No. 841,779. PATENTED JAN. 22, 1907.

C. W. HINMAN & W. F. WELLMAN.

GAS APPARATUS.

APPLICATION FILED APR. 13, 1905.

3 SHEETS—SHEET 1.

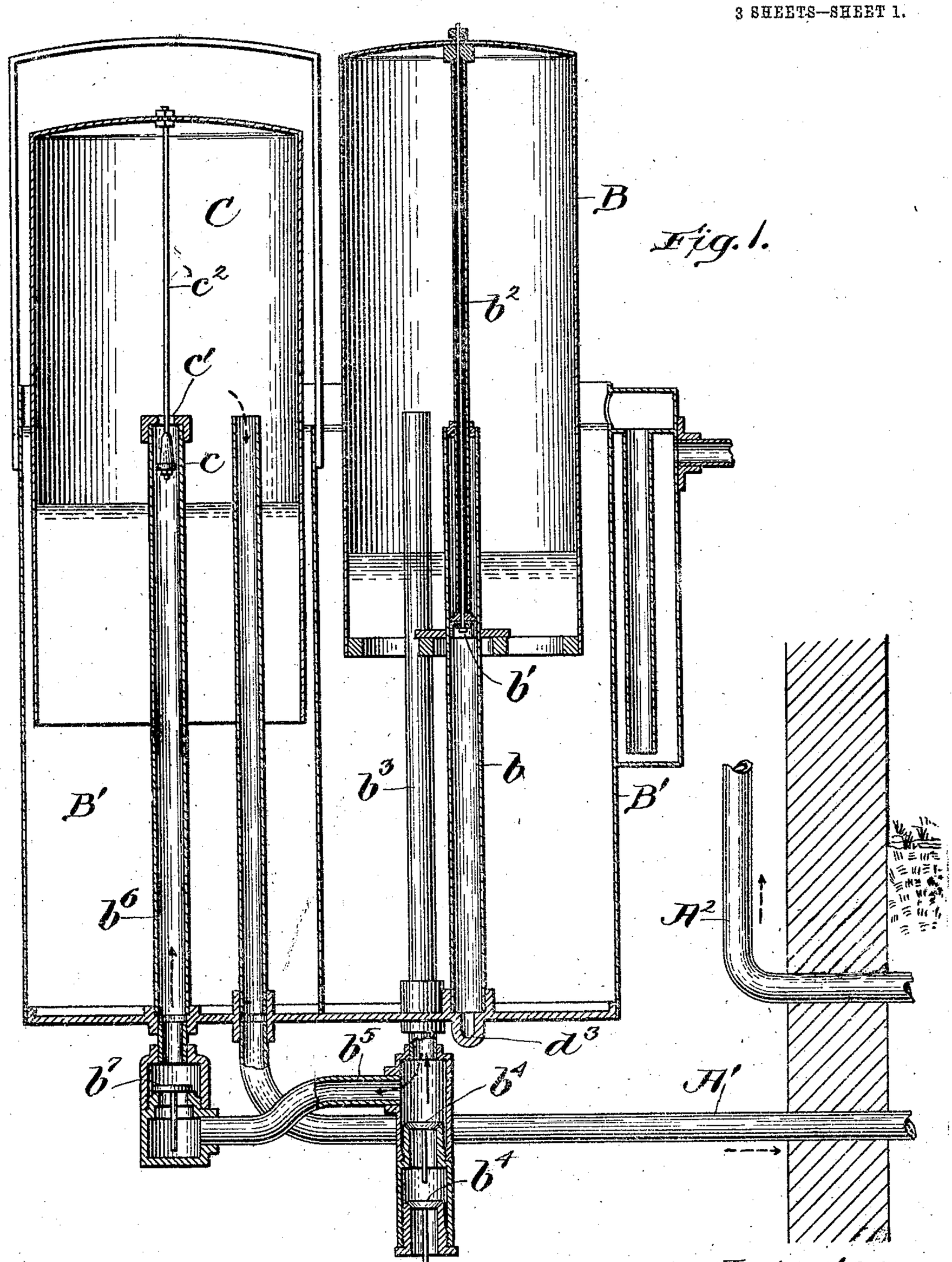

Fig. 1.

Witnesses:
G. N. Goddard
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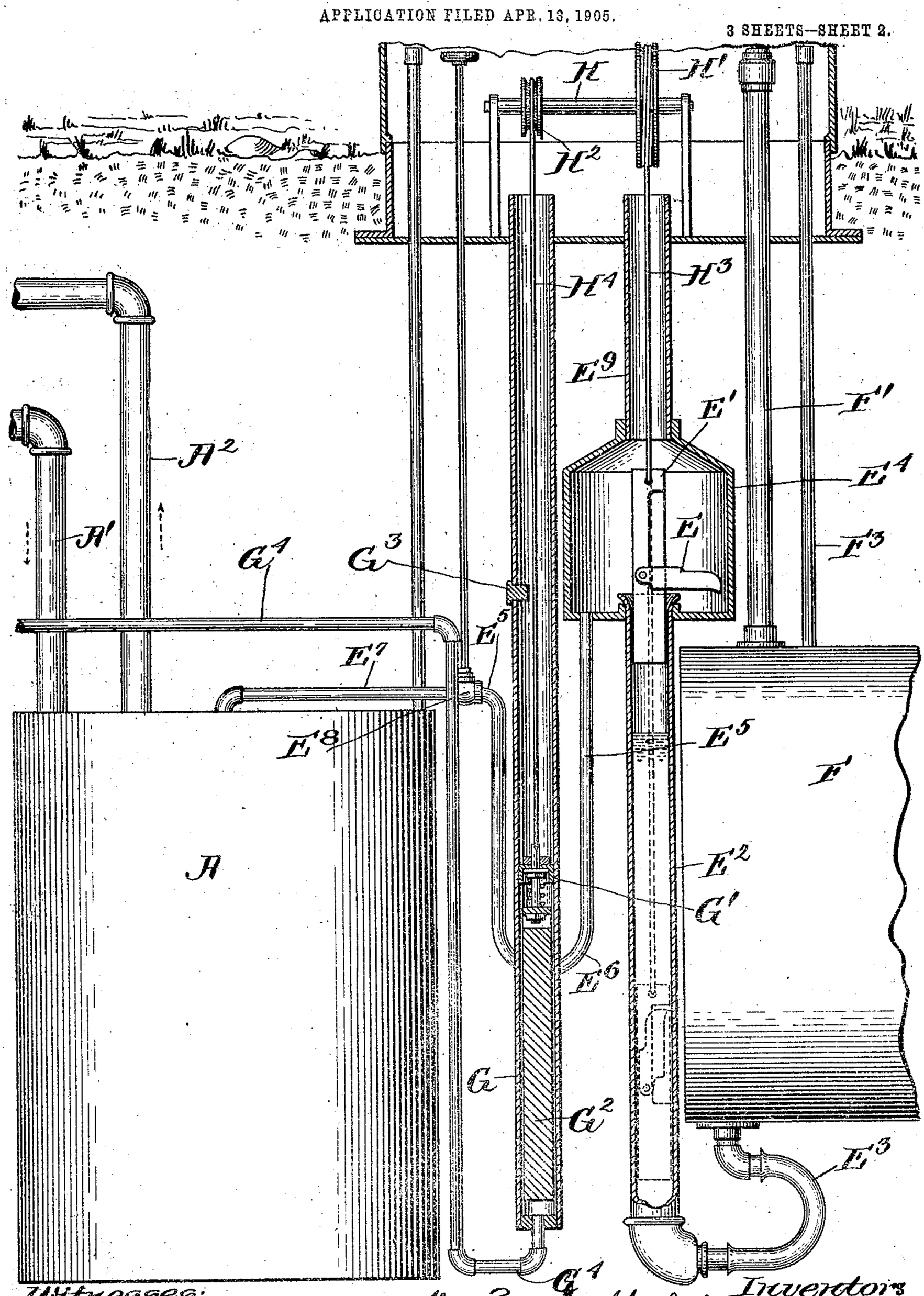

Fig. 2.

Witnesses:
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3 SHEETS—SHEET 3.

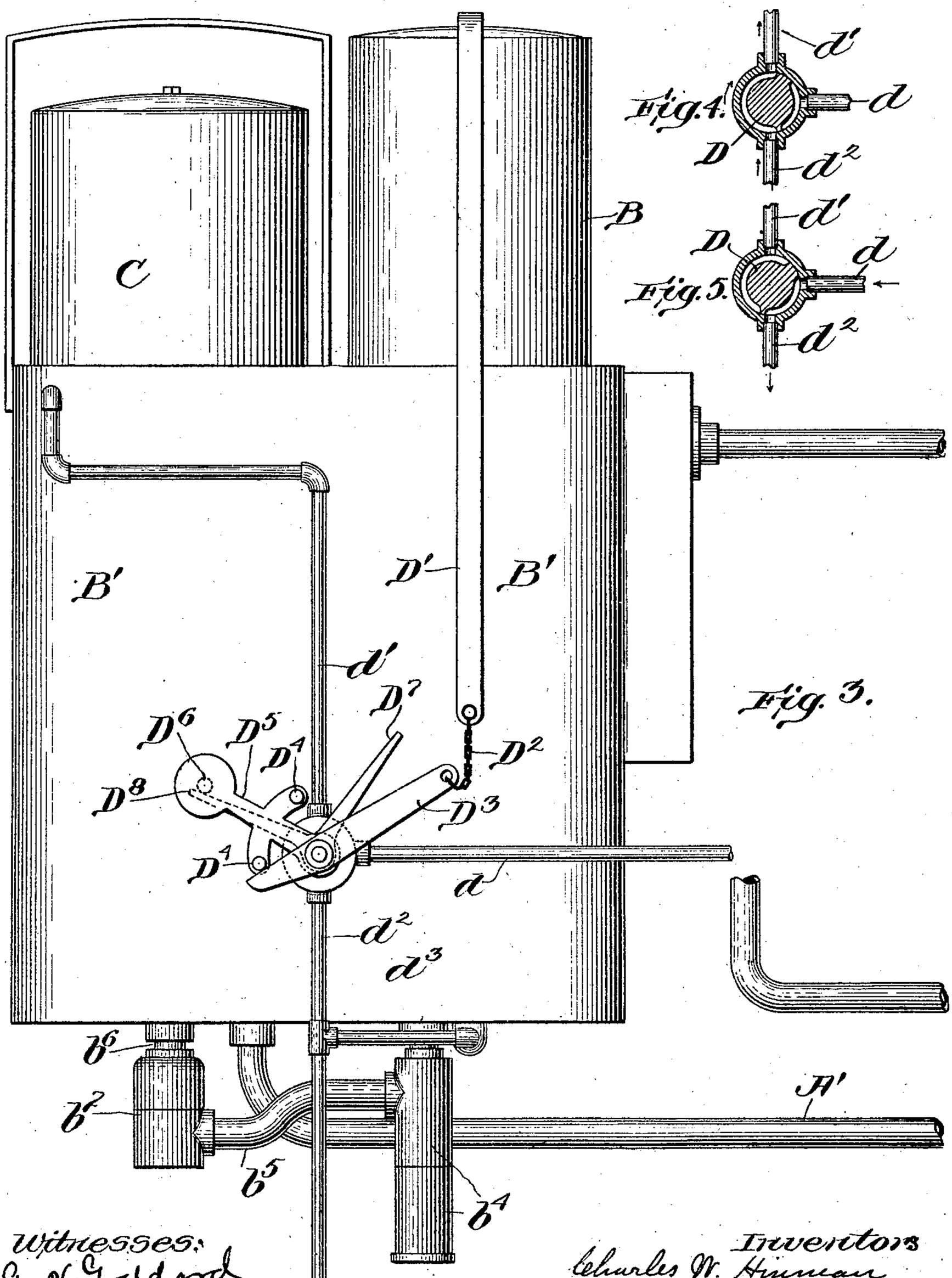

Fig. 3.

Fig. 4.

Fig. 5.

Witnesses:
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UNITED STATES PATENT OFFICE.

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GAS APPARATUS.

No. 841,779. Specification of Letters Patent. Patented Jan. 22, 1907.

Application filed April 13, 1905. Serial No. 255,321.

To all whom it may concern:

Be it known that we, CHARLES W. HINMAN, a resident of Boston, county of Suffolk, and WALTER F. WELLMAN, a resident of Cambridge, county of Middlesex, State of Massachusetts, citizens of the United States, have invented certain new and useful Improvements in Gas Apparatus, of which the following is a specification.

The invention relates to an apparatus for producing gas by supplying air and a hydrocarbon liquid to a carbureter in such fixed and definite proportions that a definite and practically uniform mixture of air and hydrocarbon vapor will be generated which is suitable for heating and lighting purposes without further admixture of air. In apparatus of this character it has heretofore been customary to locate the carbureter and the devices for supplying air and hydrocarbon liquid thereto within the building which is to be supplied with the gas. This arrangement of the apparatus results in the presence of hydrocarbon liquid in greater or less quantities within the building, and for this reason this type of apparatus has not found favor with either insurance underwriters or with persons who would otherwise be disposed to utilize such apparatus.

The primary object of the present invention is to provide an apparatus of the type referred to in which the carbureter, measuring device for the hydrocarbon liquid, and other parts containing hydrocarbon liquid may be located at any desired distance from the devices for supplying air to the carbureter and the devices for controlling the operation of the measuring device for the hydrocarbon liquid and which at the same time will be simple and practicable in construction and operate in a reliable and efficient manner to produce the desired quality of gaseous mixture. Such an apparatus enables all the parts containing hydrocarbon liquid to be located at a safe distance from the building within which the gas is to be used, while the air-supplying devices and the devices for controlling the operation of the hydrocarbon measuring device may be located within the building where they are conveniently accessible and may operate under favorable conditions.

In practicing our invention we operate the device for supplying gasolene or other hydrocarbon liquid to the carbureter in a definite proportion to the air passing through the carbureter by a fluid-motor and connect the motor by piping with a valve or other device for controlling the supply and exhaust of the motive fluid for the motor. We are thus enabled to locate the controlling device at any desired distance from the measuring device without introducing any complicate.. or impractical connections. We are also enabled to arrange the controlling device where it may be operated or controlled through the operation of the air-supplying device even when the air-supplying device is located at a considerable distance from the carbureter. In the practice of this feature of the invention any suitable form of measuring device and any suitable form of motor may be used and the operation of the motor may be controlled in any suitable and desired manner, depending upon the form of measuring device and the manner in which the hydrocarbon liquid is to be supplied to the carbureter, provided the operation of the measuring device is such that a given amount of liquid is delivered for a given amount of air. We prefer, however, to so construct and control the measuring device and the means for operating it that the measuring device will be operated at intervals during the supply of air to the carbureter. With such construction a charge of hydrocarbon liquid will be delivered to the carbureter and then the measuring device will remain inactive until a given amount of air has been supplied to the carbureter, when the measuring device will be again operated.

While we prefer to include both of the features of invention above referred to in the same apparatus for the sake of simplicity and efficiency in the operation, it will be understood that either feature may with advantage be embodied in constructions which do not include the other feature. In embodying these two features of invention in a simple construction, which will operate in a reliable manner, we have also utilized various further features of invention relating more or less to details of construction and arrangement which while they are not essential are of importance in contributing to the simplicity and efficiency of the apparatus.

All the various features of the invention will be set forth in the claims and will be understood from the following detailed description of an apparatus embodying all such features in the forms in which we prefer to use them. This apparatus is shown in the accompanying drawings, in which—

Figures 1 and 2 show an elevation of the apparatus, certain parts being shown in section. Fig. 3 is an elevation of the parts shown in Fig. 1, and Figs. 4 and 5 are sectional details of the valve for controlling the supply and exhaust for the motor which operates the air-pump and the motor which operates the measuring device for delivering the hydrocarbon liquid to the carbureter.

For convenience the hydrocarbon liquid will be referred to in the following description as "gasolene," it being understood that any suitable hydrocarbon liquid which will vaporize and mingle with the air supplied to the carbureter may be employed in generating the gas.

In the construction and arrangement of apparatus shown in the drawings the carbureter A is buried in the ground at a safe distance from the building to which the gas is to be supplied and is connected, by means of an air-supply pipe A′, with the devices for supplying air to the carbureter, which are arranged in any convenient location within the building to which the gas is to be supplied. The air-supplying devices consist of an air-pump and a pressure-controlling device. The air-pump consists of an air-bell B, open at the bottom and adapted to rise and fall within a tank B′, which is nearly filled with water. The bell B is raised by water under pressure admitted to a cylinder b, arranged within the tank B′ and containing a piston b', which is connected by a rod b^2 with the bell. When water under pressure is admitted to the cylinder b, it acts upon the piston b' and raises the air-bell B. During this movement of the air-bell air is drawn into the space within the bell through a pipe b^3, which communicates with the atmosphere through check-valves b^4. When the water in the cylinder b is allowed to escape, the weight of the air-bell B compresses the air within the bell and tends to force said air through the pipe b^3 and through a branch pipe b^5, leading from the pipe b^3. The branch pipe b^5 communicates with the pipe b^3 above the check-valve b^4 and leads to the lower end of a pipe b^6, which extends upward through the tank B′ and communicates with the interior of a second bell C. The communication between the pipe b^6 and the branch pipe b^5 is controlled by a check-valve b^7, which allows the air to flow from the bell B into the bell C, but prevents any backward flow of the air from the bell C while the air-bell B is being raised. The flow of air from the bell B to the bell C is controlled by a valve c, arranged within the pipe b^6 and adapted to close the discharge-opening c' at the upper end of said pipe. The valve c is connected by a rod c^2 with the bell C, so that the discharge-opening c' will be closed when the bell C is raised to a certain point. The air-pipe A′, leading to the carbureter, communicates with the interior of the bell C, so that the bell in connection with the valve c acts as a governor for determining the pressure under which the air is forced to the carbureter.

The bells B and C are so constructed that the air-pressure developed by the weight of the bell B is sufficient to raise the bell C. The air from the bell B is therefore forced into the bell C at a rate depending upon the rate at which the air is passing through the pipe A′ to the carbureter. After the bell B has completed its downward stroke and during the time it is being raised to take in a fresh supply of air the bell C maintains the air-pressure in the pipe A′ leading to the carbureter and acts to force air through this pipe in case the gas generated in the carbureter is being consumed. When the cylinder b is again open to the exhaust, so that the water therein may escape, the downward movement of the bell B forces the air over into the bell C and raises the bell until the regulating-valve c is in position to allow a flow of air requisite to maintain the governor-bell C in position. Thus the air-pump B and the governor C act to supply air under a uniform pressure to the carbureter at a rate depending upon the rate of consumption of the gas generated in the carbureter.

The supply and exhaust of water for the cylinder b is controlled by a valve D, the movement of which alternately opens communication between the cylinder b and the supply and exhaust pipes d d'. The valve is operated in the proper direction and at proper intervals by the movement of the air-bell B. For this purpose the air-bell is provided with a depending arm D′, which is connected, by means of a chain D^2, with the end of a lever D^3. The lever is mounted to turn about the axis of the valve D and is arranged to operate upon one or the other of two pins D^4, projecting from a weighted arm D^5, which is also mounted to turn about the axis of the valve D. The weighted arm D^5 carries a pin D^6, arranged to alternately engage arms D^7 and D^8, secured to the valve D.

When the parts are in the position shown in Fig. 3, the pin D^6 on the weighted arm D^5 has operated upon the arm D^8 and moved the valve D into the position shown in Fig. 4. With the valve in this position the exhaust-pipe d' is in communication with the pipe d^2, which communicates, through a pipe d^3, with the lower end of the cylinder b. The water in the cylinder b is therefore free to flow out through the pipe d^3 and through the discharge-pipe d', which delivers into the tank

B′. The air-bell B is now free to descend and supply air to the carbureter. When the bell B has nearly reached its lower position, the lever D^3 is rocked, thus acting upon the pin D^4 to lift the weighted arm D^5 until the arm passes the vertical. When the arm has been raised to this position, it falls suddenly toward the right in Fig. 3, thus bringing the pin D^4 against the arm D^7 and quickly shifting the valve into the position shown in Fig. 5. This movement of the valves cuts off communication between the exhaust-pipe d' and the pipe d^2 and opens communication between the supply-pipe d and the pipe d^2. Water under pressure from the supply-pipe now flows through the pipes d^2 d^3 into the lower end of the cylinder b and acts on the piston b' to raise the bell B. When the bell reaches its upper position, the lever D^3 is rocked into the position shown in Fig. 3, lifting the weighted arm D^5 until it passes the vertical, when it falls to the left and quickly shifts the valve into the position shown in Fig. 4, thus shutting off communication between the supply-pipe and the cylinder B and opening up communication between the cylinder b and the exhaust-pipe d'.

The measuring device for supplying a fixed amount of gasolene to the carbureter for a given amount of air supplied to the carbureter is located near the carbureter and consists of a measuring-bucket E. This measuring-bucket is pivoted on a weighted carrier E′, arranged to reciprocate in a vertical cylinder E^2, the lower end of which is connected by a pipe E^3 with a gasolene-tank F. The lower end of the cylinder E is thus filled with gasolene and forms the reservoir from which the bucket takes a supply of gasolene at each reciprocation of the carrier E′. At the upper end of the cylinder E^2 there is a chamber E^4, the bottom of which is somewhat below the upper end of the cylinder, so that the gasolene which is delivered into the chamber will not flow back into the cylinder. The gasolene which is delivered into the chamber E^4 by the measuring-bucket E is conducted from said chamber to the carbureter by a pipe E^5 leading from the lower end of the chamber to the upper end of the carbureter. A downwardly-extending loop E^6 is formed in the pipe and the bottom of the chamber E^4 is arranged at a sufficient distance above the part E^7 of the pipe beyond the loop to cause a flow of the gasolene through the pipe against the pressure in the carbureter.

The measuring device is operated by means of a water-motor consisting of a vertical cylinder G, within which is arranged a piston G′ and a weight G^2. The connection between the water-motor and the measuring device consists of a shaft H, carrying pulleys H′ H^2, to which are secured cords H^3 H^4, connected with the carrier E′ and the piston G′, respectively. The pulley H′, about which the cord connected with the carrier E′ is wound, is double the size of the pulley H^2, about which the cord H^4, connected with the piston G′, is wound, so that a given movement of the piston G′ produces twice the movement in the carrier E′.

When water under pressure is supplied to the lower end of the cylinder G, the water acts against the piston G′ to raise the piston and weight G^2 in the cylinder until the upward movement of the piston is arrested by engagement with a stop G^3. This movement of the piston and weight G^2 lowers the weighted carrier E′ and measuring-bucket E into the position shown in dotted lines in Fig. 2. The measuring-bucket is so pivoted to the carrier E′ that it tends to assume the position shown in full lines in Fig. 2. As the carrier is lowered, however, the bucket is moved into a vertical position by its engagement with the upper end of the cylinder E^2 and is maintained in this position while within the cylinder, as indicated in dotted lines. When the water in the cylinder G is allowed to escape, the weight G^2 and piston G′ move into the position shown in full lines in Fig. 2. This movement of the weight and piston raises the carrier E′ into the full-line position shown in Fig. 2, and as the carrier comes into this position the measuring-bucket E tips into the position shown in full lines, thus discharging its contents into the chamber E^4. This gasolene passes from the chamber E^4 into the pipe E^5, and thus a charge of gasolene is supplied to the carbureter equal to the capacity of the measuring device E.

The supply of water to and the exhaust of the water from the cylinder G takes place through a pipe G^4, connecting the lower end of the cylinder with a valve for alternately connecting the pipe with the supply and exhaust. In the apparatus as shown the supply and exhaust through the pipe G^4 is controlled by the same valve D which controls the supply and exhaust to the cylinder b, forming a part of the motor for operating the air-bell B, the pipe G^4 being connected with or forming an extension of the pipe D^2 leading from the valve D. When the motor for the measuring device is thus controlled, the areas of the motor-pistons are so proportioned with relation to each other and with relation to the weight to be lifted that when the valve is moved into the position shown in Fig. 5 the measuring-device motor will be first operated to bring the measuring device into the dotted-line position, Fig. 2, and then the air-pump motor will be operated to raise the air-bell B. The measuring device will remain in the dotted-line position until the air-bell B has reached its upper position and moved the valve D into the position shown in Fig. 5, when the pipe G^4 will be opened to the exhaust and the weight G^2 and piston G′ will immediately descend, thus raising the meas-

uring device and delivering a charge of gasolene to the carbureter. The measuring device will remain in the full-line position, Fig. 2, until the air-bell reaches its lower position and moves the valve D into the position shown in Fig. 5, when the measuring device will be again lowered. Thus the valve D acts to control the supply and exhaust for the measuring-device motor, and as the operation of this valve is controlled by the movement of the air-bell it follows that the supply of gasolene to the carbureter will be in a fixed proportion to the air supplied to the carbureter. This construction and manner of operating and controlling the measuring device also results in a charge of gasolene being delivered to the carbureter for each bell full of air.

While we have shown an apparatus in which the same valve controls the supply and exhaust for both the air-pump motor and the measuring-device motor, we have found it desirable under some circumstances—as, for instance, when using a light water-pressure in the supply-pipe—to employ a double valve or two valves for controlling the supply and exhaust for these motors. In case a double valve or two valves are used the measuring-device motor may be opened to the exhaust at the time the air-pump motor is in communication with the supply and the timing of the delivery of gasolene to the carbureter with relation to the movement of the air-bell be thus varied from the timing produced in the apparatus shown and already described. In either case, however, a charge of gasolene will be supplied to the carbureter at intervals and a charge will be delivered for each bell full of air delivered to the carbureter by the air-supplying devices.

In the arrangement of the apparatus shown the gasolene-tank, the measuring devices, and the motor for the measuring devices, as well as the carbureter, are all buried in the ground, as indicated in Fig. 2. The shaft H and pulleys H' H^2 are, however, arranged in a housing at the surface of the ground, where they are accessible. The cylinder G extends up into this housing, and the chamber E^4 is connected with the housing by means of a cylinder E^9, through which the carrier E′ may be removed when desired. The gasolene-tank F is provided with a pipe F′, extending up into the housing, through which the tank may be filled, and is also provided with a pipe F^3, leading to the bottom of the tank, through which the contents of the tank may be removed, if desired. The pipe E^5 is provided with a valve E^8, the operating-stem of which extends up within the housing, where it is accessible.

The mixture of air and hydrocarbon vapor generated in the carbureter is conveyed back to the building which is to be supplied with gas through a pipe A^2.

It will be noted that with the construction and arrangement of apparatus shown all the parts containing gasolene are located outside of the building to which gas is to be supplied, while the air-supplying device and the valve or valves for controlling the operation of the air-pump and the measuring device are located within the building, where they are conveniently accessible and where they may operate under favorable conditions.

In constructing apparatus having a large capacity we have found it desirable to provide the measuring device with a second bucket and carrier and to connect the two carriers with the same pulley, so that one is raised as the other is lowered. We have also found it desirable in some instances to provide the air-supplying device with a second air-supplying bell. These modifications and various modifications in the specific construction and arrangement of parts and various changes in the details of construction may be made without departing from our invention as defined in the following claims.

What we claim, and desire to secure by Letters Patent, is—

1. A gas apparatus having in combination a carbureter, an independent gasolene-reservoir, a conduit leading to the carbureter, a gasolene-carrying device arranged to carry uniformly-measured quantities of gasolene from the reservoir to the conduit, an air-supplying device for supplying measured quantities of air to the carbureter, means for operating the air-supplying device, a motor connected to operate the measuring device, and means for controlling the motor from the air-supplying device.

2. A gas apparatus having in combination a carbureter, a measuring device for supplying measured quantities of hydrocarbon liquid thereto, a motor connected to operate said measuring device, an air-supplying device, a motor connected to operate said air-supplying devices, and devices for controlling the operation of said motors from the air-supplying device.

3. A gas apparatus having in combination a carbureter, a measuring device for supplying measured quantities of hydrocarbon liquid thereto, a fluid-motor connected to operate said measuring device, an air-supplying device, a fluid-motor connected to operate said air-supplying device, and devices for controlling the exhaust and supply for said fluid-motors from the air-supplying device.

4. A gas apparatus having in combination a carbureter, an independent gasolene-reservoir, a conduit leading to the carbureter, a gasolene-carrying device arranged to move between the gasolene-reservoir and the conduit, a fluid-motor connected to operate said gasolene-carrying device, an air-supplying device constructed to deliver measured quantities of air to the carbureter, a fluid-motor connected to operate said air-supplying device, and de-

vices for controlling the exhaust and supply for said fluid-motors from the air-supplying device.

5. A gas apparatus having in combination a carbureter, an independent gasolene-reservoir adjacent to the carbureter, a conduit leading to the carbureter, a gasolene-carrying device arranged to travel between the gasolene-reservoir and the conduit for transferring measured quantities of gasolene to the conduit, a fluid-motor adjacent to the measuring devices and connected to operate the same, an air-supplying device remote from the carbureter, a motor for operating the same, a valve adjacent to the air-supplying device for controlling the supply and exhaust for the measuring-device motor, and pipe connections between the air-supplying device and carbureter and between the valve and said measuring-device motor.

6. A gas apparatus having in combination a carbureter, a measuring device for supplying hydrocarbon liquid thereto, a fluid-motor connected to operate said measuring device, an air-supplying device, a fluid-motor connected to operate said air-supplying device, a controlling-valve for said motors, and connections between the valve and air-supplying device for operating the valve from the air-supplying device.

7. A gas apparatus having in combination a carbureter, a measuring device for supplying hydrocarbon liquid thereto, a fluid-motor connected to operate the measuring device, a controlling-valve for said motor, pipe connections between the valve and motor, an air-supplying bell, a fluid-motor connected to operate the bell, and means for controlling said valve from the air-bell.

8. A gas apparatus having in combination a carbureter, a measuring device for supplying hydrocarbon liquid thereto, a fluid-motor connected to operate the measuring device, an air-supplying bell, a fluid-motor connected to operate the bell, a controlling-valve for said motors, and devices for operating said valve through the movement of the air-bell.

9. A gas apparatus having in combination a carbureter, a gasolene-carrying device for supplying a uniformly-measured charge of gasolene thereto, an air-supplying bell, means for operating the bell, a fluid-motor for operating the gasolene-carrying device, a valve for controlling the supply and exhaust for the motor, and connections between the air-bell and valve for operating the valve.

10. A gas apparatus having in combination, a carbureter, a conduit leading thereto, a gasolene-reservoir, a measuring-bucket arranged to travel between the reservoir and conduit, a cylinder, a piston therein, connections between the piston and measuring-bucket, a conduit leading to the cylinder, an air-bell, a motor for operating the bell, a valve for controlling the supply and exhaust of motive fluid through the cylinder-conduit operated by the air-bell.

11. A gas apparatus having in combination a carbureter, a conduit leading thereto, a gasolene-reservoir, a measuring-bucket E arranged to travel between the reservoir and conduit, a cylinder G, a piston G′ therein, a shaft H provided with pulleys H′ and H^2, cords connecting the pulley H′ with the bucket and pulley H^2 with the piston, a conduit leading to the cylinder, an air-supplying device connected with the carbureter, and a controlling-valve in the cylinder-conduit operated by the air-supplying device.

12. A gas apparatus having in combination a carbureter, a conduit leading thereto, a gasolene-reservoir, a measuring-bucket arranged to travel between the reservoir and conduit, a cylinder, a piston therein, a shaft arranged over the cylinder and reservoir, connections between the shaft and piston and between the shaft and bucket for communicating motion to the bucket from the piston and in the opposite direction, a conduit leading to the cylinder, an air-supplying device connected with the carbureter, and a controlling-valve in the cylinder-conduit operated by the air-supplying device.

In witness whereof we have hereunto set our hands this 7th day of April, 1905.

CHARLES W. HINMAN.
WALTER F. WELLMAN.

In presence of—
IRA L. FISH,
G. N. GODDARD.