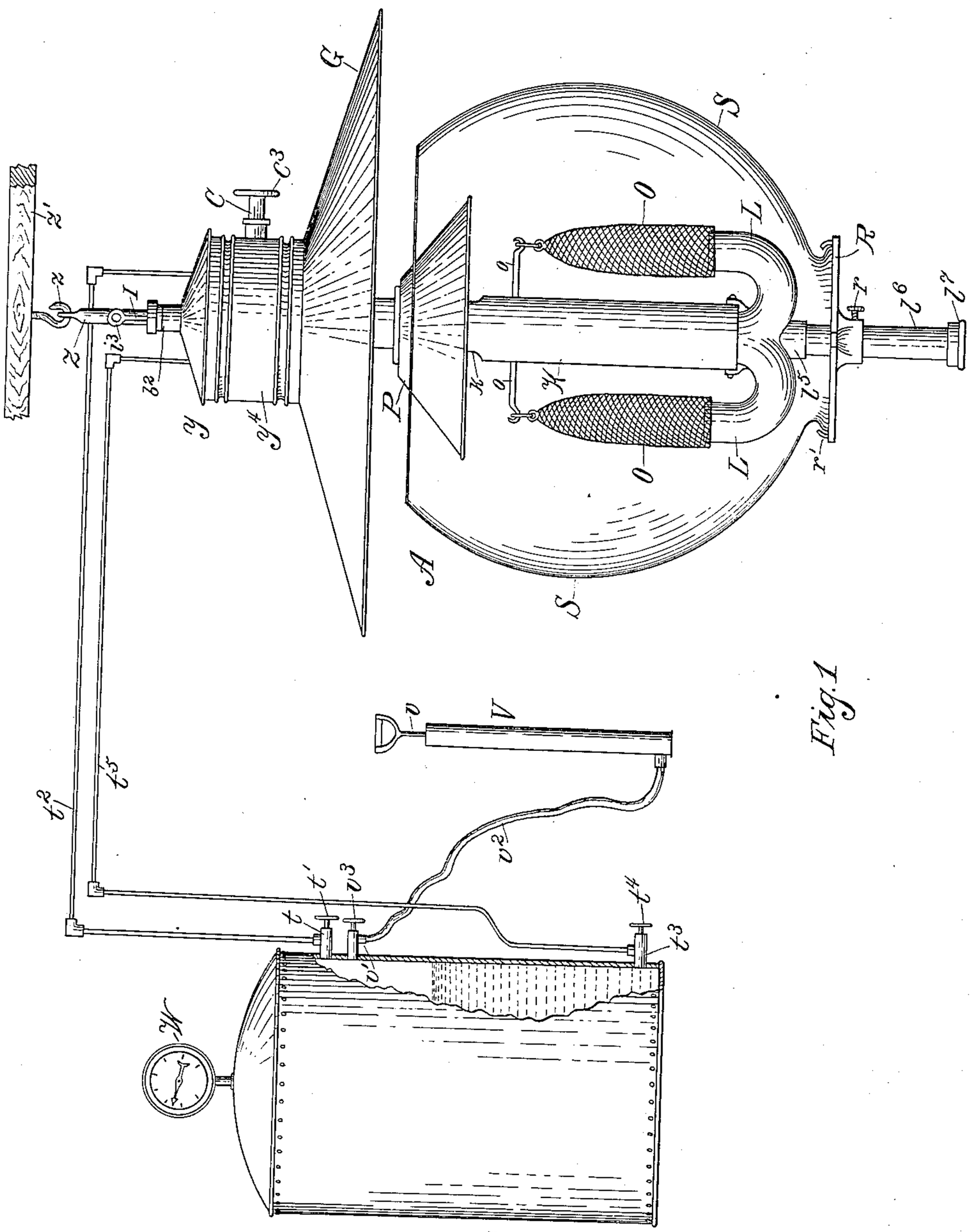

Fig. 1

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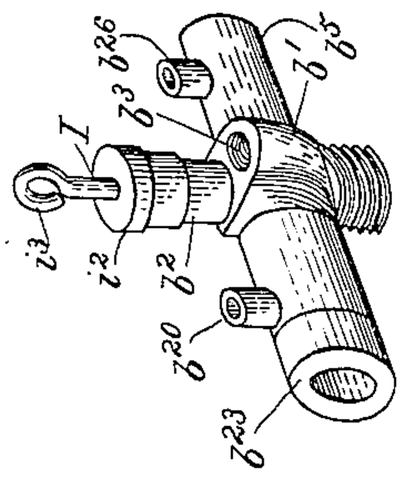

Fig. 4.

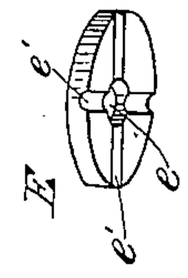

Fig. 5.

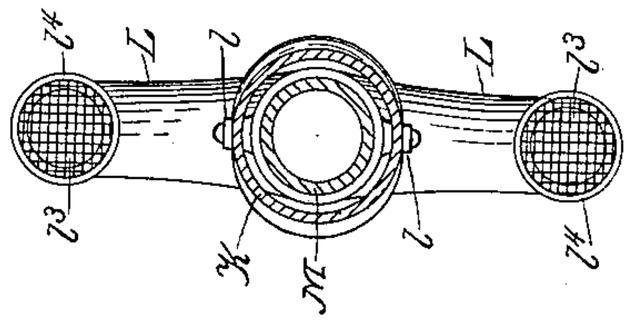

Fig. 6.

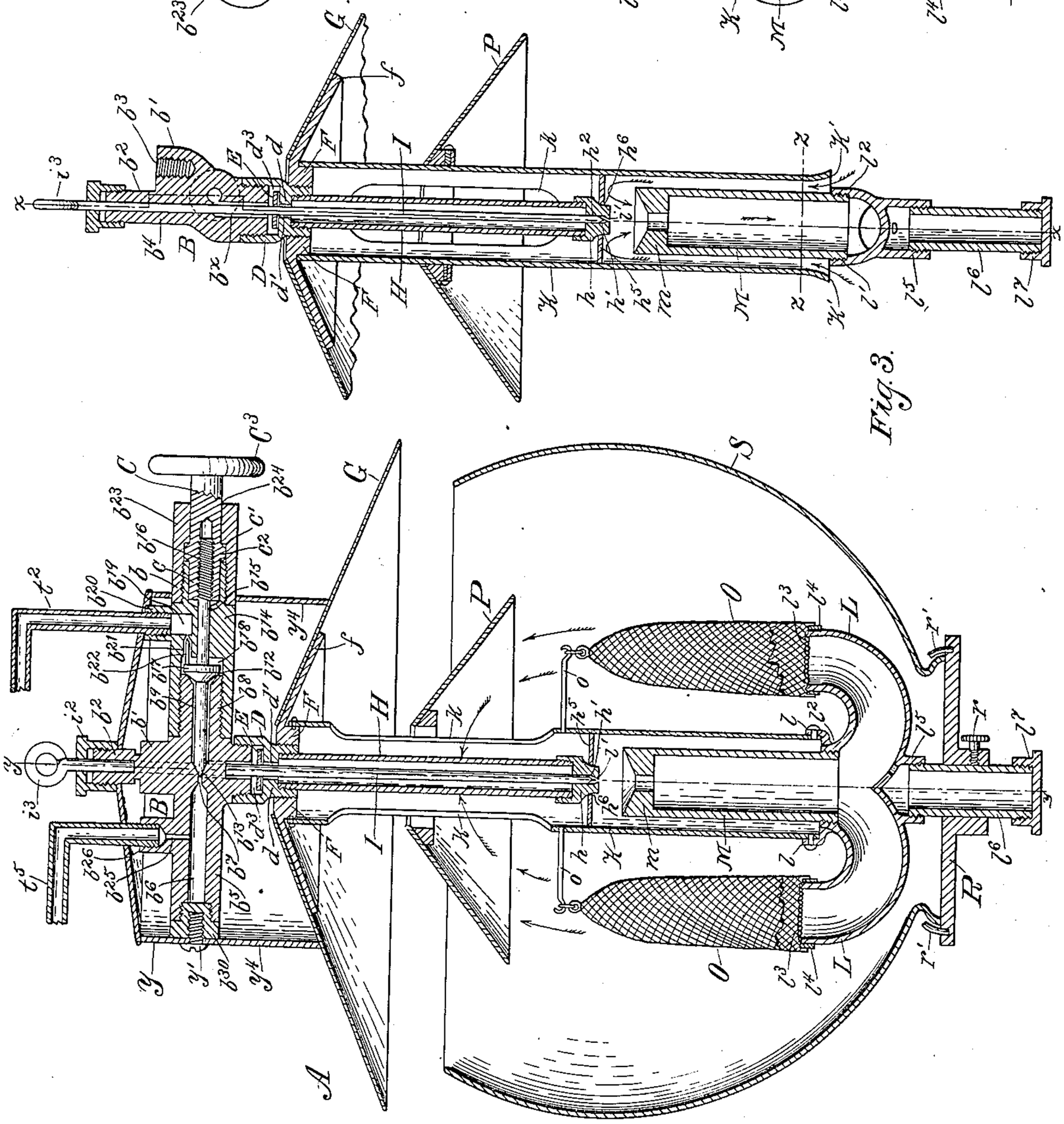

Fig. 3.

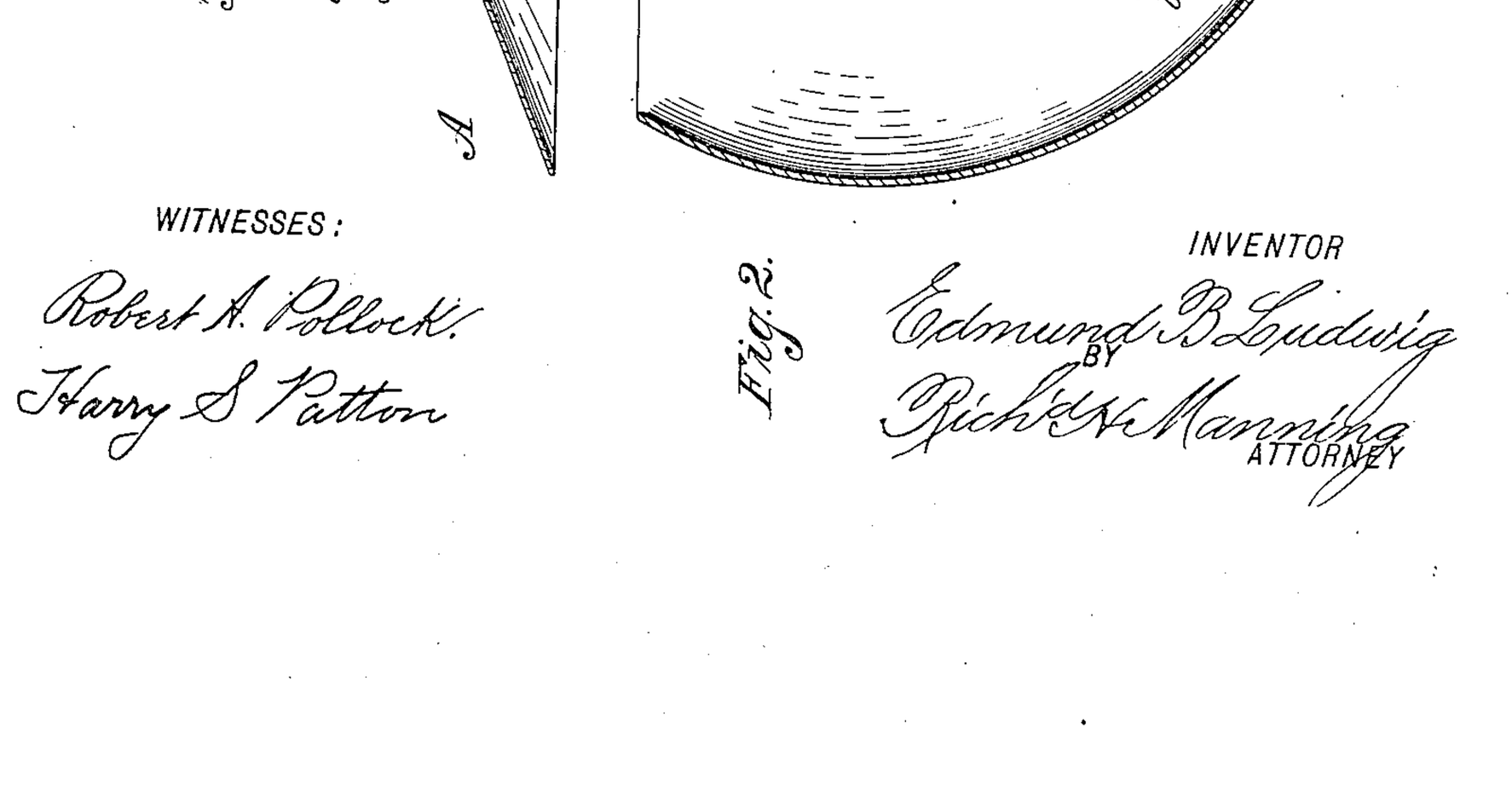

Fig. 2.

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EDMUND B. LUDWIG, OF KANSAS CITY, MISSOURI.

CARBURETING-LAMP.

No. 816,669. Specification of Letters Patent. Patented April 3, 1906.

Application filed February 6, 1903. Renewed September 5, 1905. Serial No. 277,007.

To all whom it may concern:

Be it known that I, EDMUND B. LUDWIG, a citizen of the United States of America, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Carbureting-Lamps; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

The objects of my invention are, first, a self-generating lamp for the burning of the hydrocarbons and which is serviceable for the illumination of dwellings, public halls, or thoroughfares; second, to subject the hydrocarbon and the atomizing fluid to opposing pressures and produce thereby a quickly-generated vapor; third, to arrange the valves contorlling the supply of the hydrocarbon and the atomizing fluid in such a manner that the complete cutting off of the former will admit a full supply of the latter, and vice versa; fourth, to enable the generated gas to draw its own supply of free air for combustion; fifth, to divert the heat from the gas in combustion to the gas-generator.

The invention consists in the novel construction and combination of parts, such as will first be fully described and then specifically pointed out in the claims.

In the drawings, Figure 1 is a side view of the novel self-generating gas-lamp embodying my invention shown in an elevated suspended position, also showing the pressure-tank for the hydrocarbon, the supply-pipes for the compressed air and the hydrocarbon leading from the tank to the lamp, and the air-compressor. Fig. 2 is a vertical sectional view of the lamp as seen in Fig. 1, the view being taken upon the section-line $x\ x$ of Fig. 3. Fig. 3 is a vertical sectional view of the lamp, taken at right angles to and upon the line $y\ y$ of Fig. 2. Fig. 4 is a detail view in perspective of the hydrocarbon-jet mixer and valve-casing, showing the body portion inclosing the jet or atomizing chamber. Fig. 5 is a detail view of the balance-valve. Fig. 6 is a cross-sectional view of the outer heating and inner downdraft tubes, taken on the line $z\ z$ of Fig. 3.

Similar letters of reference indicate corresponding parts in all the figures of the drawings.

Referring to the drawings, A represents the novel carbureting-lamp. In the upper portion of the lamp is a horizontally-extended jet-mixing casing B, forming a single piece and supporting the valve-casing b, and from which casing the other parts of the lamp are suspended. The main or nearly central portion or body b' of the casing incloses the jet-mixing or atomizing chamber and is of considerable thickness transversely and extends upwardly above the line of the valve-casing and is deflected rearwardly of its vertical axis. Upon the upper end of the body b' of the casing, in line with the forward edge, is a screw-threaded vertical projection b^2. In the body b', in a vertical line with the opening in the projection b^2, is a vertical opening b^4. Upon the upper end of the body b', in rear of the projection b^2, is a vertical screw-threaded opening b^3 to receive the attachment for suspending the lamp, as hereinafter described. Upon one side of the body b' is a horizontally-extended integral portion b^5, which is cored out to form the atomizing or jet tube b^6, extending from its outer end to a position within the body portion b', the axial line of said opening b^6 extending in rear of the vertical opening b^4. The inner end of the opening or atomizing-tube b^6 is decreased in size and terminates in a small atomizing-passage b^7. From the other side of the body portion b' of the casing, extending in an opposite direction to the portion b^5, is an externally-screw-threaded bearing b^8, in which is an opening or tube b^9, nearly of the same size as the opening b^6 and extending from the outer end of the bearing in the direction of said opening, the axial line of the opening b^6 meeting the axial line of the opening b^9. A flanged plug b^{30} closes the opening b^6.

The inner end of the chamber or opening b^9 communicates with the inner end of the opening b^6, the end of said opening b^9 being contracted in size to form a cone-shaped valve-seat b^{13}, which valve-seat is in communication with the opening b^4, said opening b^4 being increased in width downwardly from the valve-seat to form a vapor-receiving chamber, as at $b^\times$, and, as seen in Fig. 3, to afford passage for the vapor around the stem I, hereinafter described. In the outer end of the bearing b^8 is a valve-seat b^{12}. The inner end of the valve-casing b is internally screw-threaded and fitted to the screw-threaded shoulder b^8 and its outer end reduced in size circumferentially and externally screw-threaded. In a central location

to the ends of the valve-casing b is a solid internal part b^{14}, in which is a longitudinal opening b^{15}, through which extends the cone-shaped inner end of the valve-stem b^{16}, which end is seated in the valve-seat b^{13}. The inner end of the stem b^{16} is smaller in size than opening b^{9}, so as to admit the passage of the air around the stem to the valve-seat b^{13}. On said stem b^{16} is a valve b^{17}, integral with the stem, which is seated in the valve-seat b^{12} on the outer end of the bearing b^{8}, and between said valve b^{17} and the solid part b^{14} is a space b^{18} at sufficient width to permit of the rearward movement of the valve. In the upper portion of the valve-casing b and extending downwardly within the solid part b^{14} a short distance is a depression or opening b^{19}, and upon the outer side of the casing, extending around said opening, is an internally-screw-threaded projection b^{20}. In the upper portion of the solid part b^{14} of the casing is a small opening b^{21}, the inner end of the opening b^{21} being contracted in size to form a cone-shaped valve-seat. With the outer side of the valve b^{17} is connected a needle-valve b^{22}, the inner end of which valve extends within the opening b^{21} and to within a short distance of the valve-seat when the valve b^{17} is closed. The outer end of the stem b^{16} is provided with a left-hand screw-thread.

Within the outer end of the valve-casing b extends the inner end c of a stem-operating spindle C, in which is a longitudinal screw-threaded opening c', the threads being left-handed and fitted to receive the left-handed screw-threads of the stem b^{16} and permit of the movement of the inner end of the stem within the spindle C the requisite distance to open the valves b^{17} and b^{16}, the valve b^{22} being already open. Fitted to the outer screw-threaded end of the valve-casing b is a longitudinally-extended cap b^{23}, which is internally screw-threaded to within a short distance of its inner end. In the outer end of the cap b^{23} is an opening b^{24}, through which the inner end of the stem-feeding spindle C extends. On the stem-feeding spindle C, within the cap b^{23}, is an annular projection c^{2}, which occupies the space between the outer end of the valve-casing and the inner end of the cap b^{23} and acts as a packing to prevent the escape of the vapor from the valve-casing. Upon the outer end of the spindle C is a hand-wheel c^{3}. In the upper portion of the horizontally-extended portion b^{5} of the chamber b^{6} is a small-sized opening b^{25}, leading to the opening b^{6} for the passage of the gasolene, and upon the outer side of said portion b^{5}, around said opening b^{25}, is a screw-threaded projection b^{26}. The lower portion b' of the atomizing-chamber is externally screw-threaded and a coupling D fitted thereto, the lower part of the coupling being reduced in size and both internally and externally screw-threaded. Within the coupling D is a diaphragm d, in which is an opening d'. Between the diaphragm and the lower end of the body portion b' of the atomizing-chamber is a chamber d^{3}, in which is a balance-valve E, in which valve is an opening e in a vertical line with the opening d' in the diaphragm d. In the under side of the balance-valve are radial grooves e', which admit of the action of the vapor to raise the valve should the pressure above be in excess of a back pressure, the area of the opening d' in the diaphragm d, through which the vapor passes, being less than the area of the vapor-mixing chamber $b^{\times}$.

Fitted to the external lower end of the coupling D is an annular screw-threaded collar F, upon which is an outwardly and downwardly extended flange f. Secured to the top of the flange f is an outwardly and downwardly extended reflector G, the under surface of which is made to reflect the light downwardly.

With the internal screw-threaded lower end of the coupling D is connected the upper screw-threaded end of the gas-generating tube H, the lower end of which extends downwardly a sufficient distance to receive the heat imparted from the heat of the gas in combustion. The lower end of the gas-generator H is externally screw-threaded, and upon said end is a screw-threaded cap h, having a cone-shaped end h^{2}, in which is a small perforation h' for the escape of the generated gas. Within the opening b^{4} of the body portion b' of the atomizer is a wire-cleaning needle-stem I, the extreme lower end of which needle-stem is reduced in size and extends downwardly within the opening h^{2} in the cap h in generator H, and upon said end is a needle-point i', which extends loosely within the opening h' and acts to permit the passage of the generated gas and to keep the opening free from incrustations. The upper end of the needle-stem I extends a short distance above the projection b^{2} and is provided with a circular enlargement or head i^{3}. Upon the projection b^{2} is a screw-threaded cap i^{2}, through which the stem I passes, the space between the cap and nipple receiving the usual packing to prevent the escape of the vapor.

With the outer side of the collar F is connected the upper end of the heat-tube K, which is several times the circumference of the gas-generating tube H, the lower end of which tube K extends downwardly a considerable distance below the line of the lower end of the gas-generating tube H to provide for the support of the air and gas mixing receiver or tubes L L and the draft-tube M. In the sides of the tube K are the longitudinal openings k k, which admit of the passage of the heat from the lamp to the gas-generator H. These openings k k are upon each side of the tube K and extend from a point

a considerable distance below the collar F downwardly about one-half the distance toward the lower end of the tube and are of the proper width to give free entrance to the heat. Upon the lower end of tube K is secured by the upwardly-extending lugs l l the internally-screw-threaded neck l^2, connected with the air and gas mixing conductor tubes L L, which tubes extend downwardly in opposite directions and their outer ends bent in curved lines and extended upwardly a short distance. The lower end of the tube K is outwardly flaring and provided with passages k' for the entrance of the air. Upon the outer ends of the tubes L L are wire screens l^3 l^3, secured by the bands l^4 to the outer surface of the tubes. Around the bands l^3 extend the lower ends of the mantles O O. The upper ends of the mantles are connected with the horizontally-extended hooks o o, the inner ends of which hooks are connected with the sides of the tube K.

Within the internally-screw-threaded neck l^2 is fitted the lower screw-threaded end of the downdraft-tube M, the upper end of which tube extends upwardly to a position a short distance below the line of the lower end of the gas-generating tube H, and within which end is a ring m, the inner side of which ring is inclined downwardly and inwardly. Above the tube M is a diaphragm h^5, connected with the inner side of the tube K and perforated centrally at h^2 to admit of the partial extension therethrough of the cone-shaped end of the cap h on the lower end of the gas-generating tube H, the diaphragm serving to cause the downdraft of the air in the tube M.

Above the mantles O O and extending from the outer side of the tube K in an outwardly and downwardly inclined direction is a heat-deflecting plate P, smaller in size than the deflecting-plate G directly above. This deflecting-plate is adjustably connected with the tube K and diverts the heat from the mantles O O to the gas-generating tube H. In the under side of the hollow air and gas mixing receiver or tubes L L, in which the air mixes with the gas, is a threaded coupling l^5, in which is fitted the upper end of a short screw-threaded tube l^6, provided with a cap l^7 in its lower end. Supported by the tube l^6 is a globe rest or spider R, which is adjustable on the tube by the screw.

Upon the rest R is a glass globe S, secured by the pins r' from the lateral movement. The globe S is open at the top and bottom, and its top extends upwardly nearly to the inner side of the deflector G.

T represents a closed tank for the reception of gasolene, which may be placed in any safe location and supplied with hydrocarbon to about one-half its capacity. Connected with the upper part and side of the tank is a valve-casing t, in which is a valve t'. With the valve-casing t is connected one end of an air-conducting pipe t^2, the other end of which pipe is fitted within the projection b^{20} on the valve-casing b of the lamp. Upon the side of tank T, near the bottom, is a valve-casing t^3, in which is a valve t^4. With the upper part of valve-casing t^3 is connected one end of a small liquid-conducting pipe t^5, the other end of which pipe extends to and is connected with the projection b^{26} on the extension b^5 of the body b of the atomizing-chamber.

V represents an air-pump for supplying compressed air to the tank T, operated by the plunger v. With the lower end of the pump is connected one end of a hose v^2, the other end of which hose is connected with the side of a valve-casing v', located in the side of the tank a short distance below the valve-casing t, and in which valve-casing v' is a valve v^2. Upon the top of tank T is an air-pressure-indicator gage W.

The body b' of the atomizing-chamber and the valve-casing b are preferably inclosed by a casing Y, the top y of which extends from beneath the cap i^2 and thence outwardly and connected with the vertical sides y^4, which is cylindrical in shape, the lower end of the sides resting upon the upper side of the deflector G. The sides y^4 of the casing Y are secured to the outer end of the horizontal extension b^5 in the plug b^{30} of the atomizing-chamber b' by means of the screw y', which enters the screw-threaded plug in said end of the extension b^5. In the opposite side of the casing Y is an opening y^3, through which the valve-casing b extends. In the screw-threaded opening b^3 in the body portion b' of the atomizing-chamber is inserted the screw-threaded end of a hook z, the upper end of which is secured to an eyebolt Z in the beam z', from which the lamp is suspended.

In operation air is supplied to the tank T by the operation of pump V until pressure upon the hydrocarbon will afford the constant flow of the gasolene for a determinate period of time, the amount of compressed air in pounds being indicated by the gage W. The valve f^3 is then closed and the valve t' t^4 opened, the air passing through pipe t^2 to the opening b^{17} in the valve-casing b and the gasolene or hydrocarbon through pipe t^5 to the opening b^6 in the extension b^5 of the atomizer-chamber. The stem-feeding spindle C being in a slight degree turned to the left, the valve-stem b^{16} opens the valve b^{17} and also opens communication from the chamber b^8 around the stem with the jet-tube b^7 of the atomizer at the same time the needle-valve b^{22} is moved toward the seat b^{20} so far as to not close the opening. The gasolene in the chamber b^6 is forced by the pressure of the air in the tank T through the jet tube or opening b^7 in comminuted quantity or small

drops or jets, which are met by the compressed air and the atoms broken up and a vapor formed of air and gasolene, which passes into the vapor-chamber $b^{\times}$ downwardly, entering the grooves *e* on the under side of the balance-valve E and raising the valve a slight degree, thence passing to the gas-generating tubes H and through the passage h' in the caps *h* through the downdraft-tube M to the gas-mixing conductor-tubes L L. The vapor being ignited in the mantles O O, the heat from the mantles is deflected by the deflector P to the gas-generating tube H, which becoming heated converts the gasolene-vapor into a highly-inflammable gas mixing with the air, the generated gas burning in the mantles with an intensity to afford a strong light of great illuminating power. The heated gas which passes through the tube M causes a suction of the air around the tube K, which passes within the opening k', thence upwardly on the outer side of the downdraft-tube M, thence downwardly within the said tube, affording the necessary oxygen for complete combustion of the gas. As soon as the gas-generating tube becomes heated and the gas generated the spindle C is operated to close the needle-valve b^{22}, and thus check the pressure and supply of the air from the tank T, the air necessary for combustion being drawn within the tube M from the opening *k* and mixed with the gas in the gas-mixing chamber in tubes L L, the upward tendency of the heated air in tube M meeting the diaphragm h^5 is turned downward.

It is obvious that when the light subsides from the lack of supply of the hydrocarbon to be converted into gas the tendency of the operator is to turn the spindle C to the left, so as to admit more hydrocarbon or less air, thus making the proper mixture. If the light flames out at the top of the globe, the tendency of the operator is to close the spindle C, thus admitting less gasolene and more air, and thus making the proper mixture. Normally the needle i' on the needle-stem I is withdrawn from the opening h' in the cap *h* and held by the cap i^2 by friction, and when the opening h' becomes clogged from any reason the stem I is lowered in position, the needle cleaning the opening in the cap *h*. The balance-valve E also regulates the quantity of the vapor necessary to supply the gas-generating tube H. When the pressure from the amount of generated gas in tube H occurs from the heat, the balance-valve E rises and constantly maintains a balance between the downward pressure of the vapor and the back pressure of the gas, and this balance affords the regulation of the quantity of gas necessary for free combustion and an uninterrupted brilliant light.

The invention provides a safe means of house illumination at little cost. The tank T being placed in a safe location, all danger is eliminated. For street illumination the lamp is suspended from any suitable support and the pipes connected in the manner shown. The mode of atomizing the gasolene may be employed for atomizing all liquids with equally satisfactory results, and the valves controlling the vaporizing of the liquid and fluids are adapted to be applied to the ordinary valve-casing for similar purposes.

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

1. In a carbureting-lamp, a casing having a vaporizing-chamber and separate passages for admitting the gaseous and the liquid fuel to the vaporizing-chamber, a valve-stem within said casing and separate valves on said stem conjointly operating with the stem to cut off the supply of the gaseous and liquid fuel from said passages to the vaporizing-chamber and also acting with the stem to cut off the flow of the gaseous and the liquid fuel alternately.

2. In a carbureting-lamp, a valve-casing having a vaporizing-chamber and separate passages in communication with each other for admitting the gaseous and the liquid fuel to the vaporizing-chamber, one of said passages having a valve-seat, a valve-stem having its inner end within the valve-seat, said valve-chamber having a chamber concentric with the valve-stem in communication with the passages for the gas and the vaporizing-chamber, a valve on said stem movable to and fro with the stem in said chamber, and a needle-valve on said latter valve acting alternately therewith to cut off the flow of the gas from the passage for the gas to said chamber.

3. In a carbureting-lamp, the combination with one or more burners, of a gas-generating tube located above the burners and heated thereby, air and gas mixing conductors beneath said tube leading to the burners, a depending tube supporting the air and gas mixing conductors, having openings at the bottom, supports for said tube and a diaphragm within the said supporting-tube through which the lower end of the gas-generating tube extends, and an inner downdraft-tube of smaller diameter leaving a space between the outer and inner tubes, leading to the air and gas mixing conductors.

4. In a carbureting-lamp, a gas-generating tube containing gas under pressure, and air and gas mixing conductor, and a tube supporting said conductor, a support for said tube having openings in the sides thereof, for the admission of heat adjacent to the gas-generating tube, a diaphragm within the said supporting-tube through which the lower end of the gas-generating tube extends, and a downdraft-tube beneath the said diaphragm, leading to the air and gas mixing conductor.

5. A carbureting-lamp comprising a vapo-

rizer for the hydrocarbon, and a gas-generating tube connected with the vaporizer, an air and gas mixing conductor and an air-conducting tube supporting said air and gas mixing conductor, a support for said tube adjacent to the gas-generating tube having openings in the sides thereof for the passage of heat, means for admitting air to the vaporizer under pressure and controlling the supply, and devices on the air and gas mixing conductors for diffusing the light.

6. A carbureting-lamp comprising a vaporizing-case having a chamber for the hydrocarbon, and a jet-opening and a vaporizing-chamber in communication with the jet-opening, a valve-casing having a chamber for air and a valve-seat in communication with the jet-opening and said vaporizing-chamber, a valve-stem and a cone-valve on the said stem controlling the admission of the air, to the vaporizing-chamber, a separate valve on said stem controlling the admission of the air to the air-chamber, a gas-generating tube connected with the vaporizing-chamber having a discharge-opening, a gas and air mixing conductor below the gas-generating tube, a heating-tube supporting the air and gas mixing conductor, and supports therefor having openings between the supports for the admission of heat connected with the vaporizing-case, a mantle on said air and gas mixing conductor, and means for directing the heat of the mantles to the gas-generating tube.

7. A carbureting-lamp comprising a vaporizing-case, having a chamber for the hydrocarbon liquid fuel, and a jet-opening and a vaporizing-chamber in communication with the jet-opening, a valve-casing having a chamber for air, and a valve-seat in communication with the jet-opening and said vaporizing-chamber, a valve-stem and a cone-valve on said stem controlling the admission of the air to the vaporizing-chamber, a separate valve on said stem, controlling the admission of the air to the air-chamber, a gas-generating tube connected with the vaporizing-chamber, said valve-casing having a valve-chamber located between the vaporizing-chamber, and the gas-generating tube and a balance-valve in said chamber, a gas and air mixing conductor below the gas-generating tube, a heating-tube supporting the air and gas mixing conductor and also connected with the vaporizing-case, a mantle on said air and gas mixing conductor, and means for directing the heat from the mantle to the gas-generating tube.

8. In a carbureting-lamp comprising a vaporizing-case having a chamber for the hydrocarbon, and a jet-opening at one end, and a chamber for air having a valve-seat in the other end in communication and in axial line with the jet-opening, and a vaporizing-chamber in communication with the jet-opening and the air-chamber, a valve-casing having an intermediate solid portion and a valve-chamber, a valve-stem having a cone-valve in the valve-seat of the air-chamber and extending through the intermediate solid portion of the valve-casing, a valve on said stem closing the opening to the chamber, said valve-casing having an opening for air to the air-chamber, and a needle-valve on the valve to the air-chamber closing said opening, a gas-generating tube connected with the vaporizing-case and the vaporizing-chamber having a discharge-opening, an air and gas mixing conductor, and a heating-tube, and supporting devices connecting the heating-tube with the vaporizing-case, and lugs connecting the lower end of said case with the air and gas mixing conductor, and a tank for gasolene, and an air-compressor, tubes connected with said tank for conducting the gasolene and compressed air, one of which tubes is connected with the chamber for hydrocarbon, in the vaporizing-case, and the other with the opening in the valve-casing leading to the air-chamber in the valve-casing, and an adjusting device for the valve-stem.

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