No. 672,855. Patented Apr. 23, 1901.

J. M. GOLDSMITH.

CARBURETER.

(Application filed Jan. 26, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

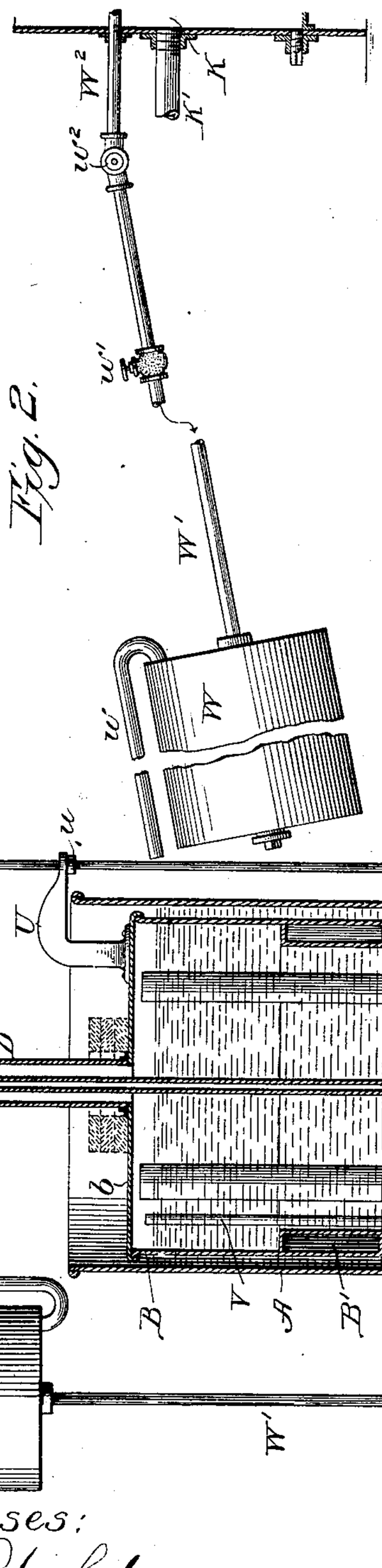

Fig. 1.

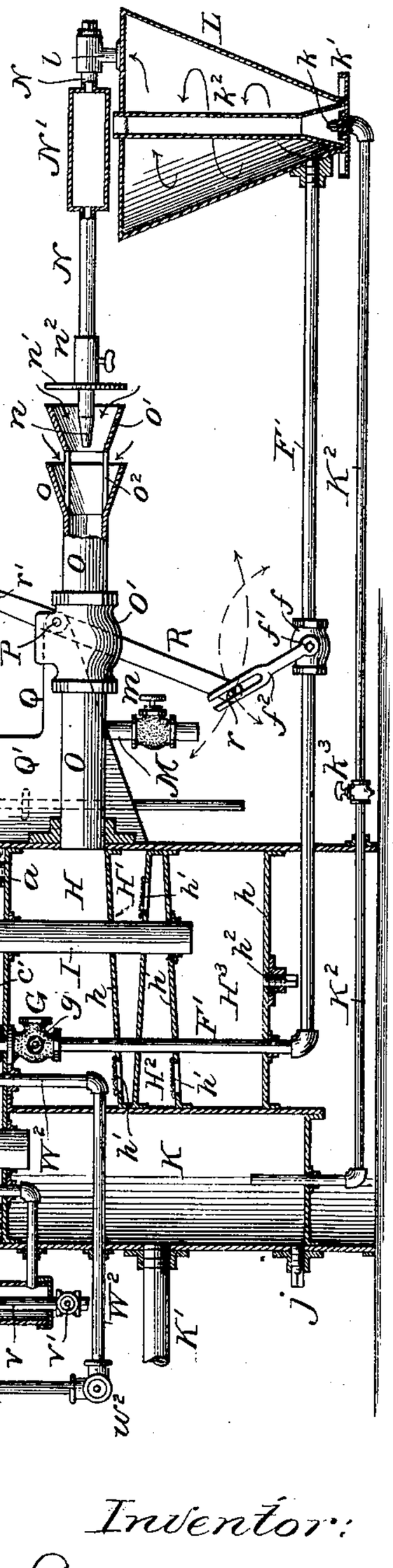

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Fig. 4.

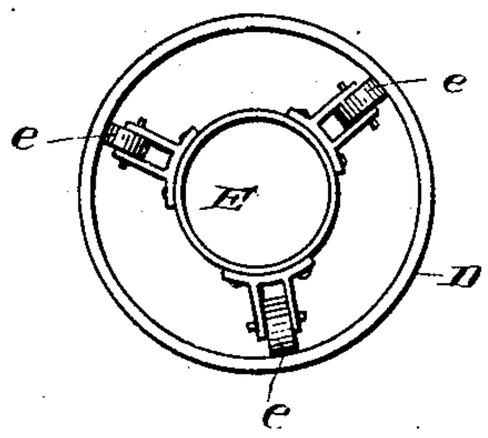


Fig. 3.

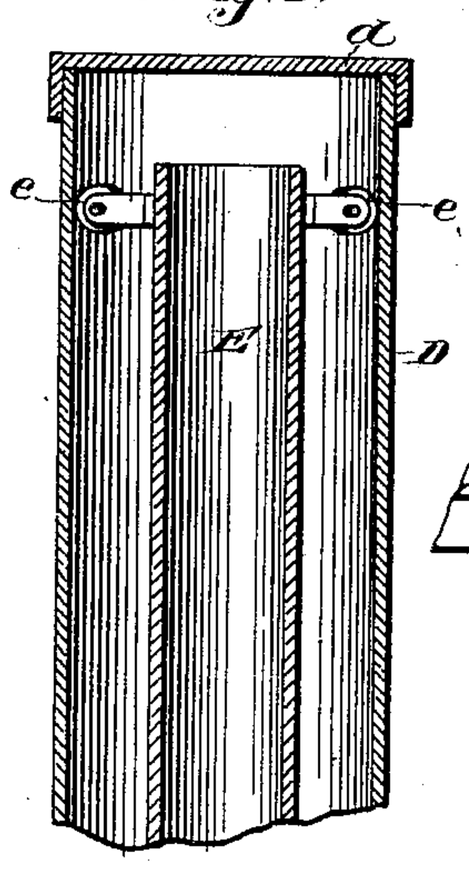


Fig. 5.

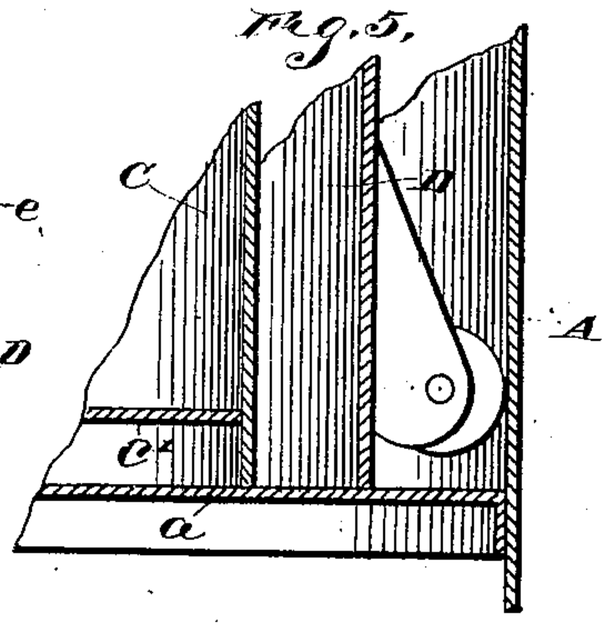


Fig. 8.

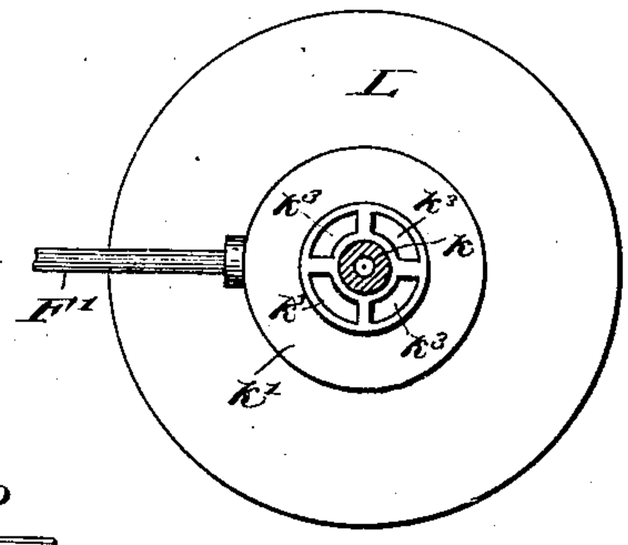


Fig. 6.

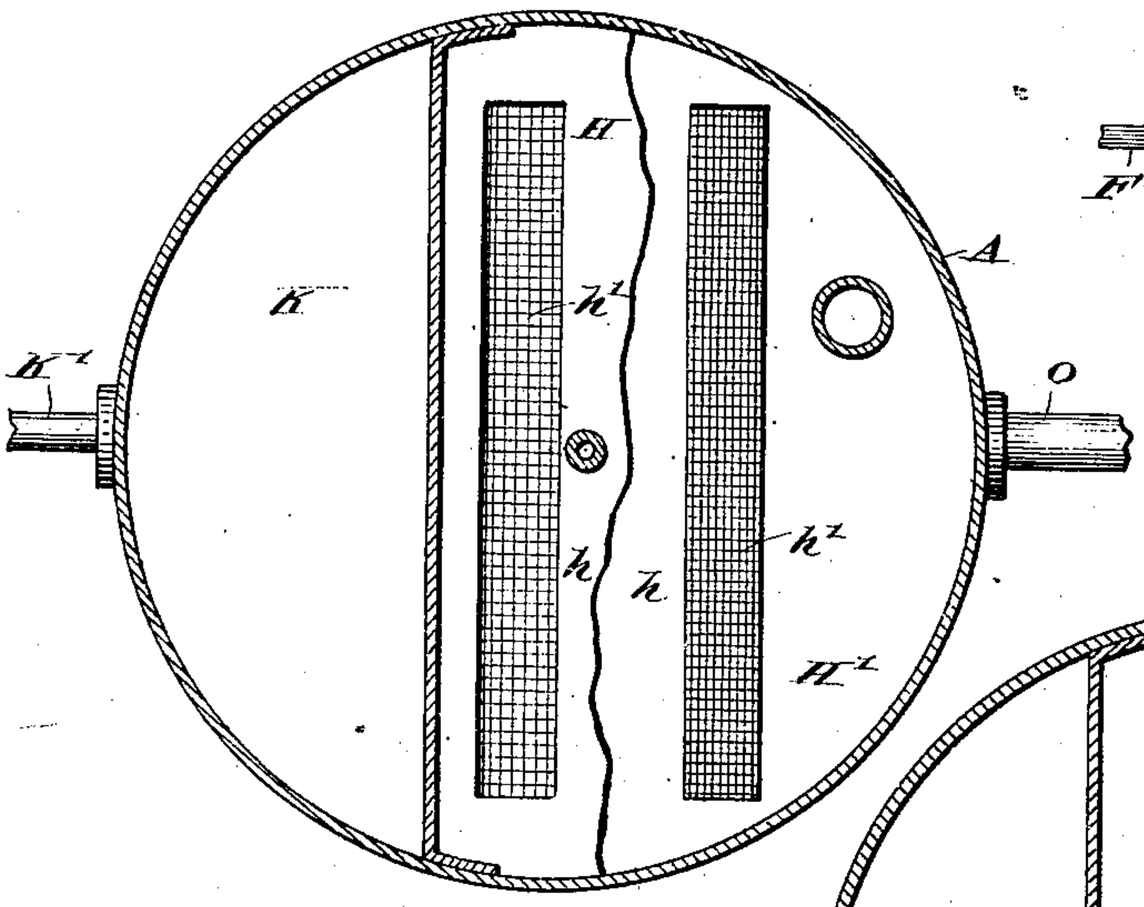
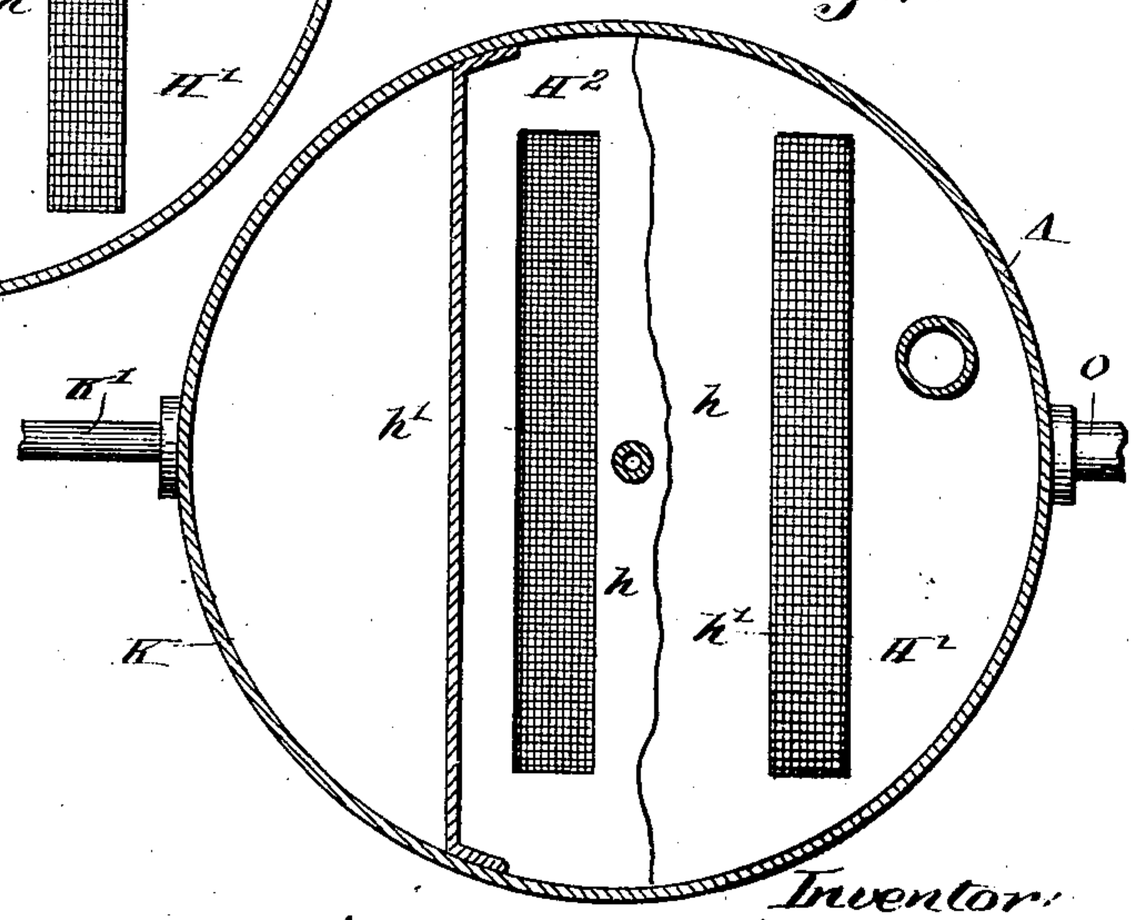


Fig. 7.



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UNITED STATES PATENT OFFICE.

JACOB MORTIMER GOLDSMITH, OF CHICAGO, ILLINOIS.

CARBURETER.

SPECIFICATION forming part of Letters Patent No. 672,855, dated April 23, 1901.

Application filed January 26, 1900. Serial No. 2,858. (No model.)

To all whom it may concern:

Be it known that I, JACOB MORTIMER GOLDSMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Portable Gas-Generators, of which the following is a specification.

This invention relates to the production of a practically-fixed gas adapted for manufacturing and domestic purposes generally and made from combining air with carbonaceous vapors in such relation and under such conditions as to create a gas for the uses and purposes for which it is designed.

The invention relates more especially to the constructing of an apparatus with a limited capacity at each operation and designed for use in places where only a small supply of gas is to be constantly maintained. The principle of the invention, however, can be used in the construction of apparatus for producing gas in large quantities.

The objects of the invention are to construct a gas-generating apparatus in which the feed for the hydrocarbon or vapor-producing oil will be controlled by an unvarying equal pressure derived from gravity, so as to automatically govern and regulate the supply to the demand under the conditions of a gravity-feed for the oil to be gasified or vaporized under pressure with a supply of air and introduce the combined mixture of air and vaporized oil into a mixing-chamber; to thoroughly and effectually atomize the air and vapors in their passage from the mixing-chamber to enter the gasometer-bell in the condition of a fixed gas; to insure a thorough impregnation of the air with the hydrocarbon vapors in proportionate quantities one to the other to produce a gaseous non-condensable body possessing great heating qualities and high illuminating power under proper and correct conditions; to properly regulate and control the oil which is to be vaporized under heat and at the same time control the supply of commingled vapor and air to the mixing-chamber; to regulate the air-supply under the required conditions of pressure and heat in connection with the hydrocarbon vapors and insure the absorbing of the vapors by the air to its full capacity; to so construct and combine the several parts entering into the apparatus as a whole as to constitute an apparatus which may be termed "self-contained," in that all of the operative parts are found in the same apparatus, and to improve generally the construction and operation of the apparatus as a whole.

The invention consists in the several features of construction and combination of parts hereinafter described and claimed.

In the drawings illustrating the invention, Figure 1 is a sectional elevation of the generator and the appliances connected therewith, showing, however, the gravity-feed and a portion of the oil and air delivery pipe in elevation; Fig. 2, a detail showing the gravity-feed appliance lowered for withdrawal of the water from the oil tank or reservoir at the termination of the feeding operation; Fig. 3, a sectional elevation of the pressure-tube and the filling-tube, showing the guide-rollers for the gasometer-bell; Fig. 4, an end elevation of the tubes and guide-rollers of Fig. 3; Fig. 5, a detail in section, showing one of the guide-rollers between the gasometer-bell and the outer casing; Fig. 6, a cross-section through the spraying-chamber with the floor of the chamber broken away to show the atomizer of the second atomizer-chamber; Fig. 7, a cross-section through the second atomizer-chamber with the bottom of the floor broken away to show the atomizer of the third atomizing-chamber.

In carrying out my invention I construct an outer cylinder A, of sheet metal or other suitable material and of the capacity required for the size of apparatus. The cylinder is provided with a partition or floor *a*, above which is located within the cylinder or casing a gasometer-bell B, having a closed top *b*. The gasometer-bell is provided with a float B', which may be in the form of a hollow annular cell inside of the bell. An oil tank or receptacle C is located within the gasometer-bell and fixed or secured in any suitable manner to the partition or floor *a*. This tank or reservoir has a closed top *c* and a closed bottom *c'*.

Extending up from the top of the gasometer-bell is a tube D, having open communication with the bell for the admission of gas thereinto and having its upper or outer end tightly closed by a removable cap *d*. This

tube surrounds a filling-tube E, having its upper end tightly closed by a removable cap and in open communication with the oil tank or reservoir through the top *c* thereof, and, as shown, the filling-tube at its upper or outer end is provided with antifriction-rollers *e*, so that the tube in connection with the rollers furnishes a guide or track for the rise and fall of the gasometer-bell in a straight line of travel. The gasometer-bell at its lower end has thereon guide-rollers *e'* to facilitate the rising and falling of the bell, the rollers traveling against the face of the outer casing.

A tube F extends up into the oil-tank and terminates near the top of the tank. This tube passes through the bottom of the tank and the floor of the outer cylinder and is connected with a valve shell or casing G, in which is located a three-way valve having a stem *g*. The valve is of such form that when properly turned it will discharge oil into a mixing-chamber H to meet the air which is to be impregnated with the hydrocarbon vapor and also discharge oil to be vaporized in a retort or chamber. This mixing-chamber communicates with a vaporizing-chamber H', which in turn communicates with a vaporizing-chamber H^2, which in turn communicates with a final vaporizing, mixing, and fixing chamber H^3. The several chambers except the last have inclined bottoms *h*, each bottom having a discharge-opening covered by a mesh or gauze constituting an atomizer *h'*. The atomizers increase in fineness as they descend, so as to cause a finer atomizing in the downward passage of the air and vapor. The bottoms are oppositely inclined, and the discharge-openings are at opposite sides or ends of the chambers, as clearly shown in Fig. 1. An induction-pipe I leads from the final vaporizing-chamber into the gasometer-bell, terminating just below the top of such bell when in its normal position, and leading from the gasometer-bell is an eduction-pipe J, which extends through the oil-tank and the partition or floor *a* into an accumulating and final discharge chamber K, from which chamber a delivery-pipe K' leads, so as to conduct the fixed gas to the point of combustion.

The residue of unabsorbed oil discharged and not used in the process of charging the air or any surplus oil will be deposited in the chamber H^3 and can be drawn off at the plug h^2 in the bottom of such chamber and reused, if so desired, and any residue deposited in the chamber K from any cause can be drawn off at the plug *j* near the bottom of such chamber. This arrangement enables the apparatus to be kept clear of any excess of oil in the final atomizing-chamber and of any residue deposited in the accumulating and fixing chamber.

A supply-pipe F' is connected with the valve-shell G and communicates with one of the ports of the valve, so that oil can pass from the oil-reservor through the pipe F into the pipe F' and thence to a retort or vaporizing-chamber. The supply of oil through the pipe F' is automatically controlled by a valve located in a coupling *f* and having a stem *f'* with a forked arm or lever f^2, as shown in Fig. 1, or the supply can be controlled in any other suitable manner. The supply-pipe F' leads into a retort or vaporizing-chamber L, which, as shown, is of a cone shape, having the apex at the bottom, but may be of any other suitable form or shape. This retort or vaporizing-chamber is connected by a pipe K^2 with the gas-chamber K, so that when the valve k^3 in such pipe is open gas will flow to a burner *k* at the end of the pipe and within the apex of the retort or vaporizing-chamber. The burner has a dish *k'* around it extending beyond the periphery of the chamber and has also a heat-conductor flue k^2 extending up through the chamber. The plate or dish *k'* within the diameter of the bottom of the flue is provided with openings k^3 for the admission of air to support combustion at the burner.

At the initial starting of the apparatus the vaporizing of the oil for oil-vapors to commingle with the air in the production of gas is had by turning on the oil to the pipe F' for admission to the vaporizing-chamber and heating such chamber by igniting oil or alcohol in the dish *k'*, so as to produce sufficient heat for the vaporizing of the oil in the retort or chamber; but after the production of the first charge the gas itself when ignited at the burner *k* supplies the necessary heat to the retort or chamber for vaporizing purposes.

The retort or vaporizing-chamber communicates with a pipe N by a suitable coupling *l*, and this pipe leads into and out from a superheating-chamber N', into which the vaporized oil is discharged and from which it passes out subjected to the heat from the flue k^2, which terminates immediately under the superheating-chamber. The delivery end of the pipe is provided with an injector or contracted discharge-nozzle *n*, having a disk or guard *n'* and adjustably attached to the pipe by a sleeve n^2. The disk or guard *n'* is carried by the sleeve n^2, so that it can be advanced or receded and gage the opening for the admission of air around its periphery into the injector-space around the regulator in the bell-mouth of the supply-pipe. The injector or discharge-nozzle projects the vapor from the chamber N' into a pipe O at its mouth *o*, passing through a regulator *o'*, entered into the mouth and held therein by spring-arms o^2. This arrangement enables the proper amount of vapor and outside air to be drawn and discharged into the supply-pipe O, as by advancing or receding the injector and advancing and receding the controlling-cap or regulator *o'* the exact amount of air and vapor required can be secured.

A short pipe or tube M, having a controlling-valve *m*, communicates with the pipe O, and this pipe or tube M is for the attachment of a hose or other pipe for supplying air to the pipe O at the initial starting of the appa-

ratus. The air can be blown into the pipe from the mouth or by the use of a small air-pump or by any other suitable means. This mode of supplying air is only necessary in the first charging of the apparatus, as after that the required amount of air will be automatically drawn into the pipe at the regulator.

The supply-tube O has a coupling O′, in which is located a flat plate or other suitable valve mounted on a stem P, which stem is supported in the coupling and by an arm or bracket Q, attached to the cylinder or casing A. The valve-stem P has secured thereto at its outer end an arm or lever R, one end of which has a pin r to enter the slot of the arm or lever f^2 for the movement of the arm or lever R to move the arm or lever f^2 and open and close the valve of the oil-supply pipe F′. The opposite end of the arm or lever R has thereon a weight R′ to insure a quick movement of the arm or lever as the center is reached and passed in either direction.

A bell-crank lever S is mounted on an extension Q′ of the arm or bracket Q. One arm s' of the bell-crank lever is connected by a link s^2 with the arm or lever R through a pin r' on the arm or lever. The pin r' moves in a recess or depression s^3, having at each end shoulders or stops s^4, which engage the pin so as to operate the arm or lever R with the movement of the arm or lever S in either direction. The other arm s of the bell-crank lever is slotted and receives a pin t on a sliding rod T, the upper end of which is provided with adjustable rings or collars u and u', arranged to be engaged by an arm U, attached to the top of the gasometer-bell. The rise and fall of the gasometer-bell through the arm U moves the rod T and operates the levers. The rise of the gasometer-bell causes the arm to strike the ring or collar u' and raise the rod T, which moves the bell-crank lever S and throws the arm R in the direction to close the valve on the stem P and through the arm or lever F^2 to also close the valve of the oil-supply pipe. The descent of the gasometer-bell causes the arm U to contact with the ring or collar u, forcing the rod T down, producing an opposite movement for the bell-crank lever and the arm or lever R, which movement opens the valve of the air-supply pipe and also the valve of the oil-supply pipe. It will be seen that by this arrangement the valves of the oil-supply pipe and of the air-supply pipe are automatically controlled by the rise and fall of the gasometer-bell and that the movements of both valves are approximately at the same time in both opening and closing. This manner of controlling the valves makes such control dependent on the amount of gas in the gasometer-bell and the working of the apparatus.

Any condensation or overflow of water in the gasometer-bell will be carried off by a drip-pipe V, which passes through the floor a and the wall of the outer cylinder and enters a drip and water seal V′, having a pipe v, controlled by a valve v'.

The oil is to be fed in regular supply and under an equal pressure in order to obtain the most positive and best results, and for this purpose a pressure gravity-feed is provided. A receptacle W, adapted to receive water and having a vent-pipe w, is mounted on the end of a tube W′, having a controlling-valve w', which pipe or tube has a jointed connection w^2 with a pipe W^2, leading into the oil-reservoir at the bottom. Water from the receptacle W, with the valve w' open and the receptacle in a vertical position, as shown in Fig. 1, will flow through the pipes W′ and W^2 into the oil tank or reservoir at the bottom, and such water under pressure of the raised receptacle will have an upward flow into the oil-tank, which by reason of the fact that oil stays on top will force the oil upward to a point where it can flow into the discharge-tube F and, with the valve of such tube properly adjusted, pass into the mixing-chamber and into the supply-tube F′ to enter the vaporizing-chamber. It will be seen that the feed of the oil is had through gravity produced from the raised receptacle and that such feed will continue until the oil is all discharged. The capacity of the water-receptacle and of the oil-receptacle should be equal, or approximately so, in order to have the full discharge of the water produce a corresponding discharge of the oil to a point where water will not enter the discharge-tube F. After the oil has been discharged the water can be withdrawn by turning the receptacle W down into the position shown in Fig. 2, which allows the water to return through the pipes W^2 and W′ into the receptacle. It is to be understood that the vent-pipe W is always open, so as to supply pressure for discharging the water and escape the air in refilling the receptacle.

The operation will be understood from the foregoing description, but is briefly as follows: The oil tank or receptacle is filled with oil to the required height through the pipe E. The receptacle W is filled with water. The valve w' is then opened and the valve of the shell G also opened for the oil to flow into the supply-pipe F′ as the water flows into the bottom of the oil-reservoir. The oil from the supply-pipe enters the retort or vaporizing-chamber L and is vaporized by the heat of such chamber, which heat is initially produced by igniting oil or other inflammable material in the dish k'. The vaporized oil passes up in the retort or vaporizing-chamber and enters the pipe N to pass through the superheating-chamber and be discharged into the air-supply pipe at the injector or discharge-nozzle, drawing in with it a supply of fresh outside air, which air, with the vapor, when the valve of the pipe O is open, commingles with the air under pressure from the supply-pipe M and discharges into the mixing-chamber for contact with the oil dis-

charging into such chamber from the oil-discharge valve. The oil and air thus brought together are carried through the several vaporizing-chambers into the final chamber and thence up into the gasometer-bell, causing such bell to rise with the fixed gas inducted into such chamber through the pipe I. The fixed gas passes through the eduction-pipe J into the accumulating-chamber K. The movement of the gasometer-bell upward continues until its full limit is reached, by which time the valves of the air-supply pipe and of the oil-supply pipe are automatically closed by the movement of the rod T. The gas as it is consumed permits the gasometer-bell to descend, and when the proper limit of descent is reached the valves of the air-supply and oil-supply are automatically opened by the movement of the rod T. The gas from the accumulating-chamber after that chamber is filled by opening the valve k^3 and igniting the gas at the burner k furnishes the heat for vaporizing the next supply of oil in the chamber L, such vaporized oil passing, as before described, with a supply of outside air, into the mixing-chamber, but not requiring an air-supply from the pipe M. After the initial starting the further operation of the machine, so far as vaporizing the oil is concerned, is had from the gas produced by the apparatus itself. After the amount of oil, in the receptacle C has been discharged the water-receptacle is thrown down, withdrawing the water from the oil-reservoir into the water-receptacle, so that a new supply of oil can be supplied to the oil-tank for such oil, to be discharged when the receptacle is in its vertical or raised position. It will thus be seen that the entire operation after the initial start is automatic in every respect, except that it is necessary in order to produce the gravity-feed to lower the water-receptacle for the withdrawal of the water and again raise such receptacle by hand to supply the water under pressure to produce the feed for the oil.

The vaporizing of the oil and then superheating the vapor before commingling it with air insures a supply of commingled air and vapor in an approximately dry state for use in absorbing the oil, so that an increased absorbing quality is obtained for the treatment of the oil with the carbon vapors in the mixing and vaporizing chambers, which insures a proportional absorption of oil-vapor to the full capacity of the air, producing a rich fuel-gas and gas for illuminating purposes.

It will be seen that the oil is fully protected by the surrounding body of water and its discharge is under perfect control. An equalized pressure from the gravity-feed is also secured through the pressure of the water from the raised receptacle, and that by such feed the discharge is maintained uniform and regular and with an unvarying pressure until the entire supply of oil in the receptacle has been discharged. The apparatus enables air under pressure to be utilized in the production of a fixed gas, and such pressure is derived from the pressure produced from the vaporized oil injected into the air-delivery pipe in a superheated condition from the oil-vaporizing chamber. The apparatus permits the use of either high-grade carbon or hydrocarbons of low specific gravity in the production of a practically fixed gas. The use of hydrocarbons of low specific gravity is successful in operation owing to the fact that the oil is first vaporized and then superheated before being finally brought into contact with the air, by which means the air is enriched before the addition thereto of hydrocarbon vapors to produce a fixed gas.

The operation of the apparatus in governing the supply of oil to be vaporized and in governing the supply of vaporized oil and air to the mixing-chamber is automatic as to both supplies. There is always a fixed equal pressure as regards the supply of oil from the gravity-feed. The oil, air, and vapor are in a fixed relation one to the other, and the operation of the apparatus is automatic after the initial starting and requires no special care and attention except the lowering and raising of the water-receptacle for the gravity-feed.

The float or oil-cell of the gasometer-bell subserves a useful purpose, as owing to its tendency to float the bell but little pressure is required to raise the bell. This enables the pressure required to be governed by placing a weight or weights on top of the bell to the amount necessary for the pressure produced by the inflow of air and vapor to raise the bell. The result is that, if desired, a pressure of a pound can be made to raise the bell, or the weights can be adjusted to increase or decrease the amount of pressure required, permitting a very slight pressure to raise the bell by overcoming its weight, which is very desirable in the operation of gas apparatus.

I claim—

1. In a gas-generator, the combination of an outer cylinder or receptacle for containing a body of water, a gasometer-bell movable within the outer cylinder or receptacle, an oil-reservoir within the gasometer-bell and surrounded by water, a valve-controlled pipe leading downward from the top or upper surface of the oil in the reservoir and receiving oil at its upper end, an oil-vaporizing chamber into which the supply-pipe delivers oil from the oil-reservoir, and a heater for the oil-vaporizing chamber, substantially as described.

2. In a gas-generator, the combination of an oil-reservoir, a valve-controlled discharge-pipe leading downward from the top or upper surface of the oil in the oil-reservoir and receiving oil at its upper end, and an oil-vaporizing chamber to which the oil-discharge pipe delivers oil from the oil-reservoir for vaporizing the oil, substantially as described.

3. In a gas-generator, the combination of an oil-reservoir, a valve-controlled discharge-pipe leading down from the top or upper surface of the oil in the oil-reservoir and receiving oil at its upper end, an oil-vaporizing chamber to which the discharge-pipe delivers oil from the oil-reservoir to be vaporized, and a vapor-superheating chamber communicating with the oil-vaporizing chamber, substantially as described.

4. In a gas-generator, the combination of an oil-reservoir, a valve-controlled discharge-pipe receiving oil at its upper end from the top or upper surface of the oil in the oil-reservoir, an oil-vaporizing chamber to which the discharge-pipe delivers oil from the oil-reservoir to be vaporized, a vapor-superheating chamber having communication with the oil-vaporizing chamber, an air and vaporized-oil supply tube leading into the spraying-chamber, and a spraying-chamber into which oil is sprayed from the oil-reservoir discharge-pipe, substantially as described.

5. In a gas-generator, the combination of an outer cylinder or receptacle for containing a body of water, a gasometer-bell movable within the outer cylinder or receptacle, an oil-reservoir within the gasometer-bell, a valve-controlled discharge-pipe from the oil-reservoir, an oil-vaporizing chamber to which the discharge-pipe delivers oil, a spraying-chamber receiving a supply of oil from the oil-reservoir, an air and vaporized-oil supply pipe leading into the spraying-chamber, a series of atomizing-chambers communicating with each other and with the spraying-chamber and each having a discharge-opening with an atomizer of proportionately-increasing fineness, a gas-induction pipe leading from the final atomizing-chamber into the gasometer-bell, and a gas-eduction pipe leading from the gasometer-bell into an accumulating and fixing chamber, substantially as described.

6. In a gas-generator, the combination of a gas-accumulating chamber receiving a supply of generated gas from a movable gasometer-bell, a pipe leading from the chamber and provided at its outer end with a burner, an oil-vaporizing chamber surrounding the burner and receiving a supply of oil to be vaporized, an air-supply pipe receiving vaporized oil from the vaporizing-chamber and leading to the spraying or mixing chamber of the generator and a spraying or mixing chamber, substantially as described.

7. In a gas-generator, the combination of an oil-vaporizing chamber receiving a supply of oil to be vaporized, a vaporized-oil-discharge pipe leading from the vaporizing-chamber, an air-supply pipe leading to the generator and into which the vaporized oil is projected, and an air and vapor supply valve between the air-supply pipe and the vapor-discharging pipe, substantially as described.

8. In a gas-generator, the combination of an oil-reservoir, a valve-controlled discharge from the oil-reservoir, a spraying or mixing chamber for the discharge, an oil-vaporizing chamber receiving a supply of oil to be vaporized, a vapor-supply pipe leading from the vaporizing-chamber, an air-supply pipe leading to the spraying or mixing chamber, a valve between the air-supply pipe and the vaporizing-pipe controlling the supply of air and vaporized oil, substantially as described.

9. In a gas-generator, the combination of an oil-vaporizing chamber, an open-mouthed air-supply pipe, an injector or discharge nozzle connected with the oil-vaporizing chamber for injecting vaporized oil into the open-mouthed pipe and producing an air-current charged with hydrocarbon vapor for use in a mixing-chamber of the gas-generator, substantially as described.

10. In a gas-generator, the combination of an oil-reservoir open to pressure from a liquid, a liquid-reservoir supported above the plane of the oil-reservoir, a pipe from the liquid-reservoir to the oil-reservoir and opening into the oil-reservoir at the bottom, and a discharge-pipe for oil extending upward in the oil-reservoir above the oil for the liquid entering at the bottom of the reservoir to cause the oil to rise and flow out through the discharge-pipe thereby producing a uniform delivery of oil under a gravity-feed, substantially as described.

11. In a gas-generator, the combination of a vaporizing-chamber receiving oil to be vaporized, a vapor-discharge pipe from the vaporizing-chamber, and an air-supply pipe receiving vapor from the discharge-pipe to commingle with the air before entering the gas-generating chamber, substantially as described.

12. In a gas-generator, the combination of an oulet cylinder or receptacle for containing a body of water, a gasometer-bell movable within the outer cylinder or receptacle, an oil-reservoir within the gasometer-bell surrounded by the body of water in the outer cylinder and the bell, a discharge-pipe leading from the top of the oil-reservoir and receiving at its upper end the oil to be discharged, a tube leading into the oil-reservoir at the bottom, and a water-supply receptacle communicating with the tube for supplying liquid to the oil-reservoir and maintain the feed of the oil from the liquid-pressure, substantially as described.

13. In a gas-generator, the combination of an outer cylinder or receptacle for containing a body of water, a gasometer-bell movable in the outer cylinder or receptacle, an oil-reservoir within the gasometer-bell and surrounded by the body of water in the outer cylinder or receptacle and the bell, a valve-controlled discharge-pipe leading from the top of the oil-reservoir and discharging through the bottom thereof, a spraying-chamber into which the oil is sprayed from the discharge-pipe under pressure, a liquid-pressure operating from the bottom of the oil-reservoir to discharge oil at the top through the discharge-pipe, and an

air and vaporizing-oil supply pipe leading into the spraying-chamber for commingling air and vapor in their passage to the pipe to coact with the sprayed oil in the projection of the fixed gas, substantially as described.

14. In a gas-generator, the combination of an outer shell or casing adapted to contain a body of water, a gasometer-bell rising and falling in the outer shell or casing, a float or air-cell on the gasometer-bell rendering the bell susceptible to move under light pressure, a spraying-chamber for oil and air, a vaporized-oil-supply pipe leading into the spraying-chamber for commingling air and vaporized oil in their passage from a vaporizing-chamber and have the pressure of the projected air and vaporized oil into the spraying-chamber sufficient to raise the gasometer-bell under a slight pressure through the action of the float, substantially as described.

15. In a gas-generator, the combination of an outer shell or casing adapted to contain a body of water, a gasometer-bell rising and falling in the outer shell or casing, a float or air-cell on the gasometer-bell, removable weights on the gasometer-bell for regulating and varying the force required to raise the bell, a spraying-chamber for oil, and an air and vaporized-oil supply pipe leading into the spraying-chamber for commingling air and vaporized oil in their passage through the pipe before discharging into the spraying-chamber and have the pressure of the projected air and vaporized oil operate to raise the bell through the float and removable weights, substantially as described.

16. In a gas-generator, the combination of a spraying-chamber, an oil-vaporizing chamber, a vapor-superheating chamber receiving its supply of vapor from the heater, a discharge-pipe for superheating vapor from the chamber, and an air-supply pipe leading to the spraying-chamber and receiving the projected superheated vapor and an air-supply at its induction end for the superheated vapor and oil to be commingled before entering the spraying-chamber, substantially as described.

17. In a gas-generator, the combination of a spraying-chamber, an oil-vaporizing chamber, a vapor-superheating chamber receiving vapor from the vaporizing-chamber, a discharge-pipe from the superheating-chamber, a discharge-nozzle at the end of the pipe, an air-supply pipe leading to the spraying-chamber and into which air is drawn and superheated vapor projected at the induction end, and a regulator between the discharge-nozzle and induction end of the air-supply pipe, substantially as described.

18. In a gas-generator, the combination of an oil-reservoir, a liquid-supply pipe leading into the oil-reservoir at the bottom, a supply-pipe pivotally connected with the supply-pipe of the oil-reservoir, and a water-supply receptacle mounted on the upper end of the pivoted supply-pipe for discharging liquid into the oil-receptacle at the bottom when the water-receptacle and its discharge-pipe are raised and for withdrawing liquid from the oil-receptacle when the water-receptacle and its discharge-pipe are lowered, substantially as described.

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Witnesses:
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