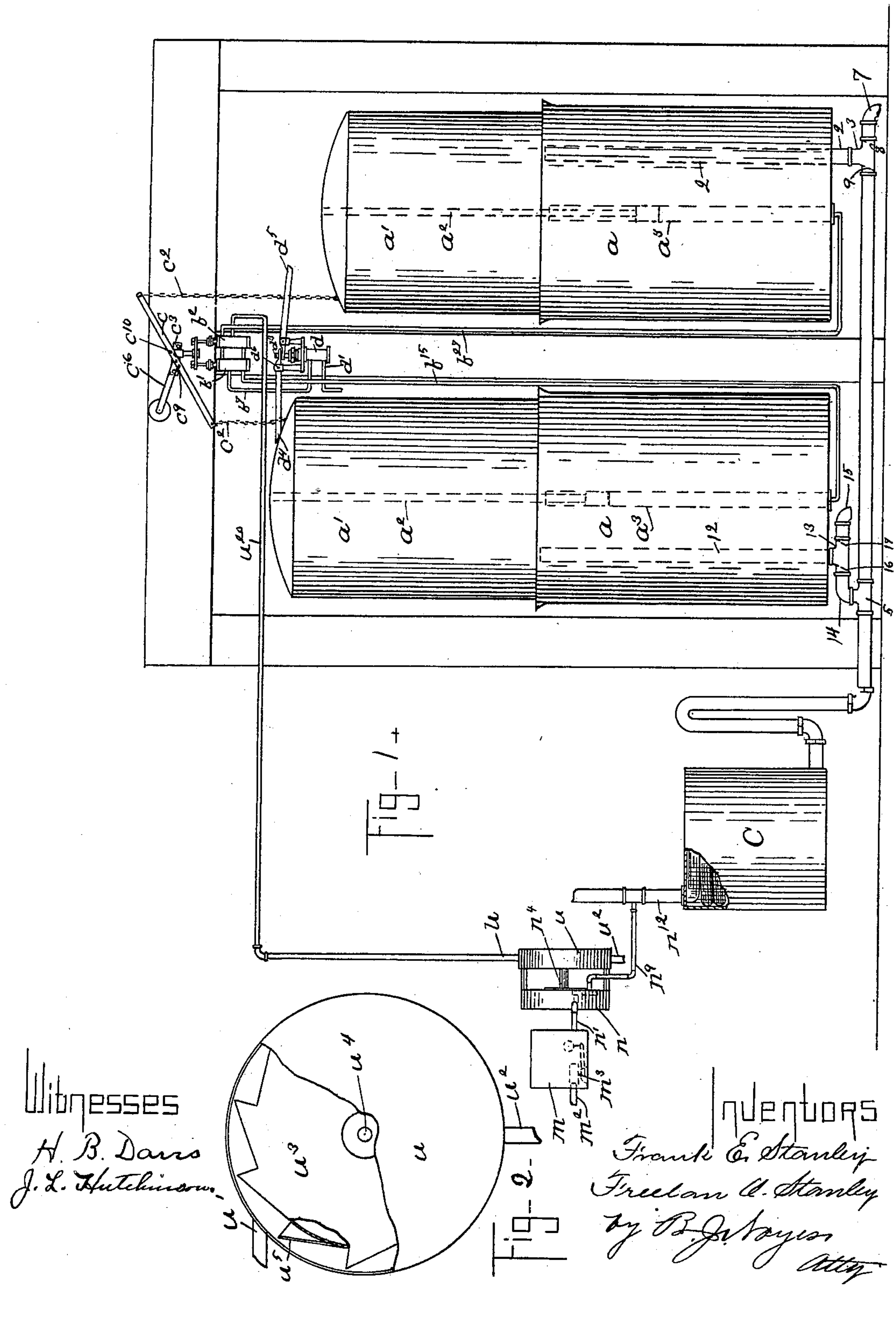
No. 632,377. Patented Sept. 5, 1899.

F. E. & F. O. STANLEY.

CARBURETER.

(Application filed June 19, 1899.)

(No Model.) 2 Sheets—Sheet 1.



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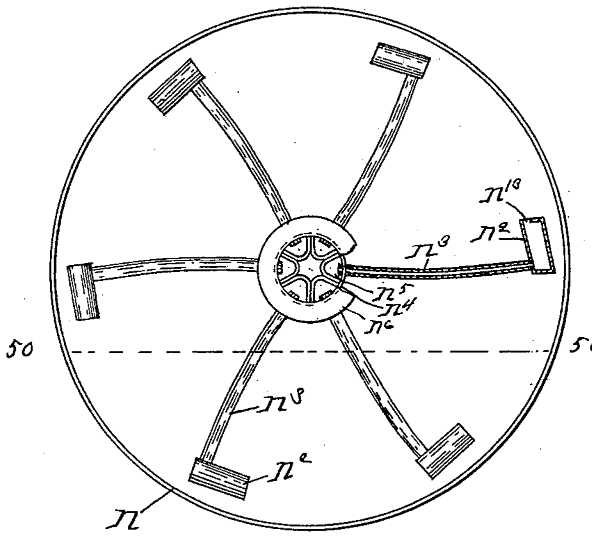
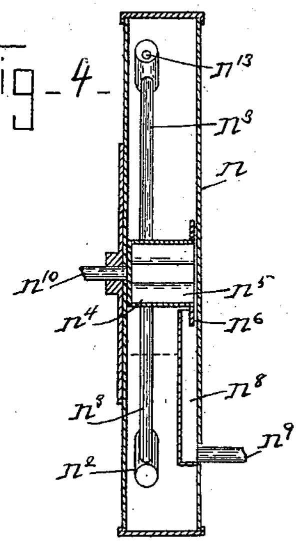


Fig-3-

Fig-4-



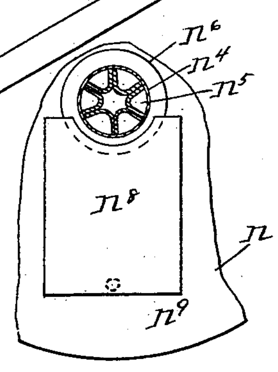


Fig-5-

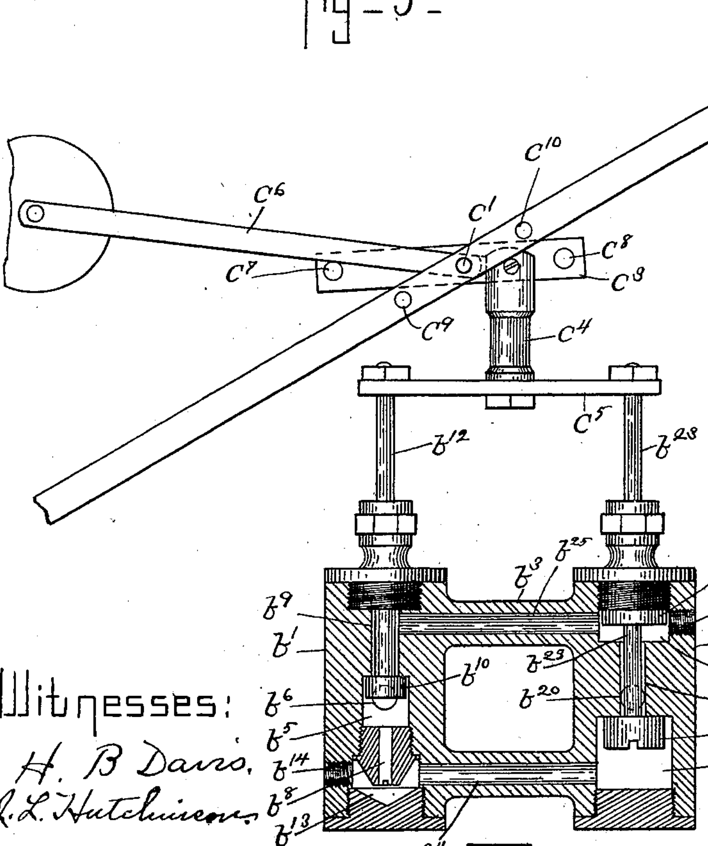


Fig-6-

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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. 632,377, dated September 5, 1899.

Application filed June 19, 1899. Serial No. 721,128. (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, and 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 numerals 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."

The gas-machine forming the subject-matter of this invention is of the type wherein the delivery of the hydrocarbon liquid to the carbureter is absolutely dependent upon the operation of an air-pressure device which delivers the air to said carbureter and both the hydrocarbon liquid and air are delivered simultaneously and in uniform proportions to the carbureter.

Our present invention comprehends the employment of a carbureter, a delivering device by which the hydrocarbon liquid is delivered in measured quantities to the carbureter, a hydraulic motor for operating said delivering device, an air-pressure device also connected with said carbureter for delivering air thereto, having a gravitating air-receiver, means for storing up a supply of water for operating said hydraulic motor as the air-receiver rises and for thereafter expelling it as the air-receiver falls to deliver its supply of air to the carbureter, and a pipe connection between the water-receiver and hydraulic motor, by which the water is conducted to said motor as it is expelled by the falling air-receiver.

The delivering device herein shown is of the rotary type and is adapted to be rotated by a hydraulic motor, and the rotating member of said delivering device has a number of buckets which enter a supply of hydrocarbon liquid, fill, and thereafter discharging their contents into a pipe, by which it is conducted to the carbureter by gravity. The hydraulic motor is also of a rotary type, and its rotating member consists, essentially, of a bucketed wheel, which is operated by a supply of water.

The air-pressure device comprises, essentially, two gravitating air-receivers operating alternately, and the water for operating said hydraulic motor is stored up in a suitable receiver as the air-receivers rise to store up a supply of air and is thereafter expelled as the air-receivers fall to deliver the air to the carbureter. A water-receiver is provided for each air-receiver, although they are connected to a common conducting-pipe for conducting the water to the hydraulic motor.

The water-receivers each consist, essentially, of a cylinder containing a piston which is connected with one of the air-receivers, and the water is expelled from the cylinder by the piston, which is thus operated by the falling air-receiver. These cylinders and pistons are or may be also used as the means of raising the air-receivers, and in such case a pipe will be connected to each cylinder, through which water is forced to raise the pistons, and thereby raise the air-receivers to store up a supply of air at the same time that the supply of water is stored up in the cylinders.

Figure 1 shows in elevation a gas-machine embodying this invention; Fig. 2, an enlarged detail of the hydraulic motor; Fig. 3, an enlarged front view of the delivering device, the front wall of the case being removed to expose the parts within; Fig. 4, a vertical section of the delivering device shown in Fig. 3; Fig. 5, a detail showing a portion of the delivering device; and Fig. 6, an enlarged vertical section of the valve controlling a supply of water, by means of which the parts are operated to store up a supply of air and also a supply of water.

The air is supplied or delivered by means of an air-pressure device, one form of which is herein shown; yet, so far as our invention is concerned, any other form may be employed having substantially the same capabilities. The air-pressure device which is herein shown consists of two tanks or hollow cylinders a, nearly filled with water and open at the top, and two hollow air-receiving cylinders a', open at the bottom and made smaller in diameter than the cylinders a and suitably suspended or supported above said cylinders a and adapted to rise and fall within said cylinders a, thus working, substantially, on the principle of an ordinary gasometer. It is designed and intended that said air-receivers a' shall operate alternately to deliver the air which is stowed up by them and that their operation shall be automatic in order that it may 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-receivers shall be controlled by the air-receivers which they operate. To accomplish this result, the following means may be employed: Each air-receiver a' has a rod a^2 fixed to and projecting downwardly from its closed top wall, and said rod a^2 has attached to it or mounted upon its lower end a piston which is adapted to work up and down within a cylinder a^3, which may be held in an upright or vertical position by a suitable frame or support to which it is attached. A compound valve is provided, which is adapted to supply water under pressure first to one and then to the other cylinder a^3, and also to provide an exit for the water contained in said cylinders through which the water is forced when the air-receivers a' fall by gravity. The compound valve herein shown (see Figs. 1 and 6) consists, essentially, of two cylinders b' b^2, located side by side and connected together by short connecting-bars b^3 b^4, formed with passages through them. The cylinder b' may be termed the "inlet-cylinder," and it has a chamber b^5 provided with an inlet-port b^6 for the inlet of the water, the inlet-pipe b^7 being connected with the cylinder b' at said inlet-port. The chamber b^5 has two passages leading from it, one, as b^8, leading down and the other, as b^9, leading up, and at the entrances of both of said passages b^8 b^9 valve-seats are formed, either one or the other of which will always be closed by a valve b^{10}, attached to a rod b^{12}, extending upward and out through the upper end of the cylinder b'. As shown in Fig. 6, the valve b^{10} is closed on the valve-seat at the entrance to the passage b^9, thereby closing said passage b^9 and leaving the passage b^8 open. The passage b^8 communicates with a chamber b^{13} at the bottom of the cylinder b', which is in open communication at one side with a port b^{14}, to which a pipe b^{15} is connected which leads directly to the lower end of one of the cylinders a^3, it being herein represented as the left-hand cylinder. In Fig. 6 the passage b^8 and chamber b^{13} are shown as open, and consequently the water is free to flow into said cylinder a^3 for the purpose of raising one of the air-receivers a' and for holding said air-receiver when raised in elevated position. The other cylinder b^2 has two chambers, one of which, as b^{17}, is located near the top of the cylinder and the other of which, as b^{18}, is located near the bottom of the cylinder, and said chambers b^{17} b^{18} are separated by a partition-wall having a vertical passage b^{19} through it connecting said chambers, and an outlet-port b^{20} leads from the cylinder b^2 at a point substantially midway the length of said partition-wall, which is in open communication with the vertical passage b^{19}. Two valves b^{21} b^{22} are contained in said vertical cylinder b^2, both of which are attached to an upright rod b^{23}, which extends through the vertical passage b^{19} and out through the upper end of the cylinder b^2, and one of said valves, as b^{21}, is contained in the chamber b^{17}, and the other valve b^{22} is contained in the chamber b^{18}, and the opposite sides or faces of said partition-wall at the opposite ends of the vertical passage b^{19} are formed with valve-seats for said valves b^{21} b^{22}. As shown in Fig. 6, the valve b^{21} is elevated from its seat and the valve b^{22} is closed upon its seat, and as a result the outlet-port b^{20} is in open communication through the passage b^{19} with the chamber b^{17}, although if the position of said valves b^{21} b^{22} should be reversed said outlet-port b^{20} would be in open communication through the passage b^{19} with the chamber b^{18}. The chamber b^{18} is connected with the chamber b^{13} at the bottom of the cylinder b' by a horizontal passage b^{24}, formed through the connecting-bar b^4, and the chamber b^{17} is connected with the vertical passage b^{12} at the top of the cylinder b' by a horizontal passage b^{25}, formed through the connecting-bar b^3. The cylinder b^2 has a port b^{26} at the top which is in open communication with the chamber b^{17}, to which a pipe b^{27} is connected, which leads to the lower end of the right-hand cylinder a^3. When the valves are in the position shown in Fig. 6, the water will enter the port b^6, flow through the passage b^8, chamber b^{13}, and passage b^{14}, along the pipe b^{15} to the left-hand cylinder a^3, and at the same time the water contained in the right-hand cylinder a^3 is free to escape from said cylinder through the port b^{26}, chamber b^{17}, vertical passage b^{19}, and outlet-port b^{20}. Thus it will be seen that the left-hand air-receiver a' will be raised and held in elevated position and the right-hand air-receiver a' will be permitted to fall by gravity. The reversing device for said compound valve consists of a reversing-lever c, loosely mounted on a pivot c' and attached at the opposite ends by chains c^2 or otherwise directly to the air-receivers a', and said reversing-lever is turned on its pivot c', by said air-receivers as they descend. A plate c^3 is also loosely mounted on said pivot c', which has loosely connected with it at one side of its pivot c' a link or stem c^4, which is attached to a cross-bar c^5, to the opposite ends of which the valve-rods b^{12} and b^{23} are connected. As the plate c^3 is rocked on its pivot c' in one direction the cross-bar c^5 will be raised, and as said plate c^3 is rocked in the opposite direction said cross-bar will be lowered. The weighted arm c^6 is employed to rock said plate c^3 on its pivot in both directions, said arm being likewise loosely mounted on the said pivot c' and when dropped to one side of said pivot will strike upon a stud c^7, projecting laterally from one end of the plate c^3, and will consequently depress this end of said plate and raise the opposite end of said plate, and thereby lift the cross-bar c^5, and when said weighted arm c^6 is moved and is dropped at the opposite side of its pivot c' it will strike upon a stud c^8, projecting laterally from the opposite end of said plate c^3 and will depress said end of the plate, and thereby lower the cross-bar c^5. The weighted arm c^6 is moved so as to drop at one or the other side of its pivot c' by means of the reversing-lever c, and to enable such result to be accomplished the reversing-lever has projecting laterally from it two studs c^9 c^{10}, which are located at the opposite sides of the pivot c' on which said lever works, and said studs are adapted to engage one or the other side of said weighted arm, as the case may be, to raise said arm into vertical position just enough farther to permit it to fall by gravity. As shown in Fig. 6, as the reversing-lever c is operated by the right-hand air-receiver a' descending the stud c^9 will engage the weighted arm c^6 and will raise said arm to a vertical position and just enough farther to permit it to drop. In falling it will strike upon the stud c^8, and thereby change the position of the pivoted plate c^3. Whenever the weighted arm is thus operated, the position of the valves in the cylinders b' b^2 will be changed and the water entering the port b^6 will pass through the passages b^9 b^{25}, chamber b^{17}, and port b^{26}, and thence will flow along the pipe leading to the right-hand cylinder a^3, and the water from the left-hand cylinder a^3 will be allowed to escape through the port b^{14}, passages b^{13} b^{24}, chamber b^{18}, passage b^{19}, and outlet-port b^{20}.

A simple controlling-valve is provided for controlling the passage of water along the inlet-pipe b^7 to the compound valve, which is herein shown as a chambered cylinder d, having an inlet-pipe d' and having an outlet to which the lower end of the said inlet-pipe b^7 is connected, and a valve also contained in said cylinder is adapted to open and close a port between said inlet and outlet pipes, said valve being attached to a rod or stem d^3, passing out through the upper end of the cylinder d, and two operating-levers d^4 d^5 are connected to said valve rod or stem d^3, either one of which is adapted to raise the valve and allow free passage of the water. One of said operating-levers, as d^4, is pivoted at d^5 to a suitable support located a short distance from the valve-stem d^3, and the inner end of the lever is connected to said valve-stem and the outer end of said lever is made long enough to overlie the top of the left-hand air-receiver a' to be engaged by said air-receiver as it rises and arrives at its most elevated position. The other operating-lever d^5 extends in the opposite way and in a similar manner and overlies and is adapted to be engaged by the left-hand air-receiver a'. When either one of said operating-levers is raised by one of the air-receivers arriving at its most elevated position, the simple valve will be closed and will remain closed, notwithstanding the position of the other operating-lever. As shown in Fig. 1, the left-hand air-receiver is in its most elevated position and the operating-lever d^4 is elevated and the valve closed and the right-hand air-receiver is falling by gravity. When said right-hand air-receiver has descended a sufficient distance to rock the reversing-lever c and operate the weighted arm c^6 to in turn reverse the compound valve, a waterway will be at once opened for the escape of the water contained in the left-hand cylinder a^3, and the left-hand air-receiver will at once begin to fall by gravity, and then the operating-lever d^4 will be operated to open the simple valve and allow the water to flow through the inlet-pipe of the compound valve to raise the right-hand air-receiver, and as soon as said right-hand air-receiver has been raised to its most elevated position the operating-lever d^5 will be operated to shut off the water-supply. Thus it will be seen that the air-receivers a' a' operate alternately to store up and deliver their respective supplies of air, and the result of such alternate operation is the delivery of a constant supply of air, and it will be particularly observed that one of the air-receivers always begins to fall by gravity before the other begins to rise.

The air is delivered from the right-hand air-receiver through a pipe 2, T-coupling 3, pipe 4, T-coupling 5, and pipe 6, and the air will be drawn into said air-receiver through pipe 7, connected with the T-coupling 3, suitable check-valves 8 and 9 being provided, the check-valve 8 preventing the air from passing out of the inlet-pipe by back pressure and the check-valve 9 preventing the air-supply being taken from the other air-receiver. The air is delivered from the left-hand air-receiver a' in a similar manner through a pipe 12, T-coupling 13, pipe 14, T-coupling 5, and pipe 6, and the air is drawn into said air-receiver through the pipe 15, and suitable check-valves 16 and 17 will be provided in said T-coupling 13 or elsewhere, the check-valve 17 preventing the air passing through the inlet-pipe 15 by back pressure and the check-valve 16 preventing taking the air-supply from the other air-receiver.

The delivering device by means of which the hydrocarbon liquid will be delivered to the carbureter is shown in Figs. 1, 3, 4, and 5, and a detail description of said delivering device is herein given for the purpose of enabling any person skilled in the art to fully comprehend this invention; yet it will be understood that the specific construction of said delivering device forms no part of the invention forming the subject-matter of this application.

The delivering device as herein shown consists of a circular shell or case n, set upright and having an inlet n' at one side a suitable distance above the bottom, whereby a supply of hydrocarbon liquid may be admitted which will be sufficient to maintain the liquid in said receptacle at a predetermined elevation, as best shown in Fig. 3, wherein the normal elevation of the hydrocarbon liquid is indicated by the dotted line 50. The normal elevation of the hydrocarbon liquid is below the center of the circular receptacle n. Consequently said liquid but partially fills the receptacle. A number of buckets n^2, six being herein shown, are contained in said receptacle n, being supported at the extremities of hollow arms n^3, which project radially from a central drum n^4, which is secured to a shaft n^{10}, connected with a shaft u^4 of a motor to be described, and as said shaft n^{10} revolves the buckets n^2 will be caused to move in the path of a circle within the circular receptacle. The central drum n^4 is divided into a number of compartments or chambers n^5, corresponding to the number of buckets, and the hollow or tubular arm n^3, to which said buckets are attached, opens into the several chambers, respectively, there being one hollow arm n^3 opening into each chamber. The several chambers n^5 are open at one end only, and said openings are at one end of the drum n^4, and said drum has formed on it at the open end of the several chambers n^5 a flange n^6. The flanged end of the drum projects over the open top of a delivery-compartment n^8, which is provided at one side of the circular receptacle, being secured to the inside of the front wall thereof, and said delivery-compartment n^8 has an outlet-pipe n^9 at or near its lower end. As the buckets are moved in a circular path in the receptacle n they will successively enter the liquid contained in said receptacle and will fill and will thereafter discharge their contents through the hollow arms bearing them into the chambers n^5, which are in open communication with said hollow arms, and the liquid which enters said chambers n^5 will flow out at the open ends thereof over the flanged end of the drum and into the delivery-compartment n^8, and thence through the outlet-pipe n^9. By means of this delivering device it will be seen that small quantities of hydrocarbon liquid are successively taken up and delivered to the pipe n^9. The pipe n^9 is connected with a pipe n^{12}, which is in open communication with the carbureter C at the upper end thereof, so that the aforesaid small quantities of hydrocarbon liquid will be successively or intermittingly delivered to the carbureter. The delivering-compartment n^8 and pipe n^9 leading from it to the carbureter C serve as and constitute a gravity delivery pipe or passage along which the hydrocarbon liquid flows by gravity to the carbureter. It will be seen that the hydrocarbon liquid flowing along this gravity delivery pipe or passage is under no pressure whatever, and consequently will not be forced into the carbureter. The several buckets n^2 will be closed at their upper ends, except a small perforation n^{13}, being provided for the entrance of the hydrocarbon liquid; yet said buckets may be made with their upper ends entirely open.

The hydrocarbon liquid will be maintained at a predetermined elevation in the circular receptacle n by means of a small supply-tank m, which is connected by a pipe m' with the pipe n' leading to said circular receptacle and which is also connected by a pipe m^2 with any suitable supply-tank, (not shown,) but which may contain a large supply of hydrocarbon liquid, and the supply of hydrocarbon liquid is maintained at a certain elevation in the supply-tank m by an ordinary ball-cock m^3, which controls the passage of the hydrocarbon liquid through the inlet-pipe m^2.

The delivering device being of a rotary character, the hydraulic motor which will be provided for operating it may likewise be of a rotary character—that is to say, it may be caused to rotate by the admission of water—and, as herein shown, said hydraulic motor consists of a circular shell or case u, (see Figs. 1 and 2,) having an inlet at or near the top, as at u', and having an outlet at or near the bottom, as at u^2, and within said circular shell or case a bucketed wheel u^3 is placed, which is secured to a shaft u^4, having its bearings in the side walls of the shell, and said wheel u^3 has formed or provided on its periphery a number of receptacles or buckets u^5, which successively occupy a position beneath the inlet u'. The water flowing through the pipe u' enters the buckets u^5, and thereby causes the wheel to revolve. In lieu of this particular form or construction of bucketed wheel u^3 any other suitable form or construction may be provided which will be operated by the water entering the shell or case. The water escapes from the shell or case through the pipe u^2. The shaft u^4 of the bucketed wheel will be connected with the shaft n^{10} of the rotating delivering device, so that said delivering device will be rotated in unison with the bucketed wheel u^3, although it is obvious that gearing of any kind may be employed, if desired. The water for operating said bucketed wheel u^3 will be taken from the cylinders a^3 of the air-pressure device, wherein it is stored up when the pistons in said cylinders are moved by the water forced therein under pressure, and to conduct the water from said cylinders a^3 to the hydraulic motor the pipe u^{20}, leading from the compound valve, will be connected to the case of said motor. As the piston of either cylinder a^3 descends with the falling air-receiver a' the water will be caused to flow through said pipe u^{20} to the motor to thereby operate said motor simultaneously with the delivery of air to the carbureter. The parts are relatively proportioned, so that the quantity of water will be sufficient to operate the motor and in turn operate the delivering device to deliver measured quantities of hydrocarbon liquid to the carbureter proportionate to the quantity of air which is delivered to said carbureter by the falling air-receiver a'. For simplicity of construction only the cylinders a^3 and pistons contained thereon and connected with the air-receivers a' are employed both as a means of raising said air-receivers to store up a supply of air and also as a supply-reservoir of the water which is stored up for operating the hydraulic motor and which is expelled to the falling air-receivers to operate said motor.

We claim—

1. In a gas-machine, the combination of a carbureter, a delivering device for delivering hydrocarbon liquid thereto, a hydraulic motor for operating said delivering device, an air-pressure device also connected with said carbureter having a gravitating air-receiver, means for storing up a supply of water as the air-receiver rises and for thereafter expelling it as the air-receiver falls to deliver its air to the carbureter, and a pipe connection between the water-receiver and hydraulic motor by which the water is conducted to said motor as it is expelled by the falling air-receiver, substantially as described.

2. In a gas-machine wherein air and hydrocarbon liquid are simultaneously delivered in proportionate quantities to a carbureter, the combination of a carbureter, a supply-tank for the hydrocarbon liquid, a delivering device for delivering said liquid in small measured quantities to the carbureter, a hydraulic motor for operating said delivering device, an air-pressure device also connected with said carbureter having a gravitating air-receiver, a water-receiving cylinder containing a piston which is connected with and operated by said air-receiver to expel the contents of said cylinder as said air-receiver falls and delivers the air to the carbureter, and a pipe connection between said cylinder and hydraulic motor to connect thereto the water thus expelled, substantially as described.

3. In a gas-machine wherein air and hydrocarbon liquid are simultaneously delivered in proportionate quantities to a carbureter, the combination of a carbureter, a supply-tank for the hydrocarbon liquid, a delivering device for delivering said liquid in small measured quantities to the carbureter, a hydraulic motor for operating said delivering device, an air-pressure device also connected with said carbureter having a gravitating air-receiver, a cylinder containing a piston which is connected with said air-receiver, means for forcing water into said cylinder to move the piston and raise the air-receiver, and simultaneously store up supplies of air and water, and a pipe connection between said cylinder and hydraulic motor whereby the water contained in said cylinder is delivered to said hydraulic motor as it is expelled by the falling air-receiver and simultaneously with the delivery of the air to the carbureter, substantially as described.

4. In a gas-machine wherein air and hydrocarbon liquid are simultaneously delivered in proportionate quantities to a carbureter, the combination of a carbureter, a supply-tank for the hydrocarbon liquid, a delivering device for delivering said liquid in small measured quantities to the carbureter, a hydraulic motor having a rotating bucketed wheel for operating said delivering device, an air-pressure device also connected with said carbureter having a gravitating air-receiver, a water-receiving cylinder containing a piston which is connected with and operated by said air-receiver to expel the contents of said cylinder as said air-receiver falls and delivers the air to the carbureter, and a pipe connection between said cylinder and hydraulic motor to conduct thereto the water thus expelled, substantially as described.

5. In a gas-machine wherein air and hydrocarbon liquid are simultaneously delivered in proportionate quantities to a carbureter, the combination of a carbureter, a supply-tank for the hydrocarbon liquid, a rotating delivering device for delivering said liquid in small measured quantities to the carbureter, a hydraulic motor having a rotating bucketed wheel for rotating said delivering device, an air-pressure device also connected with said carbureter having a gravitating air-receiver, a water-receiving cylinder containing a piston which is connected with and operated by said air-receiver to expel the contents of said cylinder as said air-receiver falls and delivers the air to the carbureter, and a pipe connection between said cylinder and hydraulic motor to conduct thereto the water thus expelled, substantially as described.

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

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FREELAN O. STANLEY.

Witnesses:
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MARGARET L. HART.