

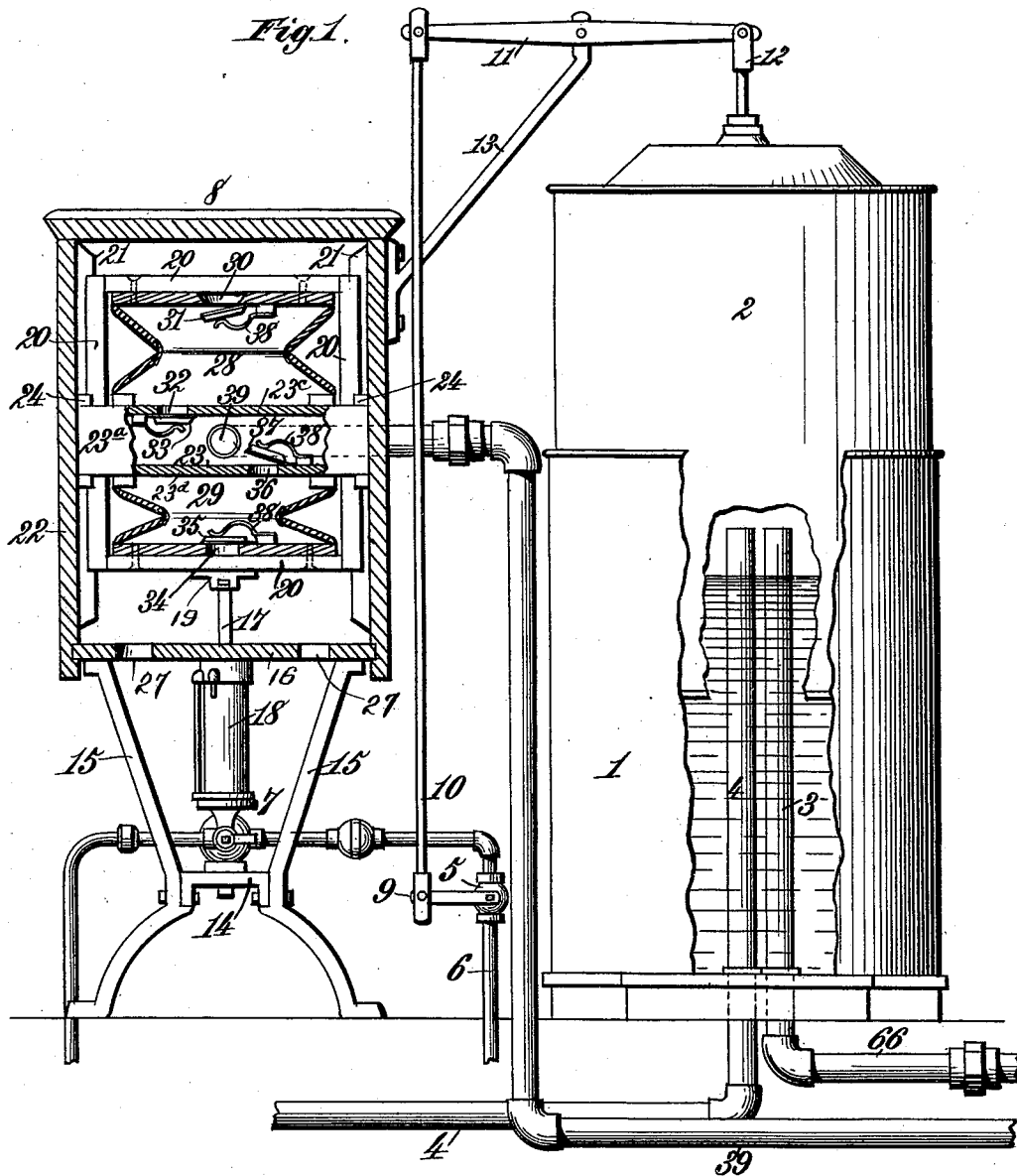
(No Model.)

4 Sheets—Sheet 1.

A. E. ALDRICH.
APPARATUS FOR MANUFACTURING GAS.

No. 586,923.

Patented July 20, 1897.



Witnesses.

Robert Everett,

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By James L. Norris,

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(No Model.)

4 Sheets—Sheet 3.

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Fig. 3.

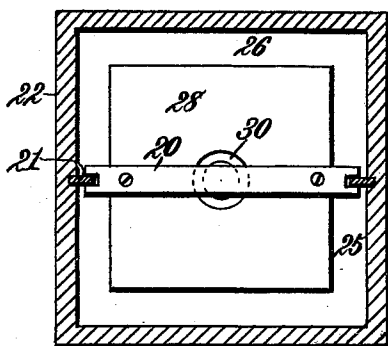


Fig. 4.

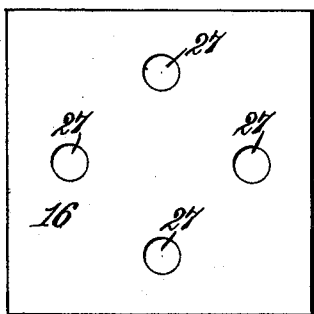


Fig. 5.

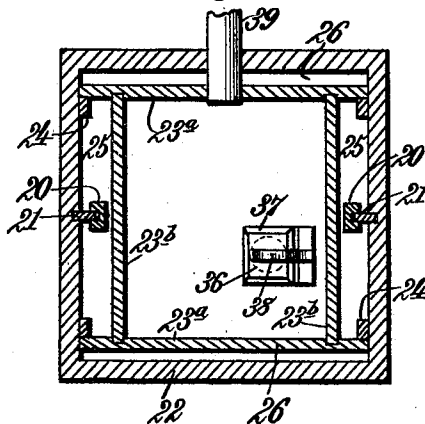
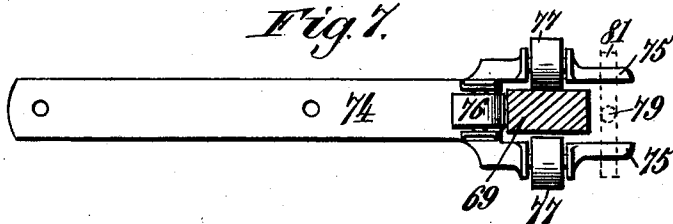


Fig. 7.



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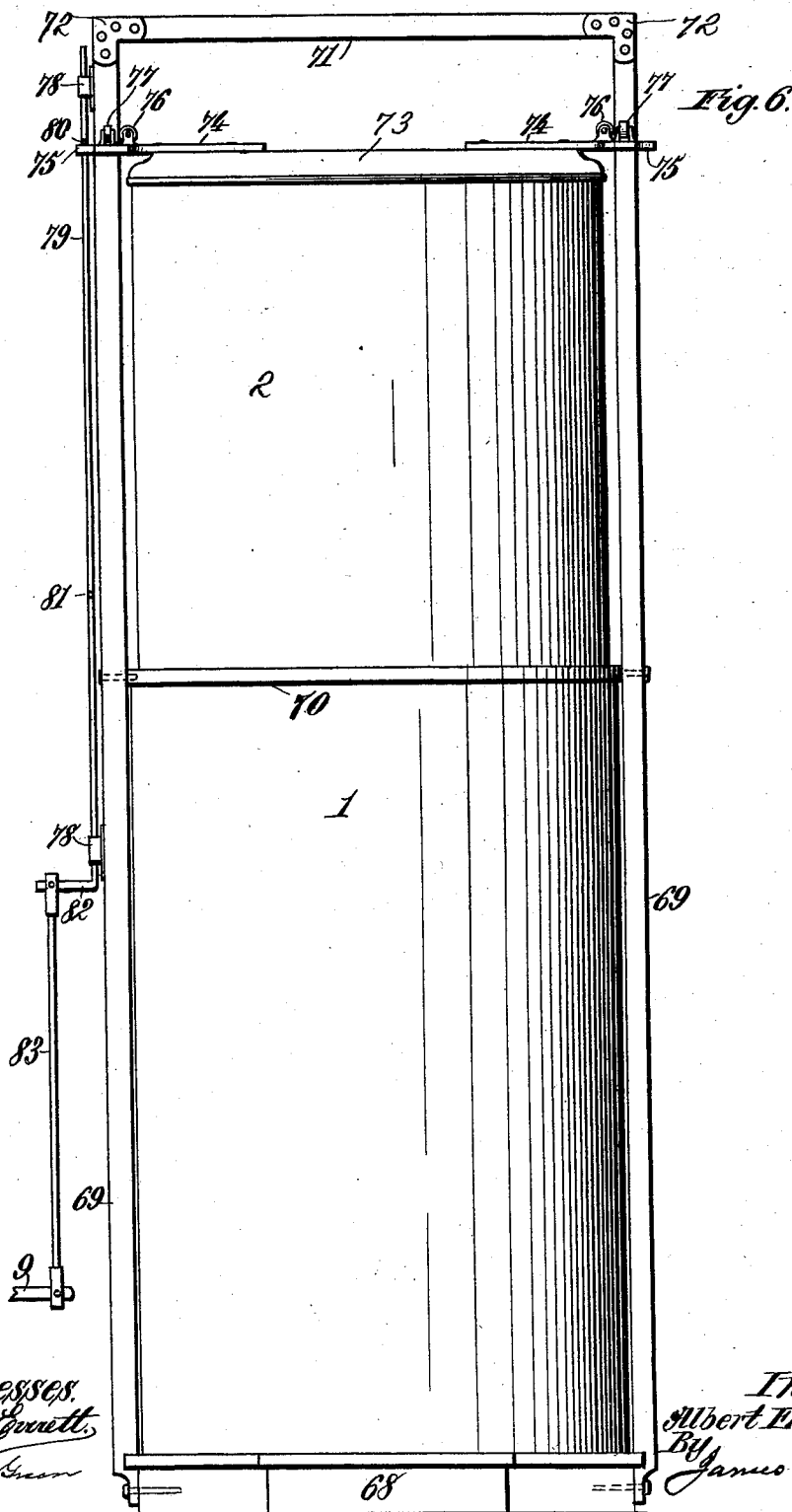
(No Model.)

4 Sheets—Sheet 4.

A. E. ALDRICH.
APPARATUS FOR MANUFACTURING GAS.

No. 586,923.

Patented July 20, 1897.



Witnesses
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UNITED STATES PATENT OFFICE.

ALBERT E. ALDRICH, OF LEXINGTON, KENTUCKY, ASSIGNOR OF ONE-TENTH TO FRANK M. FLENNER, OF SAME PLACE.

APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 586,923, dated July 20, 1897.

Application filed June 24, 1896. Serial No. 596,744. (No model.)

To all whom it may concern:

Be it known that I, ALBERT E. ALDRICH, a citizen of the United States, residing at Lexington, in the county of Fayette and State of Kentucky, have invented new and useful Improvements in Apparatus for the Manufacture of Illuminating and Heating Gas, of which the following is a specification.

My invention relates to apparatus for the manufacture of illuminating and heating gas by the carburation of atmospheric air with a hydrocarbon, such as gasolene; and the invention consists in features of construction and novel combinations of the parts of a gas-making apparatus, as hereinafter more particularly described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a sectional elevation of the gas-making apparatus omitting the carbureter. Fig. 2 is a sectional elevation of the carbureter with portions of the pipes for connecting with the air-pump and the gas-holder. Fig. 3 is a plan of the upper portion of the hydraulic air-pump with its casing in horizontal section. Fig. 4 is a plan of the bottom of the pump-casing with air-inlet ports. Fig. 5 is a plan of the wind-chest with yoke, guides, and pump-casing in horizontal section. Fig. 6 is an elevation of an enlarged gas-holder, illustrating modified mechanism for automatically controlling the operation of the hydraulic air-pump to accord with variations in the supply and consumption of gas. Fig. 7 is a partly-sectional plan of devices for steadying the movable section of the gas-holder, from which is controlled the valve of the hydraulic motor that operates the air-compressing pump.

Referring first to Fig. 1, it will be seen that the gas-holder comprises the usual base-section or water-tank 1 and vertically-movable upper section or bell 2, the latter being arranged to rise and fall with variations of gas-pressure in the holder. Gas is admitted to the holder through a pipe 3, communicating with a carbureter hereinafter described, and another pipe 4 is provided for conveying gas to the place of consumption.

Adjacent to the gas-holder is arranged the

valve 5 of a pipe 6 for supplying water to a hydraulic motor 7, of any suitable and well-known construction, adapted for the operation of an air-pump 8, that is provided for the purpose of supplying compressed air to the carbureter.

In order to automatically control the operation of the hydraulic motor and air-pump to correspond with varying requirements of gas production, the motor-supply valve 5 is provided with a lever 9, to which may be attached the lower end of a connecting-rod 10, having its upper end connected with one end of a walking-beam 11, that connects at its other end, through a link 12, with the movable portion of the gas-holder.

The beam 11 may be fulcrumed to an arm or bracket 13, supported from the air-pump casing. With a full pressure of gas in the holder the rise of the bell-section 2 will oscillate the beam 11 sufficiently and in such direction as to cause the closing of the valve 5, thus cutting off supply of liquid to the hydraulic motor and stopping the action of the air-pump until the supply of gas in the holder is diminished. As the movable section of the gas-holder descends the beam 11 will be rocked in an opposite direction to open the valve 5 and cause the operation of the motor 7 and air-pump 8 to be resumed. In connection with the gas-holder shown in Fig. 6 there will be hereinafter described a modified arrangement of devices for automatically operating the supply-valve of the hydraulic air-pump motor.

The hydraulic motor 7 is supported on the base portion 14 of a frame 15, on the upper part of which is mounted the base 16 of the air-compressing pump. In the center of the air-pump base 16 is an opening for passage of the piston-rod 17 of a piston that works in the cylinder 18 of the hydraulic motor. The piston-rod 17 connects, by a casting or coupling 19, with a yoke 20, Fig. 1, the upright portions of which are grooved longitudinally on their outer edges, as shown in Figs. 3 and 5, to engage vertical guides 21, secured centrally in each side of the pump-casing 22 and extended from top to bottom.

In the center of the pump-casing 22 is a wind-chest 23, Figs. 1 and 5, having its side walls 23^a secured, preferably, to cleats 24 on the inner sides of the pump-casing. The end walls 23^b of the wind-chest are set back a sufficient distance to afford spaces or channels 25 in which the yoke 20 may reciprocate outside the stationary wind-chest. These spaces 25 and other spaces 26, Figs. 3 and 5, at the sides of the wind-chest permit a free access of air to all parts of the interior of the pump-casing 22, the air being admitted through openings 27, Fig. 4, in the base 16 of the pump-casing. The top wall 23^c of the wind-chest and its bottom wall 23^d, Fig. 1, respectively constitute also the bottom wall of an upper-bellows chamber 28 and top wall of a lower-bellows chamber 29, each of which is bolted or otherwise secured to the cross-bars of the reciprocating yoke 20 and operated therefrom. In the top of the upper bellows 28 is an air-inlet port 30, Fig. 3, controlled by a downwardly-opening valve 31, Fig. 1, and in the bottom of this bellows is a port 32, controlled by a downwardly-opening valve 33 for admission of air from said bellows into the wind-chest. The lower-bellows chamber has an air-inlet port 34, controlled by an upwardly-opening valve 35 and an outlet-port 36 to the wind-chest, controlled by an upwardly-opening valve 37, each bellows-chamber being thus arranged to alternately draw in air and force it into the intermediately-located wind-chest. The several bellows-valves are normally closed by springs 38, as shown.

The vertical inside length of the yoke 20 is such that when one bellows chamber or section is extended or open for admission of air the other bellows chamber or section is closed or collapsed in the act of expelling its contents. Thus as the yoke is driven upward and downward by the connected piston of the hydraulic motor the bellows chambers or sections will alternately force air into the wind-chest. The lateral inside dimensions of the yoke 20 are somewhat greater than the outside dimensions of the bellows in order to prevent any chafing of the bellows against the yoke in its upward-and-downward movements.

The gas-holder and the hydraulic air-pump are preferably located above the surface of the ground, as shown.

A pipe 39, Figs. 1 and 2, is arranged to conduct air from the wind-chest 23 of the air-pump to a carbureting apparatus 40, that is preferably located below ground and at any suitable or convenient distance from the gas-holder.

As shown in Fig. 2, the carbureter 40 is a vertically-cylindrical chamber, the whole of which may be below ground. Across the lower portion of the carbureting-chamber 40, near its bottom, is secured a disk or diaphragm 41, having numerous perforations 42 therein. Within the carbureter is arranged a vertical

pipe 43, one end of which is secured in the top of the chamber 40, while the other end is tapped into the diaphragm 41 and communicates with the lower part of the chamber below said diaphragm. At its upper end the pipe 43 communicates through an elbow 44 with the pipe 39, that conducts air from the hydraulic air-pump.

The carbureting-chamber 40 receives a supply of gasoline or other hydrocarbon liquid from a reservoir 45, Fig. 2, preferably located below the surface of the ground, but of less depth than the carbureter, though larger in horizontal diameter. A filling-pipe 46 is secured in the top of the hydrocarbon-reservoir and has its upper end provided with a closing-cap 47 above the ground-level. The lower end of this filling-pipe 46 projects downward within the reservoir.

For the purpose of maintaining a constant level of liquid in the carbureter 40 an automatic feed is provided. One side of the carbureting-chamber 40 is provided with an inlet-opening, around which a brass saddle-flange 48 is secured. Into this flange 48 is secured one end of a pipe or casing 49, having a centrally-perforated cap 50 screwed onto its outer end. The cap 50 has tapped or screwed therein a pipe 51, one end of which extends within the pipe or casing 49, while the other end is projected outward.

To the inner end of the pipe 51 is screwed a coupling 52, to which is attached a valve 53, arranged within the pipe or casing 49 and automatically controlled by a float 54 on a rod or arm 55, that connects with said valve 53, the construction of which is the same as usually employed in float-valves for automatically controlling the flow of a liquid. The pipe 51 connects, through a detachable union 56, with a pipe 57, which is connected by an elbow 58 with a pipe 59, tapped into the bottom of the hydrocarbon-reservoir. By this manner of construction it will be easy to get at the valve 53 to clean, repair, or adjust it, and the several pipe connections can be also repaired from the outside without unsoldering or otherwise opening the apparatus. This construction also enables the apparatus to be thoroughly tested with reference to leaks or other defects before being set up, as every possible leak will manifest itself on the outside and can be readily seen and repaired.

The upper part of the carbureter 40 connects with the upper part of the gasoline-reservoir 45 through a pipe 60, having a detachable union 61 therein. Thus by means of the unions 56 and 61 the carbureter 40 and reservoir 45 can be readily disconnected from each other when desired. A cock 62 may be arranged in the pipe connection 57 for the purpose of cutting off any loss of liquid from the reservoir 45 when disconnected from the carbureter.

There is placed in the top of the hydrocarbon-reservoir 45, above the lower end of the

filling-pipe 46, a transverse partition 63, having a small vent-hole 64 therein. By means of this partition 63 there is formed in the top of the reservoir 45 a gas-expansion chamber 65, which receives through the pipe 60 the gas that is produced in the carbureter. From the gas-expansion chamber 65 the gas is conducted through a pipe 66 to the gas-inlet 3 of the gas-holder.

When gasoline or other suitable hydrocarbon liquid is supplied to the reservoir 45, the liquid will flow also into the carbureter 40 until the feed is arrested by automatic closing of the float-valve. While the air-pump is not in operation, the liquid will also stand in the pipe 43 at about the same level as in the carbureting-chamber. If there is not sufficient gas in the holder to maintain its bell portion 2 in an elevated position, the gravitation of said bell will cause the opening of the valve 5 that controls the supply of water to the hydraulic motor 7 for operating the air pump or bellows. From the wind-chest 23 air will now pass under pressure through the pipe 39 into the pipe 43 and against the body of gasoline or liquid hydrocarbon standing therein. Forcing this body of gasoline before it and upward through the perforations 42 of the disk 41, the compressed air will enter the body of gasoline in the carbureter 40, where, the pressure being somewhat relieved, the air in expanding will absorb or take up the hydrogen and carbon of the liquid and become converted into a gas fit for illuminating and heating purposes.

The aggregate area of all the perforations in the disk or diaphragm 41 should not exceed the area of the pipe 43, through which air is supplied, and may be, preferably, less than the area of that pipe. Consequently there will be an exit of air through all the perforations 42 of the diaphragm 41, and as these perforations are very numerous and may cover the whole extent of the diaphragm the multitude of small ascending air columns will practically come in contact with the whole body of hydrocarbon liquid, disturbing and agitating its entire volume and intimately mingling therewith in the production of gas.

After passing above the level of the hydrocarbon liquid and filling the upper part of the carbureter the gas will pass off through the pipe 60 into the expansion-chamber 65, and thence through the pipe 66 to the gas-holder.

By providing a carbureting-chamber 40 separate from the gasoline-reservoir 45 and supplied by an automatic gasoline-feed the gasoline can be successfully used in small volumes and with the utmost economy and uniformity of results in the carburation of air for making a steady burning gas.

The construction of the carbureter, as shown and described, is simple, compact, and thoroughly effective, and the manner of arranging and attaching the air-inlet pipe 43 avoids any possibility of the leakage of gasoline. It

will also be obvious that the substantially constant level of gasoline maintained in the carbureter by means of the automatically-acting float-valve 53 for controlling the feed and the fine division of the upward currents of air through the steady volume of gasoline by means of the closely-perforated diaphragm 41 will together secure a practically uniform quality of gas.

The gas-expansion chamber 65 prevents all possibility of any liquid spray being carried through the gas-pipes by suction. Consequently gas enters the pipe 66 perfectly dry and thoroughly free from any moisture whatever that characterizes vapor. The comparatively large area of expansion-space in the chamber 65 and its separation from the main body of gasoline by the partition 63 are thus important and valuable features of the apparatus.

Another important advantage secured by the expansion-chamber 65 is the easy and important venting of the hydrocarbon-reservoir 45 by means of the small vent-hole 64 in the bottom of the expansion-chamber. It will be apparent that back pressure from the gas-holder will keep constantly filled with gas through vent 64 the space in reservoir 45 between the liquid surface-line 67 and the partition 63, and thereby exert a constant pressure on the surface of the liquid hydrocarbon to facilitate an easy feed thereof through the float-controlled valve 53 to the carbureter, a result that would obviously be defeated by permitting any tendency to a vacuum above the liquid in the hydrocarbon-reservoir. The presence of the partition 63 secures, therefore, two important advantages: First, the carbureted air in passing over an unprotected surface of gasoline in the reservoir 45 would carry off large quantities of vapor, the result of which would be smoky illumination, probable condensation, and a gradual change in specific gravity of the liquid in the reservoir 45, which would render it impossible to make a uniform quality of gas; second, the partition 63 in preventing the escape of any vapor maintains uniformly the volatile properties of the liquid in the reservoir 45 from the time the reservoir is filled until the last drop is withdrawn. The advantages thus secured are obvious, and by practical tests it has been found that every drop of hydrocarbon thus protected can be utilized in the continuous production of a gas of uniform quality and such degree of dryness or freedom from vapor that it is not liable to condense in the pipes and other parts of the apparatus even when exposed to severely cold weather.

In running a large number of burners it is preferable to employ a gas-holder of such capacity that a continuous working of the hydraulic air-pump will not be necessary. A sufficiently large gas-holder will give to the gas-making apparatus short intervals of rest

that will avoid any tendency to the accumulation of such pressure in the carbureter as might interfere with a free feeding of hydrocarbon liquid thereto.

5 In Fig. 6 is represented a gas-holder of large capacity provided with means for guiding the upper movable section or bell 2, so that it will move steadily up and down, the said bell being arranged also to actuate suitable devices
10 for controlling the valve of the hydraulic motor that operates the air pump or compressor.

To opposite sides of the base 68 of the gas-holder, Fig. 6, are secured standards 69, that are also fastened to the rim 70 of the lower section of the gas-holder. These standards extend to a height above the desired rise of
15 the upper gas-holder section and are connected at the top by a cross-piece 71, secured by angle-irons 72 or otherwise. To the top
20 of the upper gas-holder section 2 is secured a cross-head 73, on the ends of which are secured plates or straps 74, provided with forked arms 75 at their outer ends. The straps 74 are provided with bearings for rollers 76, that
25 run in easy contact with the inner sides of the standards 69, and the arms 75 are provided with bearings for rollers 77, Figs. 6 and 7, that run in contact with the front and rear sides of said standards. The bifurcations or
30 arms 75 project beyond the outer sides of the standards 69, as shown in Figs. 6 and 7. On the outer side of one of the standards 69 are secured thimble-plates or tubular guides 78, through which is passed a vertically-movable
35 rod 79, having cross-arms 80 and 81 thereon. The cross-arm 80 is located above the adjacent arms 75, near the upward limit of movement for the upper section of the gas-holder, and the other cross-arm 81 is located near the
40 lower limit of movement for said movable gas-holder section. On the lower end of the vertically-movable rod 79 is an outward-projecting arm 82 for attachment of one end of a connecting-rod 83, the other end of which
45 connects with the lever 9 on the valve 5, that controls the hydraulic motor of the air-pump. When the movable section 2 of the gas-holder rises sufficiently to cause engagement of the arms 75 and 80, the lever 9 will be moved in
50 such direction as to cut off the water, and thus stop the hydraulic air-pump, and when the said movable section or bell 2 descends a sufficient distance to engage the arms 75 with the arm 81 the lever 9 will be moved in a direction to turn on the water and again start
55 the air-pump. By means of the standards and guide-rollers the upper section of the large gas-holder will have a steady movement, and through the connections for controlling
60 the valve of the hydraulic motor the air pump or compressor will be operated only at necessary intervals.

What I claim as my invention is—

1. In an apparatus for manufacturing gas
65 from air and hydrocarbon liquid, the combination of a gas-holder, a carbureter, a hydro-

carbon-reservoir communicating with the carbureter through an automatic-valve mechanism for controlling the flow of hydrocarbon liquid from said reservoir to the carbureter, 70 a gas-expansion chamber located in the upper part of the hydrocarbon-reservoir and in communication therewith through a small vent, pipe connections for conducting gas from the carbureter to said expansion-chamber and from said chamber to the gas-holder, an air-pump for supplying air to the carbureter, a hydraulic motor for operating said air-pump, a valve for controlling the supply of water to said motor, and means for automatically opening and closing said valve from a moving part of the gas-holder, substantially as described. 80

2. In an apparatus for manufacturing gas from air and hydrocarbon liquid, the combination of a gas-holder, a carbureter, an air-pump for supplying air to the carbureter, means for automatically controlling the operation of the air-pump from a movable part of the gas-holder, a hydrocarbon-reservoir 90 in automatically-controlled communication with said carbureter, a gas-expansion chamber located in the upper part of the hydrocarbon-reservoir, said expansion-chamber being in communication with the gas-holder and with the upper part of the carbureter and having a vent through which the said chamber communicates with the hydrocarbon-reservoir above the level of liquid therein, and a filling-pipe for said hydrocarbon-reservoir, extended through the said gas-expansion chamber, substantially as described. 95

3. In an apparatus for manufacturing gas from air and hydrocarbon liquid, the combination of a gas-holder, a hydrocarbon-reservoir having in its upper part a gas-expansion chamber in communication with the gas-holder and with the upper interior portion of the hydrocarbon-reservoir above the level of liquid therein, a carbureter having across its lower portion a diaphragm provided with numerous perforations, a pipe or casing communicating with the bottom of the hydrocarbon-reservoir and with the carbureter at a point above its perforated diaphragm, a float-valve mounted in said casing to automatically control the level of hydrocarbon liquid in the carbureter, a pipe connection from the upper part of the carbureter to the gas-expansion chamber, an air-pump for supplying air under pressure to the space below the perforated diaphragm of the carbureter, and means for automatically controlling the operation of said air-pump from a movable part of the gas-holder, substantially as described. 105 110 115 120 125

4. In an apparatus for manufacturing gas from air and hydrocarbon liquid, the combination of a gas-holder, a carbureter, a hydrocarbon-reservoir having in its upper part a gas-expansion chamber in communication with the carbureter and gas-holder, an air-pump for supplying air to the carbureter, a 130

hydraulic motor for operating said air-pump, a vertically-movable yoke connection between the said motor and pump, a valve for controlling supply of water to said motor, and 5 vertically-movable rod connections from said valve to a moving part of the gas-holder for automatically opening and closing said valve, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ALBERT E. ALDRICH.

Witnesses:

RICHARD ARNSPIGER,
FLORENCE CAMPBELL.