No. 672,947. Patented Apr. 30, 1901.

F. A. LARAWAY & J. W. HOUSER.

GAS GENERATOR.

(Application filed July 14, 1899.)

(No Model.) 2 Sheets—Sheet 1.

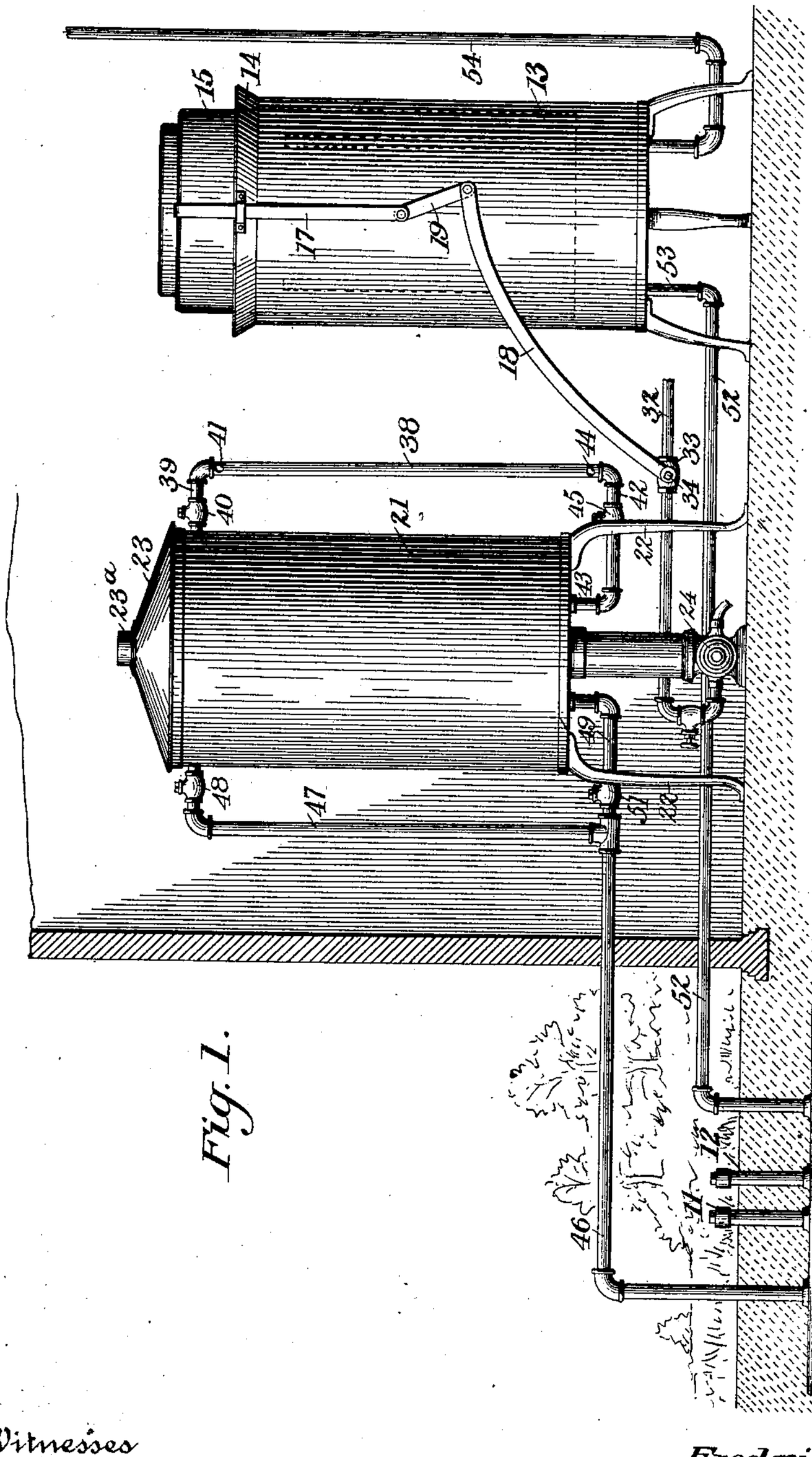

Fig. 1.

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Fig. 2.

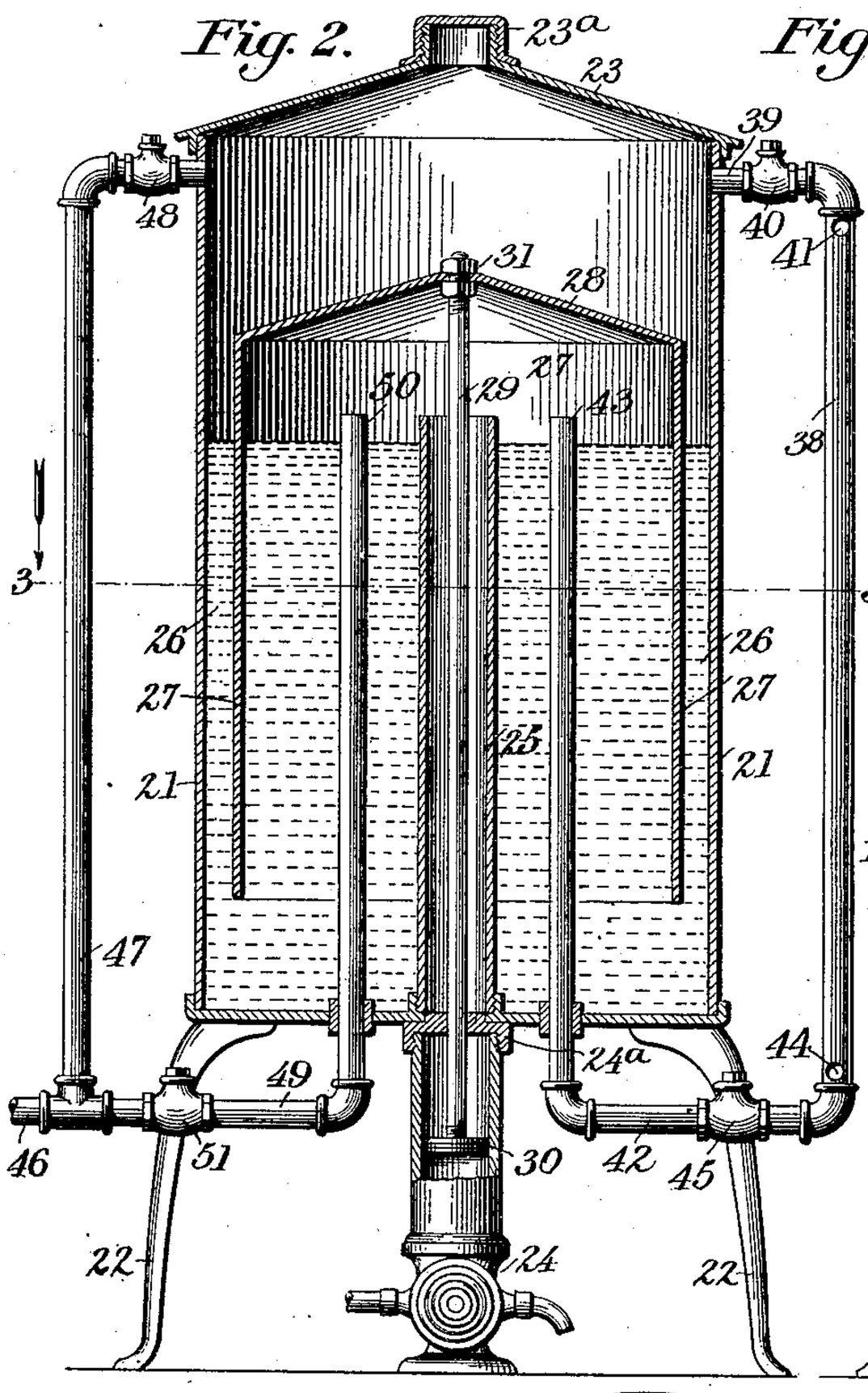


Fig. 4.

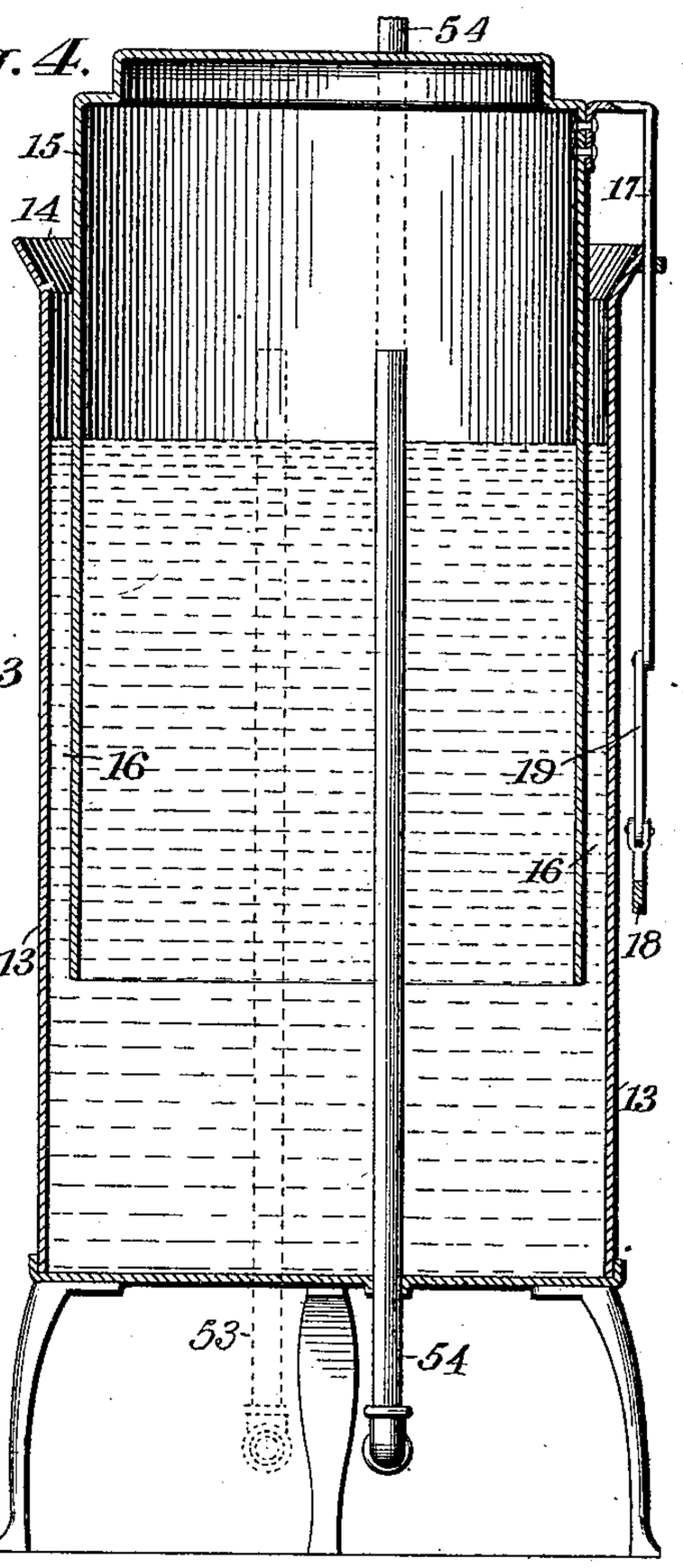
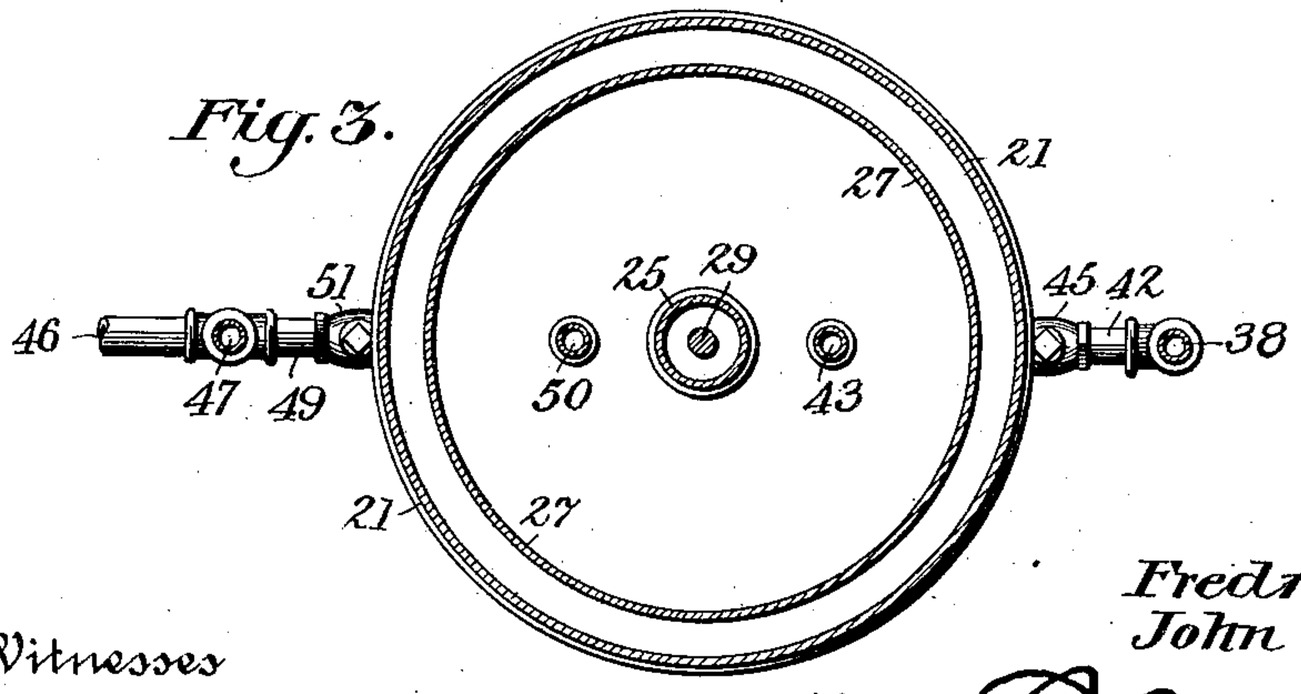


Fig. 3.



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UNITED STATES PATENT OFFICE.

FREDRICK A. LARAWAY AND JOHN W. HOUSER, OF CLEVELAND, NEW YORK.

GAS-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 672,947, dated April 30, 1901.

Application filed July 14, 1899. Serial No. 723,837. (No model.)

To all whom it may concern:

Be it known that we, FREDRICK A. LARAWAY and JOHN W. HOUSER, citizens of the United States, residing at Cleveland, in the county of Oswego and State of New York, have invented a new and useful Gas-Generator, of which the following is a specification.

Our invention relates to improvements in gas-generators of that class known to those skilled in the art as "carbureters," in which atmospheric air is saturated mechanically with a volatile hydrocarbon, such as gasolene or naphtha, for the economical production of a gas adapted for illuminating or heating purposes.

The prime object of the present invention is to produce an apparatus in which atmospheric air is forced mechanically and automatically into a generator by variation in the volume of the available gas-supply and in which the pressure of the gas remains constant under the different conditions which prevail in the practical service of the apparatus, such as the increase or decrease in the number of burners which may be in use.

With this end in view the invention consists in the novel combination of devices and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

In the drawings, Figure 1 is a side elevation of a complete gas-generator constructed in accordance with our invention. Fig. 2 is an enlarged vertical sectional elevation of the air-forcing mechanism, which is operatively connected with the generator and is controlled by movement of the bell forming a part of the storage-gasometer. Fig. 3 is a horizontal sectional plan view through the air-forcing mechanism on the plane indicated by the dotted line 3 3 of Fig. 2. Fig. 4 is an enlarged view of the storage-gasometer.

The same numerals of reference are used to indicate like and corresponding parts in each of the several figures of the drawings.

The generator 10, which we employ in the practice of our invention, is designed to be located underground in a suitable well or cavity at a proper distance from the building in which the storage-gasometer is located for supplying the gas to the burners. This generator is designed to be charged or partly filled with a highly-volatile hydrocarbon fluid—such, for example, as naphtha or gasolene—which may readily be introduced into the generator-chamber by a filling-tube 11, which is fastened to the top of the generator and extends above the level of the excavation in which said generator is buried. A vent-tube 12 is also connected to the generator for the free egress of the air which is displaced in the generator-chamber on the introduction of the fluid therein.

The storage-gasometer employed in our system may be located in the basement of a building, or it may be situated outside of the building and be provided with proper pipe connections adapted to convey carbureted air to the burners. This gasometer has a tank 13, which is provided with a flared rim 14 at its upper edge, and the floatable gas-bell 15 is inverted into the water seal 16, which is contained in the chamber of the tank 13. The floatable bell has a guide-rod 17 made fast therewith to direct the movement of the bell in its vertical travel, and said rod is adapted to play in a suitable guide fixed to the tank 13. We may provide the flared rim 14 with a slot adapted to receive the rod to serve as a guide therefor; but it is evident that the guide may be made separate from the rim and fastened to the tank. The lower end of the guide-rod is adapted to operate a lever 18, which is connected to the rod at its upper end by a link 19 and has its lower end connected with a controlling-valve in a manner hereinafter explained, so that a movement of the rod with the floatable bell will actuate the lever for the purpose of opening or closing said valve in a pressure-pipe to the hydraulic motor of the air-forcing mechanism, which we will now proceed to describe.

One element of the air-forcing mechanism is a closed vertical tank 21, which is provided with the legs or standards 22 and with a removable closure or head 23, the latter serving to permit access to the chamber of said closed tank and having a capped filling-opening 23^a. Operatively connected with the tank is a double-acting hydraulic motor 24 of any suitable construction approved by those skilled in the art; but as this motor *per se*

constitutes no part of our invention and as we contemplate availing ourselves of the use of devices well known in the art we have not considered it necessary to particularly illustrate and describe the hydraulic motor. This hydraulic motor is designed to be supplied with water under pressure from an elevated tank or from one of the water-service mains and is preferably arranged at the lower end of and in alinement with the housing-tube for the piston-rod 25. This housing-tube is disposed centrally within the chamber of the closed tank 21 and is closed at its lower end by the cap 24^a of the cylinder of the hydraulic motor 24. The chamber of the closed tank 21 is designed to be filled with the heaviest lubricating-oil to the level indicated in Fig. 2, and this volume of oil forms a seal 26, in which plays a bell-shaped piston 27. The housing-tube 25 extends through the oil seal in the tank 21 to have its upper end protrude above the oil-line, and in this housing-tube is arranged a reciprocating piston-rod 29. The lower end of the piston-rod has fitted thereto the piston-head 30 of the hydraulic motor, and the upper end of said piston-rod is clamped firmly at 31 to the head of the bell-shaped piston 27. The piston 27 is arranged to travel loosely within the chamber of the tank 21, and the lower end of said bell-shaped piston is immersed in the oil seal 26 of said tank, so that an air space or chamber is provided within the piston 27 between the water-level and the head of said piston. The piston is adapted to reciprocate vertically with the piston-rod, which is made fast thereto, and this piston-rod is caused to reciprocate in the guide or casing 25 by the operation of the double-acting hydraulic motor 24. The bell-shaped piston on its upstroke with the reciprocating rod 29 is adapted to compress the air which is contained in the chamber of the tank 21 between the oil-level and the tank-head without appreciable displacement of the heavy oil, and on the downstroke of the bell-shaped piston with the piston-rod air which is confined in the chamber between the oil-level and the head 28 of said piston 27 is compressed, whereby the piston is adapted to compress and expel air on each stroke or movement.

The water under pressure is supplied to the hydraulic motor by a pressure-pipe 32, which is equipped with a controlling-valve 33 of any suitable construction, and this valve is provided with an arm 34, to which is connected the lever 18, hereinafter referred to, whereby the floatable bell of the gasometer is connected by said lever to the arm of the gate-valve, so as to open the latter on a descent of the bell and to close said controlling-valve on the rise of the bell, owing to accumulation of gas therein.

In our air-forcing mechanism we have provided valved pipes which are arranged to communicate with the air-chambers of the tank 21 and the reciprocating bell-shaped piston 27, and these pipes are adapted to permit air to enter said chambers for compression therein and to escape from the chambers to the generator 10 in a manner to continuously force air under pressure during the operation of the bell-shaped piston. One air-pipe of the air-forcing mechanism is indicated by the numeral 38, and this pipe constitutes the inlet to the chambers of the tank and bell-shaped piston. This inlet-pipe is provided at its upper end with a branch 39, which is fastened to the upper part of the tank 21 to communicate with the air-space therein, and this branch 39 is provided with an inwardly-opening check-valve 40, which is located at a point between the attachment of the branch 39 of the tank, and an air-ingress port 41, which is provided in the upper part of the pipe 38. The inlet-pipe 38 is furthermore provided at its lower end with a branch 42, which is carried below the bottom of the tank and is extended vertically, as at 43, through the oil seal 26 of the tank 21, so as to open into the air-chamber within the bell-shaped piston. The lower branch of the inlet-pipe 38 is provided with an air-port 44, and between the tank and this port is arranged an inwardly-opening check-valve 45. On the ascent of the bell-shaped piston the air is drawn through the port 44, past the check-valve 45, and through the pipe branch 43 into the chamber of said piston 27, and as the check-valve 45 is opened on the ascent of the piston to compress the air in the chamber of the tank 21 the other check-valve 40 is closed to prevent escape of air from the tank. On the descent of the bell-shaped piston with the piston-rod 29 the check-valve 45 is closed by back pressure of the air which is compressed between the oil-surface and the head of said bell-shaped piston, and at the same time the check-valve 40 is opened to permit air to be drawn through the port 41 and branch 39 into the chamber of the tank 21. It will thus be seen that the air is alternately admitted on the travel of the bell-shaped piston to the chambers of the tank 21 and the piston 27 itself, thus maintaining the proper air-supply to the air-forcing apparatus.

The air-outlet pipe from the forcing apparatus to the generator is indicated at 46, and one end of said pipe is attached to the head of the generator in communication with the pendent extension 46^a, projecting into the hydrocarbon within the generator vessel. The opposite end of this connecting-pipe 46 is provided with two branches communicating, respectively, with the air-chambers of the tank and the bell-shaped piston. One branch 47 of this connecting-pipe is attached to the tank to communicate with the air-space above the level of the oil seal therein, and said branch is provided with an outwardly-opening check-valve 48. The other branch 49 of the connecting-pipe is extended below the bottom of the tank 21 and is carried vertically at 50 through

the oil in said tank to open into the chamber of the piston 27, and said branch pipe 49 likewise has an outwardly-opening check-valve 51. On the ascent of the bell-shaped piston to compress air in the chamber of the tank 21 the valve 48 opens to permit the air to escape readily from the tank-chamber; but the check-valve 51 is closed by the pressure in the pipe 46 to prevent the air from passing into the chamber of the piston. On the downward travel of the piston 27 to compress air between the head thereof and the oil-surface the valve 51 opens freely to permit the air to escape from the chamber of the piston 27; but the check-valve 48 is closed by the pressure in the pipe 46.

The carbureted air from the generator 10 is conducted to the storage-gasometer by a gas-pipe 52, which has one end attached to the head of the generator, while its other end is extended to form a branch 53, which passes through the water seal 16 of the tank 13, so as to discharge the gas above the level of the seal 16 and into the chamber of the floatable bell 15. The gas is conveyed from the gasometer to the burners by means of a service-pipe 54, which communicates with the chamber of the bell 15.

The operation is as follows: The said valve 33 in the pressure-pipe to the hydraulic motor is closed by the described connections with the floatable bell when the gasometer contains a proper supply of gas for the burners, and the reduction in the available gas-supply permits the bell 15 to descend, thereby depressing the guide-rod and actuating the lever and pitman to open the valve 33. Water under pressure passes through the pipe 32 into the hydraulic motor to positively actuate the latter in order to reciprocate the piston-rod 29 and the bell-shaped piston. On the ascent of the piston 27 the valves 45 48 are opened to permit air to pass into the chamber of the piston and the air to pass from the chamber of the tank to the pipe 46 and thence to the generator, the valves 40 51 being closed. On the descent of the piston the valves 45 48 are closed and the valves 40 51 are opened to permit air to pass into the chamber of the tank 21 and from the chamber of the piston 27 through the pipe 50 49 and thence through the pipe 46 into the generator. The air is thus compressed in the forcing mechanism at each stroke of the piston 27, and the air under pressure travels continuously through the pipe 46, which connects the forcing mechanism to the generator. The air is thus forced mechanically into the bath of liquid hydrocarbon for absorbing the vapors therefrom in order to carburet the air, and the gas thus produced is conveyed by the pipe 50 to the bell of the storage-gasometer, and from thence the gas passes from the pipe 54 to the burners.

The operation of the apparatus is wholly automatic, because the pump is controlled by the valve 33, which is actuated by the rise and fall of the floatable bell, and the pressure in the bell thus remains constant without respect to the operation of the forcing mechanism or the number of burners which may be in service at one time.

Changes in the form, proportion, size, and the minor details of construction within the scope of the appended claims may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having thus described the invention, what we claim is—

1. In an apparatus of the class described, an air-forcing mechanism comprising a closed tank supported in an elevated position and having a liquid seal, a centrally-arranged housing-tube for the piston-rod, said tube being detachably fitted at its lower end to the bottom of the tank and projecting above the level of the liquid therein, a bell-piston movable wholly within the tank and immersed in the liquid to form in its top portion a chamber cut off from communication with the air-chamber in the top part of the closed tank, a hydraulic motor interposed between the bottom of the tank and the base upon which it is supported and arranged in vertical alinement with said housing-tube, a cap closing the upper end of the cylinder of said motor, and also fitting in the bottom of the closed tank to constitute a closure for the housing-tube therein, a piston-rod working through the housing-tube and connected at its upper end with the bell-piston and at its lower end joined to the piston of the hydraulic motor, an air-inlet pipe having an air-port and provided with valved branches communicating respectively with the space of the tank and of the bell-piston, and an air-outlet pipe having valved branches communicating respectively with the said air-space of the tank and of the bell-piston, substantially as set forth.

2. In an apparatus of the class described, an air-forcing mechanism comprising a closed tank having suitable pipe connections therewith, and provided with a liquid seal therein, a bell-piston movable within the tank, a centrally-arranged housing-tube detachably fitted at its lower end to the bottom of the tank, a hydraulic motor arranged exterior to the tank in vertical alinement with the housing-tube therein, a cap closing the upper end of the cylinder of said motor and also closing the lower end of the housing-tube, and a piston-rod extending from the piston of the motor to the bell-piston of said mechanism, said rod working through the housing-tube therefor and guided in its movements by the said cap, substantially as set forth.

3. In an apparatus of the class described, an air-forcing mechanism comprising a closed tank having suitable pipe connections therewith, and provided with a liquid seal therein, a bell-piston movable within the tank, a centrally-arranged housing-tube located within the tank and arising from the bottom thereof,

a hydraulic motor arranged wholly exterior to the tank beneath the bottom thereof and in vertical alinement with the housing-tube therein, and a piston-rod extending from the piston of the motor to the bell-piston within the tank, said rod working through the housing-tube therefor, substantially as set forth.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

FREDRICK A. LARAWAY.
JOHN W. HOUSER.

Witnesses:
ALBERT MORSE,
WALTER A. BENNET.