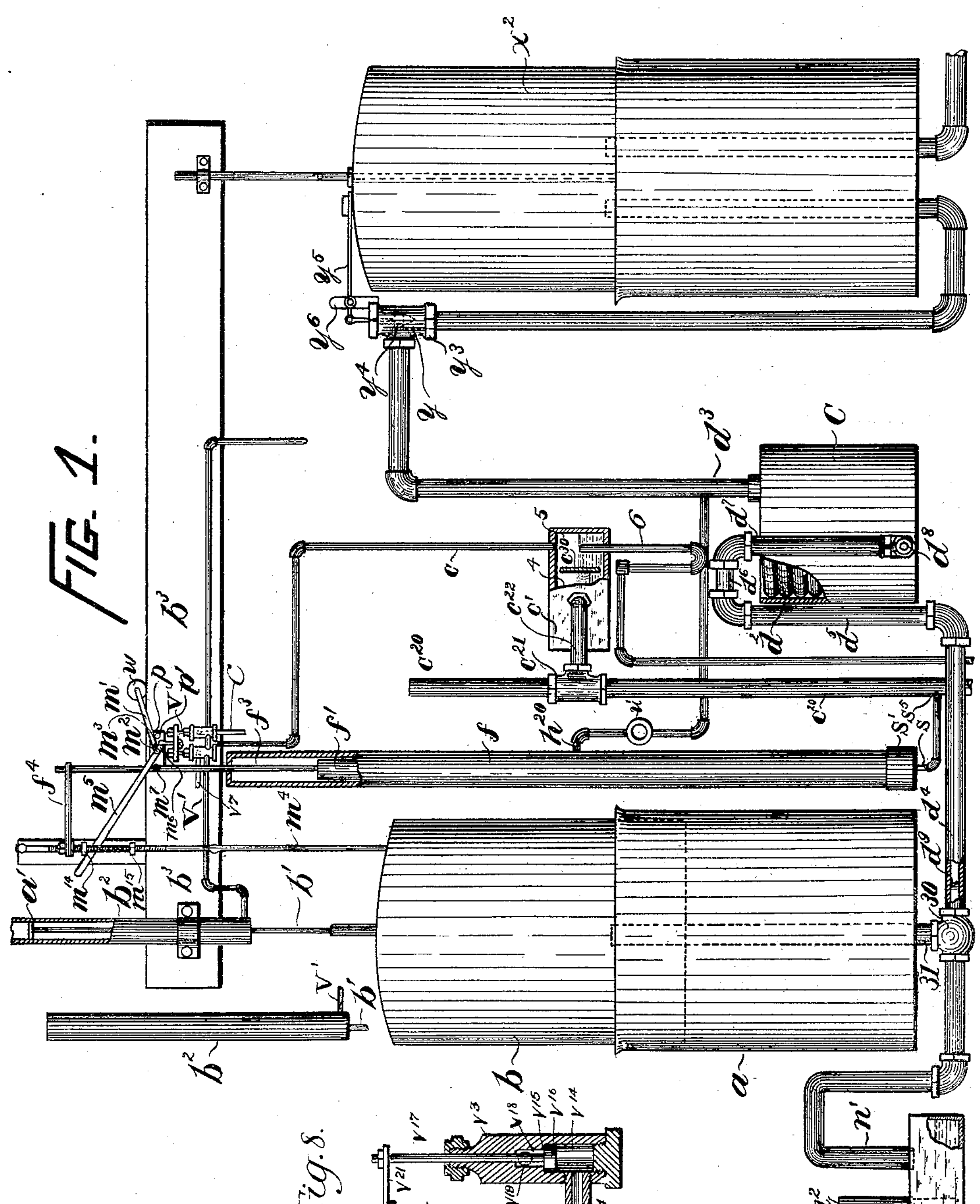
No. 632,376. Patented Sept. 5, 1899.

F. E. & F. O. STANLEY.

CARBURETER.

(Application filed Feb. 11, 1897.)

(No Model.) 3 Sheets—Sheet 1.



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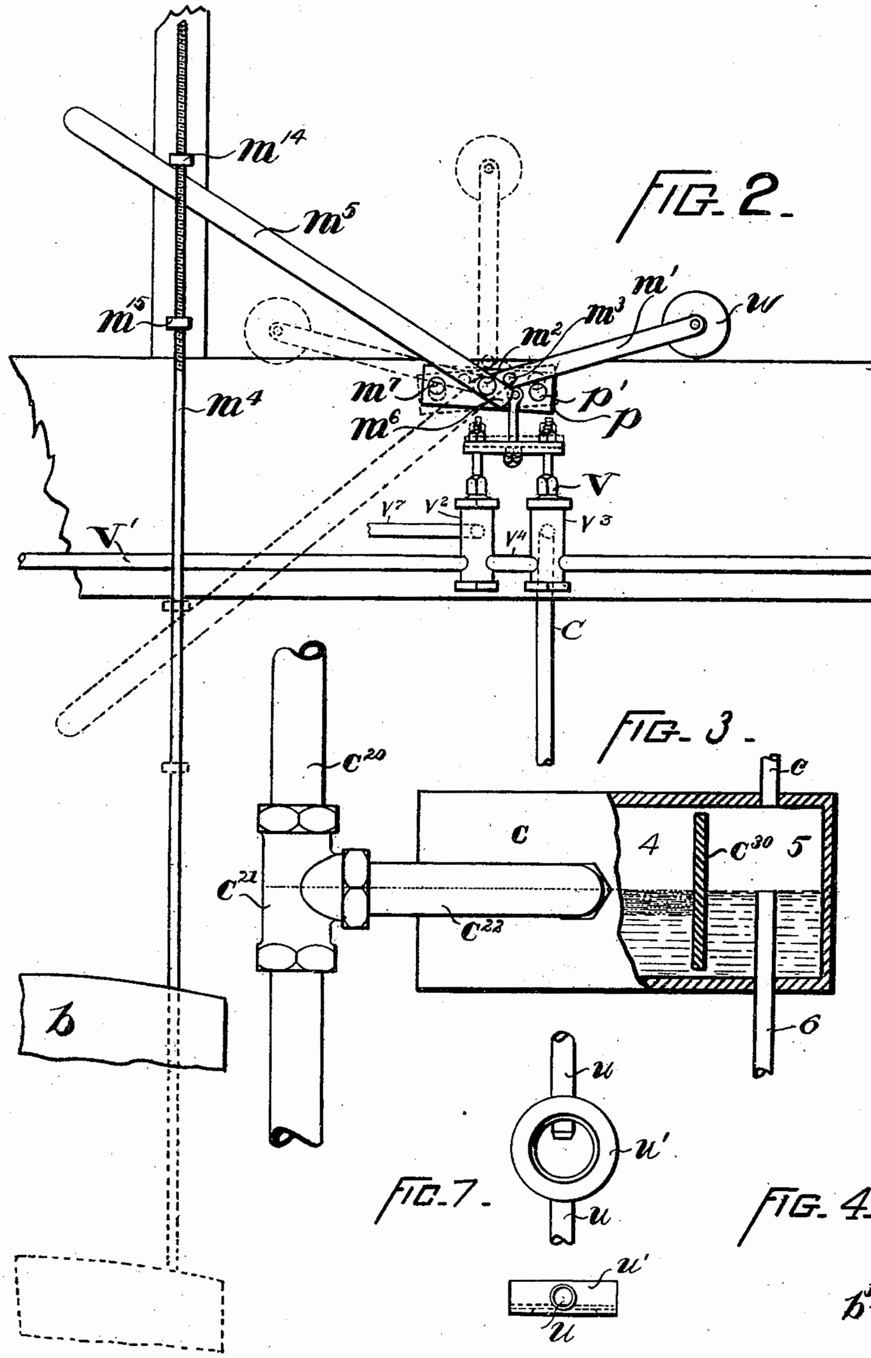
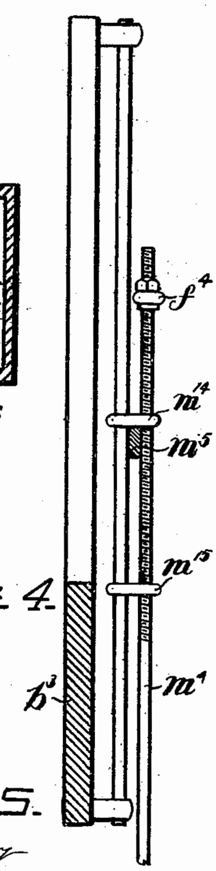
3 Sheets—Sheet 2.





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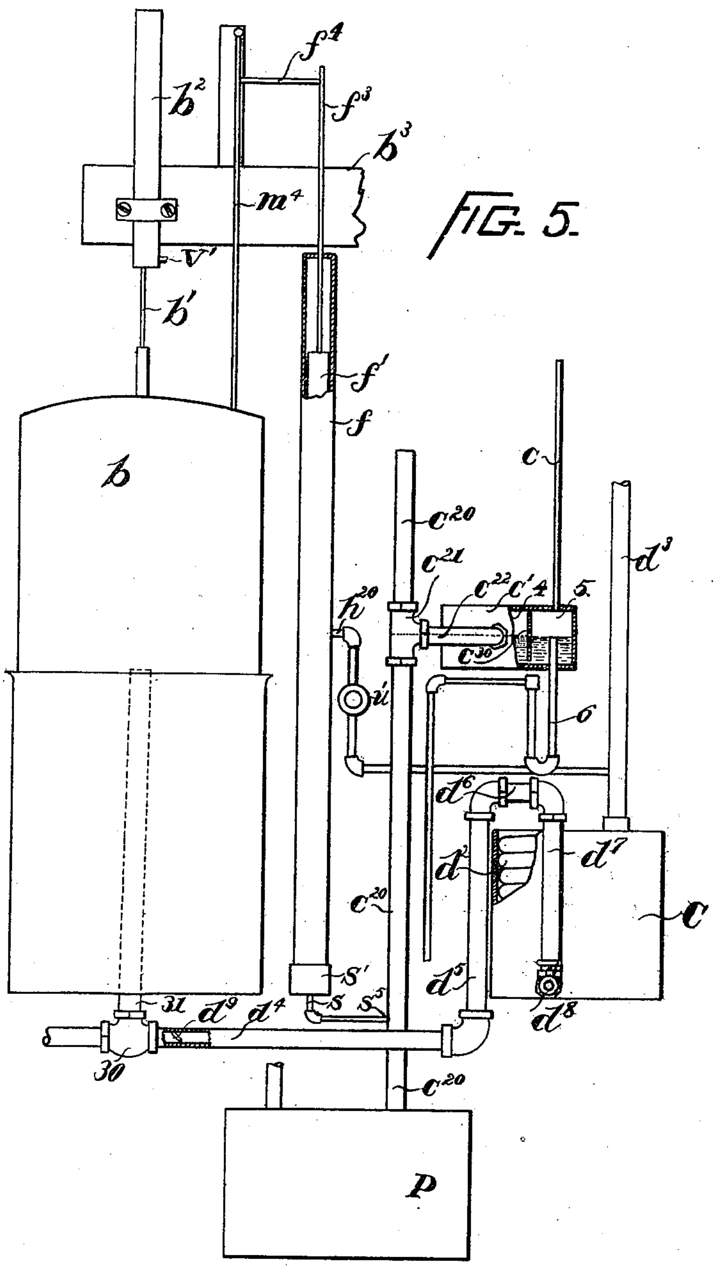

FIG. 5.

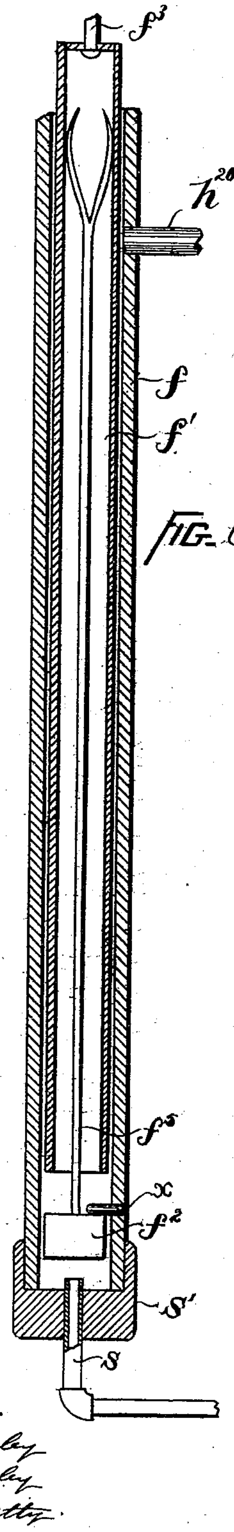

FIG. 6.

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UNITED STATES PATENT OFFICE.

FRANK E. STANLEY AND FREELAN O. STANLEY, OF NEWTON, MASSACHUSETTS.

CARBURETER.

SPECIFICATION forming part of Letters Patent No. 632,376, dated September 5, 1899.

Application filed February 11, 1897. Serial No. 622,915. (No model.)

To all whom it may concern:

Be it known that we, FRANK E. STANLEY and FREELAN O. STANLEY, of Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Gas-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to improve the construction of gas-machines wherein naphtha or some other equivalent hydrocarbon liquid is converted into a gas for illuminating and other purposes, such a gas being commonly known as "air-gas."

In accordance with this invention an air-pressure device is employed for delivering air to the carbureter, and a delivering device is employed for delivering hydrocarbon liquid to said carbureter, and means are provided for operating said air-pressure and liquid-delivering devices conjunctively to store up a supply of air and hydrocarbon liquid, and said devices also operate conjunctively to simultaneously deliver the stored-up air and liquid in uniform proportions to the carbureter.

The quantities of air and hydrocarbon liquid stored up at each conjunctive operation of the air-pressure and liquid-delivering devices are proportionate to the quantities required in producing a certain quantity of gas of the desired quality, and as said devices operate conjunctively they will also deliver their respective stored-up supplies to the carbureter in uniform proportions.

The action of the delivering device is made absolutely dependent upon the action of the air-pressure device, and to accomplish this result the delivering device is constructed and arranged to be operated directly by the air-pressure device instead of by the motive power or means which is employed to operate said air-pressure device, and, as herein shown, the said delivering device is operated directly by the air-pressure device to first store up a measured quantity of hydrocarbon liquid and is thereafter operated by said air-pressure device to deliver its stored-up supply to the carbureter. Our invention, however, is intended to include the important feature of operating the delivering device directly by the air-pressure device and utilizing the motive power solely for operating the air-pressure device, even in case a supply of hydrocarbon liquid should not be stored up at each operation.

The air-pressure device comprises, essentially, a gravitating air-receiver, and means are provided for raising it to store up a measured quantity of air which will be subsequently delivered to the carbureter, and said gravitating air-receiver is herein shown as connected with the operating member of the delivering device, so that as said air-receiver is raised to store up a quantity of air the delivering device will be operated at the same time to store up a proportionate quantity of hydrocarbon liquid, and as said air-receiver falls by gravity to deliver its stored-up supply of air to the carbureter the delivering device will be operated at the same time to deliver its stored-up supply of hydrocarbon liquid to the carbureter, the action of the delivering device being thus absolutely dependent upon the action of the air-pressure device.

As herein shown, the hydrocarbon liquid is expelled from the delivering device by displacement—that is to say, the delivering device may consist of a receptacle which contains a supply of hydrocarbon liquid, and a body—such, for instance, as a hollow vessel, tube, or rod—is adapted to be moved up and down in said receptacle and when descending to expel the hydrocarbon liquid by displacement.

As a means of supplying the delivering device with hydrocarbon liquid a supply-tank is provided, which may be located at any suitable or convenient place and which will contain a large supply of hydrocarbon liquid, and as herein shown a stand-pipe rises from said supply-pipe which is connected with said delivering device, a valve being employed to control the passage from said stand-pipe to said delivering device. The hydrocarbon liquid is maintained in said stand-pipe at a predetermined elevation, so that whenever the controlling-valve is opened a measured quantity will flow from the stand-pipe into the delivering device to be subsequently delivered to the carbureter. The liquid is caused to rise in said stand-pipe by means controlled and operated automatically in order that the stand-pipe will be filled at all times sufficiently to supply the delivering device with a measured or predetermined quantity.

Many of the parts herein to be described are novel and are included in this invention, as well as connections whereby certain conjunctive and automatic actions are produced, as will be hereinafter more fully specified.

Figure 1 shows in side elevation a gas-machine embodying this invention; Fig. 2, a side elevation of the actuating device for the air-pressure device; Fig. 3, a detail of the means employed for maintaining hydrocarbon liquid in the stand-pipe at a certain level; Fig. 4, a detail to be referred to; Fig. 5, a side elevation of a portion of the gas-machine shown in Fig. 1; Fig. 6, a vertical section of the delivering device by which the hydrocarbon liquid is delivered to the carbureter; Fig. 7, a detail showing the indicator by which the operation of the machine may be observed; and Fig. 8, a vertical section of the valve which forms the essential element of the actuating device, which is solely connected with and adapted to operate the air-pressure device.

The air is supplied or delivered to a carbureter or converter C by means of an air-pressure device, which consists of a tank or hollow cylinder a, nearly filled with water and open at the top, and a hollow air-receiving cylinder b, open at the bottom only and made smaller in diameter than the cylinder a and suitably suspended or supported above said cylinder a and adapted to rise and fall within said cylinder a, thus working substantially on the principle of an ordinary gasometer. It is designed and intended that the operation of said air-pressure device to store up and to deliver air to the carbureter shall be carried on without attention or action on the part of the user, and also that the actuating device for thus automatically operating said air-pressure device shall be controlled by the movable member of said air-pressure device, and in order that such automatic action of the air-pressure device and its actuator may be carried out water under pressure and controlled by a valve v is employed as the actuating device for the air-pressure device, said valve v being controlled by the rising-and-falling air-receiving cylinder b of said air-pressure device. The air-receiving cylinder or air-receiver b has a rod b' fixed to and projecting upwardly from its closed top wall, and said rod b' has attached to or mounted upon its upper end a plunger or piston a', which is adapted to fit tightly and work up and down within a cylinder b^2, which may be held in an upright or vertical position by a suitable frame or support b^3, to which it is attached. A pipe v' leads from the valve v to said cylinder b^2, entering it at a point below the piston a', and the water is forced through the pipe v' into said cylinder b^2, moving the piston or plunger a' upward, and thereby bodily lifting the air-receiver b. As the air-receiver b is thus raised the air is admitted and stored up for subsequent delivery to the carbureter as said receiver b falls by gravity. Thus the air-pressure device is operated to store up air by water admitted under pressure, and operates to expel or deliver said air by the falling of its gravitating air-receiver b. The valve v, Fig. 8, which controls the admission of water under pressure to said cylinder b^2, consists of two cylinders v^2 v^3, located side by side and connected by a short pipe v^4. The cylinder v^2 has a chamber v^5 within it, provided with an inlet-port v^6 for the inlet of the water, and an inlet-pipe v^7 is connected with said cylinder v^2 at such point. At the bottom of said chamber v^5 a valve-seat v^8 is located, which when open allows the water entering the chamber v^5 to pass through it into the chamber v^9 below said valve-seat and then into the pipe v'. A valve v^{10} is contained in the chamber v^5, which is attached to a rod v^{12}, passing out through the upper end of the cylinder v^2, and said valve is adapted to close on said valve-seat v^8 to shut off the supply of water, preventing the water from entering the pipe v'. It will be seen that when said valve v^{10} is raised, as shown in Fig. 8, the water is free to enter the chamber and flow into the pipe v', and when said valve is seated the water is shut off. The cylinder v^3 has a chamber v^{14} within it and has also a valve-seat v^{15}, and a valve v^{16} is adapted to close on said seat v^{15}, which is attached to a rod v^{17}, which passes out through the upper end of the cylinder v^3. Above the valve-seat v^{15} another chamber v^{18} is provided, having an outlet-port v^{19}, to which an outlet-pipe c is connected. The short pipe v^4, connecting the two cylinders v^2 v^3, is in open communication with the chambers v^9 and v^{14}. The two valve-rods v^{12} and v^{17} are connected together by a cross-head v^{21}, so that the two valves will be simultaneously operated. It will be seen that as the valve v^{10} is raised, and thereby removed from its seat, the valve v^{16} will be closed on its seat, and with the parts in such position, as shown in Fig. 8, the water is free to enter and flow into the pipe v' for the purpose of raising the air-receiver b, and as soon as said valves are operated in the opposite way, the valve v^{10} closing upon its seat and the valve v^{16} leaving its seat, the supply of water will be shut off and an open passage provided from the pipe v' through the chamber v^9, pipe v^4, chambers v^{14} and v^{18}, and through the outlet-port v^{19} to the outlet-pipe c. The cross-head v^{21} of the valve v, which controls the admission of water under pressure to said cylinder b^2, is connected to a plate p, (see Fig. 2,) which is pivoted at m^2 to the frame b^3, and as said plate is turned on its pivot in one or the other direction the valve v will be opened and closed. To turn said plate p on its pivot in one or the other direction to thereby control the action of the valve v, and thus control the admission of water, the arm m' is pivoted at m^2 and provided at its outer end with a weight w, and said arm is adapted to occupy two different positions, one, as shown in full lines, Fig. 2, wherein said arm rests upon a pin p', projecting laterally from the plate p, and the other, as shown by dotted lines, wherein said arm rests upon the pin m^7, projecting laterally from said plate p, and as the pivot m^2 is between said pins it will be seen that the plate will be turned in one or the other direction by the to-and-fro movement of the arm m'. When the arm m' is in the full-line position shown, resting upon the pin p', the plate p is turned to close the valve v, and when said arm is moved into the dotted-line position shown said plate p will be turned to open said valve v. To automatically control the valve v by means of the air-pressure device a b, we provide mechanism whereby said actuating-arm m' will be operated by the rising-and-falling air-receiver b. An arm m^5 is provided for operating the arm m', it being pivoted at m^2 in front of the plate p, and the arm m' has a pin m^3 projecting from it laterally at a point near its pivot m^2, against which the lower end m^6 of said arm m^5 bears when said arm m' is in the full-line position shown in Fig. 2. As said arm m^5 is depressed or caused to occupy the dotted-line position shown, its lower end m^6 by engaging the pin m^3 will positively raise said arm m' to a vertical position and cause it to pass the center, when said arm m' will fall by gravity into its dotted-line position, and as said arm m^5 is raised or caused to occupy its full-line position it will engage said pin m^3 on the arm m', but at the opposite side of its pivot, and will move said arm m' into a vertical position and cause it to pass the center, when it will fall by gravity into the full-line position shown. Thus by depressing said arm m^5 the arm m' will be caused to move from its full to its dotted line position and in so doing will rock the plate p and open the valve v, and by raising said arm m^5 the arm m' will be caused to return to its full-line position, and in so doing will return the plate p and close the valve v. To thus depress and elevate the arm m^5 to operate the arm m', it is made long enough to enter and work between or coöperate with two nuts m^{14} m^{15}, adjustably located upon and at the upper part of the rod m^4, which is fixed to and projects upwardly from the top wall of the gravitating air-receiver b, and as said air-receiver falls the uppermost nut m^{14} will engage said arm m^5 and depress it a certain distance, sufficient to raise the arm m' and cause it to pass its center in order that it may fall into the dotted-line position shown by gravity, and when said arm m' thus falls its pin m^3 will strike the arm m^5 at the opposite side of its pivot and will further depress said arm m^5, and as said air-receiver rises the lowermost nut m^{15} will engage said arm m^5 and elevate it a certain distance, sufficient to raise the arm m' from its dotted-line position into a vertical position and cause it to pass the center in order that it may fall into the full-line position shown by gravity, and when said arm m' thus falls its pin m^3 will strike the arm m^5 at the opposite side of its pivot and further elevate said arm m^5, causing it to bear against the uppermost nut m^{14}. Thus it will be seen that when the valve is open the water under pressure will be admitted to elevate the air-receiver b of the air-pressure device and that when said air-receiver b rises to a certain elevation the said valve v will be closed and will remain closed while said air-receiver falls to expel the air and deliver it to the carbureter, and when the falling air-receiver reaches a certain point it will operate to open said valve v to again admit the water. It will thus be seen that the air-pressure device is automatically actuated to store up air to be thereafter delivered to the carbureter and that its actuator is in turn controlled by the air-receiver b of said air-pressure device.

The valve n, through which air is admitted to the air-pressure device, consists of an air-tight box n, partly filled with a liquid, a pipe n^2, which passes down through the top wall of said box and extends down into the liquid and terminates some distance below its level, and a pipe n', which leads from the top wall of said box n. The pipe n' extends to and connects with a T-coupling 30, located beneath the tank a, and a pipe 31 extends from said T-coupling 30 up through the bottom of said tank a and through the liquid contained therein and terminates at a point above the level of said liquid. A check-valve of any well-known or suitable construction (not shown) will be contained in the pipe n^9 to prevent back pressure of the air. As the air-receiver b rises a partial vacuum is produced within it, and air is drawn in through the pipe n^2 and through the liquid in the box n, and thence through the pipe n', T-coupling 30, and pipe 31 into the air-receiver b to equalize the pressure. This particular construction of valve for controlling the admission of air is employed for the reason that it is air-tight. A pipe d^4 leads from the T-coupling 30 to a short vertical pipe d^5, which rises to a height just above the carbureter C, and a short horizontal pipe d^6 is connected to the upper end of said vertical pipe d^5, and to the opposite end of said short horizontal pipe d^6 a vertical pipe d^7 is connected, which passes down along the side of the carbureter C to a valve d^8 at or near the lower end of said carbureter C, and from said valve d^8 a pipe connects with the lower end of the carbureter, and as the air-receiver b falls the air contained therein is forced through the pipe 31, T-coupling 30, pipes d^4 d^5 d^6 d^7 and valve d^8, and thence to the carbureter C to mix with the hydrocarbon liquid which is being supplied.

A valve d^9 is placed in the pipe d^4 or at some other convenient point to permit passage of the air from the falling air-receiver b to the carbureter, but which closes when the pressure is removed—as, for instance, while the air-receiver b is being drawn up by the action of the water admitted under pressure, and during which time the air is being drawn into said cylinder through the inlet-valve.

The hydrocarbon liquid to be consumed is contained in a supply-tank P, which may be located at any convenient or suitable place, and said hydrocarbon liquid is delivered in its liquid state to the carbureter C, entering at the top thereof and being converted into gas as it passes downward, and to accomplish this result a delivering device of novel construction is employed, which is operated by and consequently conjunctively with the air-pressure device, so that a proper delivery is insured of both liquid and air in uniform proportions, yet the delivery of the liquid is absolutely dependent upon the operation of the air-pressure device, and this conjunctive action of the delivering device and air-pressure device and the dependence of the action of the former on the latter constitutes one of the most important features of this invention. The said delivering device (see Fig. 3) consists of a long tube or cylinder f, which is secured in a vertical position to an upright b^4 on the frame b^3, and said tube or cylinder contains the hydrocarbon liquid which is to be delivered to the carbureter, and said tube f is closed at both ends, except as hereinafter described, to thereby form a liquid-holding receptacle. f' represents a short tube or cylinder which loosely fits and is adapted to work up and down within said long tube or cylinder f, it acting by displacement as it falls to cause the hydrocarbon liquid to rise in the cylinder, and to thus expel it. The tube f' is attached to and suspended from a vertical rod f^3, which passes up through a hole in the top of the cylinder, and the upper end of said rod f^3 is connected by a rod f^4 to the rod m^4, so that said rods f^3 and m^4 will move in unison, and as said rod m^4 is attached to the air-receiver b of the air-pressure device and moved by it said rod f^3 and inner tube f', supported by it, will be correspondingly moved up and down with said air-receiver b.

Contained within and located near the bottom of the tube or cylinder f is a valve f^2 shown as a plug, made considerably smaller in diameter than the interior of the tube f and having its lower end formed to seat upon and close the upper end of an inlet-pipe s, which projects up into the lower end of the tube f, passing up through a cap or nut s', which is screwed onto and closes the lower end of said tube f, and said valve f^2 is movable toward and from the valve-formed end of said inlet-pipe s to open and close the outlet of said pipe. The pipe s serves as an inlet-pipe for the admission of hydrocarbon liquid to the tube or cylinder f, and said inlet-pipe s is connected by a short pipe with a stand-pipe c^{20} at s^5, as hereinafter described, and said stand-pipe c^{20} is kept continously filled with the hydrocarbon liquid to a predetermined elevation. The valve f^2 is attached to the lower end of a rod f^5, which projects up into the inner tube or cylinder f', which is contained within the tube or cylinder f, and the upper end of said rod f^5 is bifurcated or otherwise divided into several fingers which are sprung apart and caused to engage frictionally the interior of said inner tube or cylinder f'. By thus frictionally connecting the rod f^5, to which the valve is attached, with the short tube or cylinder f', said valve will be raised and lowered by said tube or cylinder f'. A pin x is passed through the wall of the cylinder f near its lower end, which projects into the upward path of movement of said valve f^2, and said pin x serves as a stop to limit the ascent of said valve f^2. As the tube f' is raised the rod f^5, having the bifurcated end in frictional engagement with the interior thereof, will be drawn up with it, and the valve f^2 will ascend until it strikes against the pin x, and then as the tube f' continues to rise the valve f^2 will remain in engagement with the said pin x, the bifurcated end of the rod f^5 at such time sliding along in said tube. As the tube f' descends the valve f^2 will descend with it until it strikes and is seated upon the upper end of the inlet-pipe s, closing said inlet, and then owing to the frictional sliding connection of the rod f^5 with said tube f' the latter may continue to descend for the purpose of expelling the liquid contained in a cylinder f by displacement. Thus the valve f^2 will be lifted and removed from its seat at the beginning of the ascent of the tube f'; but its ascent will be checked by the stop x, and by means of the sliding connection of the rod f^5 with said tube f' said tube f' may continue to ascend, holding the valve f^2 up against said stop, and as the tube f' is connected with the air-receiver b said tube will rise conjunctively therewith, and the result is that the valve remains lifted and open during the time the air-receiver is rising to store up a supply of air, and during the time that the valve f^2 is thus elevated the hydrocarbon liquid is free to enter and rise in the cylinder f to a predetermined elevation. Thus a quantity of air and a quantity of hydrocarbon liquid are stored up in their respective receivers to be subsequently delivered, and it will also be seen that the valve f^2 will be caused to descend and to close upon its seat at the beginning of the descent of the tube f' to thereby close the inlet, and by means of the aforesaid sliding connection of the rod f^5 with the tube f' said tube f' will be permitted to continue its descent conjunctively with the gravitating air-receiver and, falling in the liquid contained in the cylinder, will act by displacement to expel the liquid, delivering it to the carbureter conjunctively with the delivery of the air.

Leading from the cylinder f of the delivering device, near its upper end, is a small pipe h^{20}, which extends to the carbureter C, and the hydrocarbon liquid contained in said cylinder f is expelled and caused to pass through said pipe h^{20} to the carbureter as the inner tube f' descends.

As the tube f' is connected with the air-receiver, as before described, it will be seen that it will descend with said air-receiver and will cause the liquid contained in the cylinder f to pass through the pipe h^{20} at a certain speed proportional to the descent of the air-receiver, so that the liquid and air will be delivered to the carbureter in uniform proportions and the delivery of the liquid will be absolutely dependent upon the delivery of the air.

It is designed that the hydrocarbon liquid shall rise in the cylinder f to a predetermined height when the inlet-valve is open to thus regulate the quantity to be used proportional to the air which is supplied by the air-receiver, and to accomplish this result we employ a stand-pipe c^{20}, which rises from a supply-tank P to a suitable height and which is kept filled with hydrocarbon liquid to a predetermined height or above a certain level by means to be described, and said stand-pipe c^{20} is tapped at s^5, and the inlet-pipe s is connected to the stand-pipe at such point and enters the lower end of the cylinder f, as before described, and the passage through said pipe s is controlled by the valve f^2, moving toward and from its inner end, and when said valve is open the hydrocarbon liquid will rise in the cylinder f to a level with the liquid contained in the stand-pipe c^{20}. The outlet h^{20} of the cylinder f is just at or above the normal level of the hydrocarbon liquid contained in the stand-pipe c^{20}; but the liquid is expelled through said outlet h^{20} by displacement produced by the falling tube f' when the valve f^2 is closed upon the end of the inlet-pipe s and is conducted to the carbureter C.

To maintain the hydrocarbon liquid at a predetermined height in the stand-pipe c^{20}, we provide a tank c', (see Figs. 1, 3, and 5,) which contains within it a vertical partition-wall c^{30}, dividing it into two compartments 4 and 5, and said partition-wall c^{30} terminates just above the bottom of said tank to allow free and unobstructed passage beneath it, as at 2. The stand-pipe c^{20}, rising from the supply-tank P, extends a short distance above the tank c' and has a T-coupling c^{21} at a point about on a level with said tank, from which a short bent pipe c^{22} leads to said tank, opening into the compartment 4 thereof at a point substantially midway the height of the tank. Water is introduced into the tank c' in suitable quantities, which upon rising therein high enough will enter said pipe c^{22} and pass down the stand-pipe c^{20} into the supply-tank P and upon settling to the bottom of said supply-tank will displace a corresponding quantity of hydrocarbon liquid, which will rise in said stand-pipe and will enter the compartment 4 of the tank and float upon the surface of the water therein. The water is introduced into the tank c' by a pipe c, which is connected with the cylinder b^2, containing the piston a', and as said piston a' falls the water will be conducted into the compartment 5 of the tank c' by said pipe c. It will be seen that the cylinder b^2 is not vented, and hence the water will be retained therein and will only pass out gradually as the piston a' falls, although it is obvious that the water might be allowed to escape at once and be conducted to the tank c', and in either case the result will be the same. The water upon entering the compartment 5 of the tank c' passes beneath the partition-wall c^{30}, and thence into and down the stand-pipe c^{20}; but to provide against the passage of too much water and consequent trouble which might arise an overflow or waste pipe 6 is provided in the compartment 5 of the tank c', the upper end of which terminates substantially on a level with the center of the pipe c^{22}, and if more water enters than is required to raise the hydrocarbon liquid to such a predetermined level in the compartment 4 of the tank c^5 then it will be carried away. Thus it will be seen that the hydrocarbon liquid and the water establish themselves in the tank c' in a ratio corresponding to their respective specific gravities. Referring to Fig. 2, the dotted line indicates the level of the water in the compartment 4, above which is the hydrocarbon liquid, and it will be understood that said hydrocarbon liquid is maintained at such a predetermined height and that the stand-pipe c^{20} will consequently be filled to such a level, and when a quantity is taken from said stand-pipe to fill the cylinder f of the delivering device the predetermined level in the tank c' will necessarily fall and the water will rise in said compartment 4 and soon will reach such a level as to enter the pipe c^{22} and to flow down the stand-pipe c^{20} into the supply-tank P and to cause a corresponding quantity of hydrocarbon liquid to rise. Thus it will be observed that the hydrocarbon liquid is automatically maintained at a predermined height in order that the delivering device may be refilled as desired.

The carbureter or converter or mixer C consists of a tank which contains within it a coil or worm d^2, the upper end of which is connected with the pipe d^3 and the lower end of which is connected with the pipe d^7, and said reservoir is adapted to be filled with water, which may be warm, if desired, to facilitate the evaporation into gas of the hydrocarbon liquid. The hydrocarbon liquid expelled from the cylinder f at h^{20} passes along said pipe h^{20} and is delivered into the pipe d^3 at a point near the connection of said pipe d^3 with the coil or worm d^2 and then passes down through said coil or worm and meets an inflow of air, which enters said coil or worm at the bottom through a pipe d^7, and the liquid is converted into gas by being taken up or commingled with the air before it reaches the bottom of the coil, and as a consequence there is no waste.

An indicating device is preferably provided to ascertain whether or not the machine is in operation, and, as herein shown, such indicating device consists of two pipes u u, (see Fig. 4,) brought nearly together and inclosed within a case u', having a glass front, so that the dropping of the hydrocarbon liquid can be seen. This indicating device is connected in the pipe h^{20}, which leads from the delivering device to the carbureter.

The gas generated in the carbureter passes through the pipes d^3, d^{30}, d^{31}, d^{32}, and d^{33} to a receiver x^2, which may be the rising-and-falling tank of a gasometer of any usual or suitable construction. The passage of the gas along said pipes to the carbureter is controlled by a pressure-regulating valve.

The pressure-regulating valve herein shown and which is preferably employed consists of a sleeve y^2, placed within a T-coupling y^3, (see Fig. 1,) a plunger y^4, which fits tightly into the said sleeve y^3 and which is connected to a rod which projects vertically out of the top of the T-coupling, and a lever y^5, pivoted to an upright arm y^6, secured to said rod and resting upon the top of said gas-receiver or gasometer x^2.

The height of the receiving-tank x^2 of the gasometer remains constant while the air-pressure device is descending, and the pressure-regulating valve admits gas to the gasometer as fast as the gas contained in the gasometer is consumed.

While the cylinder b of the air-pressure device is being lifted the receiver x^2 of the gasometer falls to supply the consumption of gas during such interval of time; but as soon as the air-pressure device is refilled and its air-receiver again begins to descend the receiver x^2 of the gasometer rises until an equalization of pressure is again established.

When the supply-tank P becomes filled with water, it will be pumped out in any suitable manner before it is refilled with hydrocarbon liquid.

We claim—

1. In a gas-machine, a carbureter, a supply-tank for the hydrocarbon liquid, a delivering device for delivering said liquid to said carbureter, comprising a receiving-chamber and means for discharging the liquid therefrom, pipes connecting said delivering device with the supply-tank and also with the carbureter, means for controlling the flow of liquid from the supply-tank to the delivering device, an air-pressure device also connected with said carbureter, intermediate connections between said air-pressure device and said delivering device, whereby the latter is operated by the former to deliver a quantity of hydrocarbon liquid to the carbureter at the same time that a proportionate quantity of air is delivered to said carbureter, and a motive power connected with said air-pressure device only, adapted to operate it, the operation of said delivering device being thereby absolutely dependent upon the operation of said air-pressure device, substantially as described.

2. In a gas-machine, wherein air and hydrocarbon liquid are simultaneously delivered in proportionate quantities to a carbureter, and the delivery of all hydrocarbon liquid is absolutely dependent upon the delivery of the air, a carbureter, a supply-tank for the hydrocarbon liquid, a delivering device for said liquid connected with said carbureter, comprising a receiving-chamber and means for discharging the liquid therefrom, a pipe connecting the delivering device with said supply-tank and means for controlling the flow of liquid from the supply-tank to the delivering device, an air-pressure device having a gravitating air-receiver b, a pipe connecting the carbureter with said air-pressure device below the air-receiver, intermediate connections between said air-receiver b and said delivering device whereby the latter is operated by said falling air-receiver to deliver the liquid to the carbureter, and a motive power connected with said air-receiver only, adapted to raise it to store up a supply of air, substantially as described.

3. In a gas-machine, a carbureter, an air-pressure device having a gravitating air-receiver b, a pipe connecting said air-pressure device with the carbureter, a supply-tank for the hydrocarbon liquid, a delivering device for said liquid, comprising a receiving-chamber and means for discharging the liquid therefrom, pipes connecting said delivering device with said supply-tank and also with the carbureter, intermediate mechanism connecting the actuating member of said delivering device with said air-receiver b, whereby the former will be operated solely by the latter, and a motive power connected with said air-receiver to simultaneously store up proportionate quantities of air and hydrocarbon liquid, which will be thereafter simultaneously delivered in uniform proportions to the carbureter as the air-receiver b falls by gravity, the action of the delivering device being thereby absolutely dependent upon the action of the air-receiver b, substantially as described.

4. In a gas-machine, a carbureter, an air-pressure device and a delivering device, the operating members of which are operated conjunctively to simultaneously deliver air and hydrocarbon liquid in uniform proportions to said carbureter, a supply-tank, a stand-pipe rising therefrom, means for automatically raising the hydrocarbon liquid and maintaining it at a certain level in said stand-pipe, a pipe connecting said stand-pipe with said delivering device, and a valve controlling the flow of liquid through said connecting-pipe, which is connected with and operated by an operating member of said delivering device, substantially as described.

5. In a gas-machine, a carbureter, an air-

pressure device and a delivering device, means for operating said devices to simultaneously store up a supply of air and liquid, both of which devices thereafter simultaneously deliver the air and liquid in uniform proportions to the carbureter, an automatic device controlling the operation of said means, a stand-pipe connected with the delivering device, and means for automatically raising and maintaining the liquid therein at a certain elevation, substantially as described.

6. In a gas-machine, a carbureter, an air-pressure device and a delivering device, a supply-tank and a stand-pipe rising therefrom, means for automatically raising and maintaining hydrocarbon liquid at a certain level in said stand-pipe, a connecting-pipe between said stand-pipe and said delivering device, a controlling-valve, means for operating said air-pressure and delivering devices conjunctively to simultaneously store up a supply of air and to store up a supply of hydrocarbon liquid, both of which devices thereafter operate simultaneously and deliver the air and liquid in uniform proportions to the carbureter, substantially as described.

7. In a gas-machine, a carbureter, means for delivering air and hydrocarbon liquid thereto consisting of an air-pressure device having an air-receiver, which descends slowly by gravity, and a delivering device having a slowly-descending liquid-displacing device connected with said gravitating air-receiver, means for quickly raising said air-receiver and the displacing device connected with it to store up a supply of air and liquid, and automatic means for supplying said delivering device with hydrocarbon liquid while the displacing device is elevated, substantially as described.

8. In a gas-machine, a carbureter, an air-pressure device having a gravitating air-receiver, and a delivering device having a gravitating liquid-displacing device connected with said gravitating air-receiver, said air-receiver and displacing device descending slowly to deliver air and hydrocarbon liquid to the carbureter, means for quickly raising said air-receiver and the displacing device connected with it to store up a supply of air and liquid, an actuator for said means connected with and operated by said air-receiver, and automatic means for supplying said delivering device with hydrocarbon liquid while the displacing device is elevated, substantially as described.

9. A delivering device for hydrocarbon liquid, a supply-tank, a stand-pipe rising therefrom, means for automatically raising and maintaining the liquid at a certain level in said stand-pipe, a pipe connecting said stand-pipe with said delivering device, and a valve controlling the flow of liquid through said connecting-pipe, substantially as described.

10. A delivering device for hydrocarbon liquid, means for operating said delivering device to deliver hydrocarbon liquid to said carbureter, a supply-tank, a stand-pipe rising therefrom, a pipe connecting said stand-pipe with said delivering device, a valve which controls the flow of liquid through said connecting-pipe, an elevated tank connected with said stand-pipe, means for maintaining water in said tank at a certain level whereby hydrocarbon liquid is caused to rise in the stand-pipe, substantially as described.

11. In a gas-machine, a carbureter, an air-pressure device and a delivering device, means for operating them conjunctively to store up a supply of air and to store up a supply of hydrocarbon liquid, means for conducting said air and said liquid to the carbureter, a supply-tank, a stand-pipe rising therefrom connected with said delivering device, a valve controlling the passage of the liquid from said stand-pipe to said delivering device, and automatically-operated means for elevating the liquid in said stand-pipe, substantially as described.

12. In a gas-machine, a carbureter, an air-pressure device and a delivering device, means for operating them conjunctively to store up a supply of air and to store up a supply of hydrocarbon liquid, means for conducting said air and said liquid to the carbureter, a supply-tank, a stand-pipe rising therefrom connected with said delivering device, a valve controlling the passage of the liquid from said stand-pipe to said delivering device, and means for elevating the liquid in said stand-pipe the operation of which is controlled by the means employed for operating the air-pressure and delivering devices, substantially as described.

13. In a gas-machine, a carbureter, an air-pressure device and a delivering device, means for operating them conjunctively to store up a supply of air and to store up a supply of hydrocarbon liquid, means for conducting said air and said liquid to the carbureter, a supply-tank, a stand-pipe rising therefrom connected with said delivering device, a valve controlling the passage of the liquid from said stand-pipe to said delivering device, and means for elevating the liquid in said stand-pipe consisting of a pipe connected with a water-supply by which water is conducted to the supply-tank, and a controlling device for said pipe operated by the means employed for operating the air-pressure and delivering devices, substantially as described.

14. A delivering device for delivering hydrocarbon liquid consisting of a vertical cylinder having an inlet, a controlling-valve therefor, and an outlet located above said inlet, and a device moving up and down within said cylinder which acts by displacement as it descends to raise the liquid in said cylinder and cause it to flow through said outlet, means for operating said device and said controlling-valve, substantially as described.

15. A delivering device for delivering hydrocarbon liquid consisting of a vertical cylinder having an inlet and an outlet, the lat-

ter being located above the former, a device moving up and down within said cylinder which acts by displacement as it descends to raise the liquid and thereby cause it to flow through said outlet, means for operating said displacing device, and a valve controlling the inlet which is connected with and operated by said displacing device, substantially as described.

16. A delivering device for delivering hydrocarbon liquid consisting of a cylinder having an inlet and an outlet, a tube moving up and down within said cylinder which acts by displacement to cause the liquid to flow through the outlet, means for raising and lowering said tube, and a valve controlling the inlet attached to a rod or stem which is in frictional engagement with said tube, and a stop for limiting the movement of said valve away from its seat, substantially as described.

17. A delivering device for delivering hydrocarbon liquid, means for supplying said delivering device with liquid consisting of a supply-tank, a stand-pipe rising therefrom, an elevated tank having a partition-wall dividing it into two compartments with a communicating passage between them at the bottom, said stand-pipe being connected with one of said compartments, a pipe connected with a water-supply leading into the other compartment of said tank, and an overflow-pipe leading from said compartment which determines the level of the water therein, substantially as described.

18. A delivering device for delivering hydrocarbon liquid, consisting of a vertical cylinder having an inlet and an outlet, the latter being located above the former, a device moving up and down within said cylinder which acts by displacement as it descends to raise the liquid in said cylinder, and thereby cause it to escape through said outlet, means for operating said device, a vertical stand-pipe connected with a supply-tank, means for automatically raising and maintaining the liquid at a certain level in said stand-pipe, a pipe connecting said stand-pipe with said delivering device, and a valve controlling the flow of liquid through said pipe, substantially as described.

19. A supply-tank for hydrocarbon liquid, a stand-pipe connected therewith having an outlet, an elevated tank connected with said stand-pipe, and a water-supply connected with said tank, means for maintaining the water in said tank, at a certain level whereby the hydrocarbon liquid is caused to rise to a corresponding level in said stand-pipe, substantially as described.

20. A supply-tank for hydrocarbon liquid, a stand-pipe connected therewith, an elevated water-receiving tank connected with said supply-tank, means for maintaining the water at a certain level in said tank, whereby the hydrocarbon liquid is caused to rise to a corresponding level in said stand-pipe, a delivering device for the hydrocarbon liquid connected with said stand-pipe, and automatic mechanism for recurrently operating said delivering device, and for recurrently furnishing the water-receiving tank with a supply of water, substantially as described.

21. In a gas-machine, a carbureter, an air-pressure device for conveying air thereto having a gravitating air-receiver and means for raising it automatically, consisting of a cylinder b^2, a piston a' working therein and connected by a rod attached to said air-receiver, a pipe connected with a water-supply for conducting water to said cylinder to move the piston, a controlling device for said water-supply, actuating-arm therefor, and intermediate connections between said air-receiver and said actuating-arm whereby the latter is operated by the former, a supply-tank for the hydrocarbon liquid, and connections between said cylinder b^2, and said supply-tank, whereby the waste water is conveyed to said tank to raise the hydrocarbon liquid, substantially as described.

22. In a gas-machine, an air-pressure device comprising the tank a, and air-receiver b, rod b', piston a' attached thereto, vertical cylinder b^2 in which said piston works, pipe v' leading to said cylinder through which water is forced to move the piston, and means for thereafter conducting said water to the supply-tank containing the hydrocarbon fluid, and for raising said fluid a predetermined elevation, consisting of the pipe c, tank c', and stand-pipe c^{20}, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRANK E. STANLEY.
FREELAN O. STANLEY.

Witnesses:
HARRY O. ROBINSON,
B. J. NOYES.