L. H. UPTON.

GAS PRODUCING APPARATUS.

APPLICATION FILED JAN. 20, 1908.

1,011,530.

Patented Dec. 12, 1911.

4 SHEETS—SHEET 1.

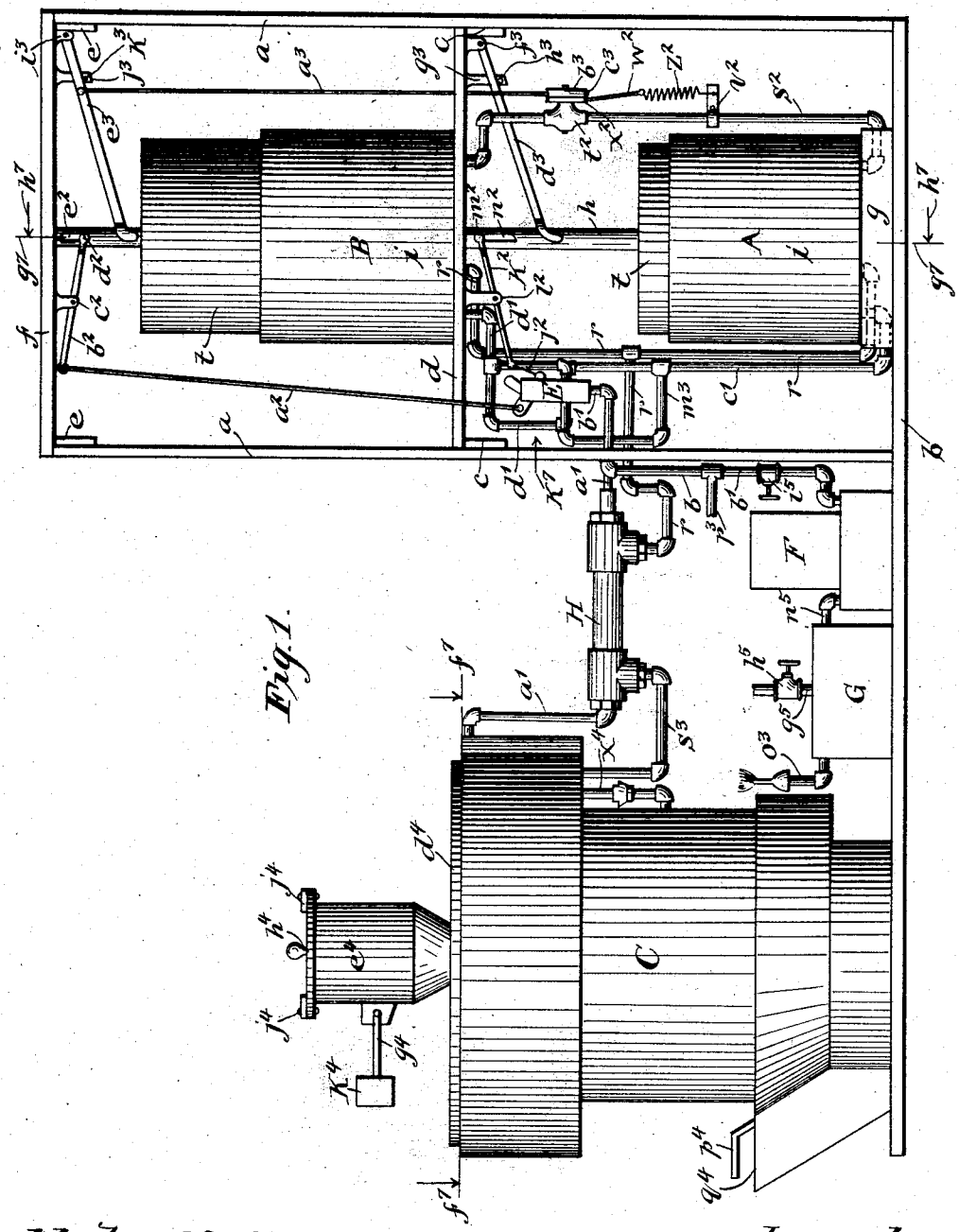

Fig. 1.

Witnesses:

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H. E. Klein

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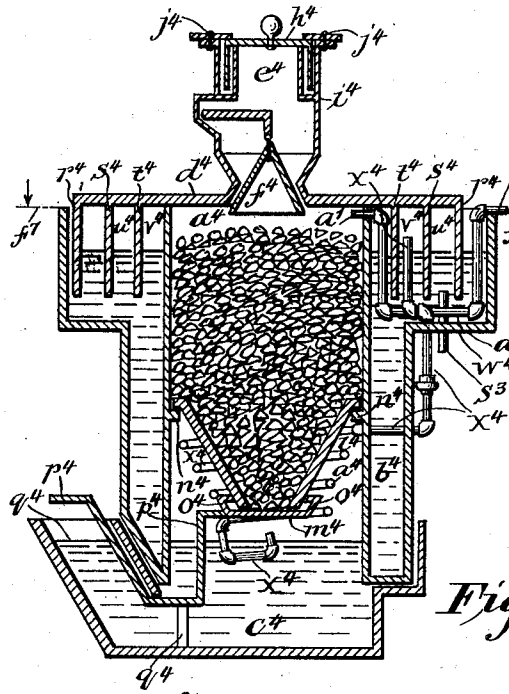

Fig. 2.

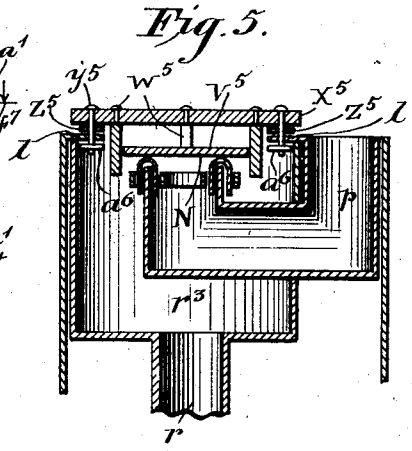

Fig. 5.

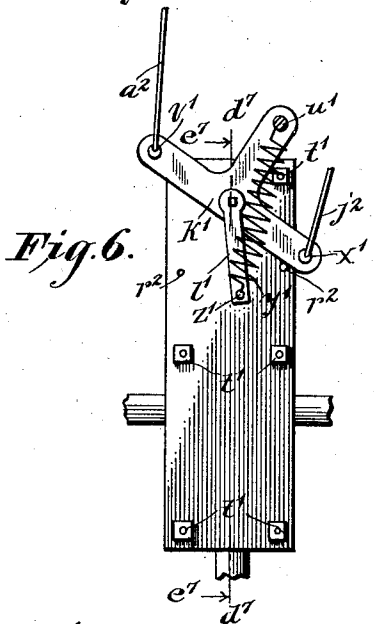

Fig. 6.

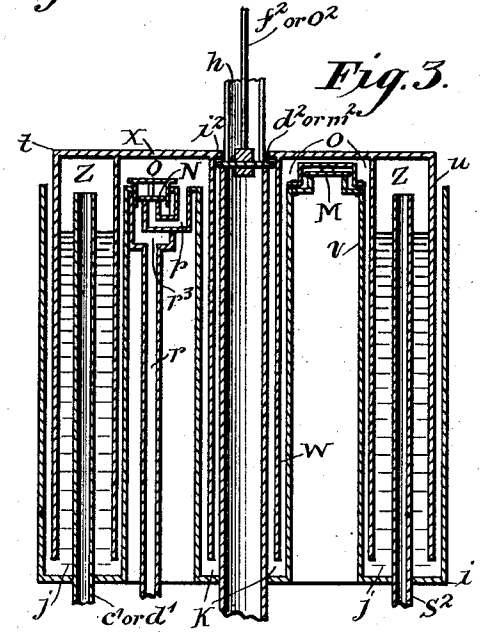

Fig. 3.

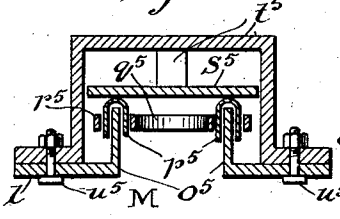

Fig. 4.

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4 SHEETS—SHEET 3.

Fig. 7.

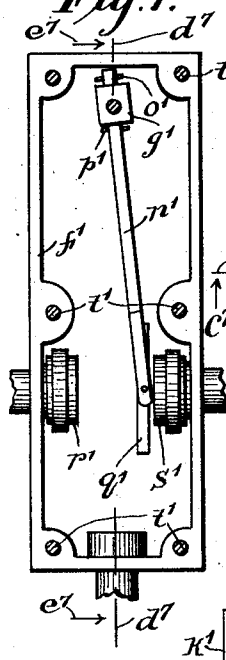


Fig. 9.

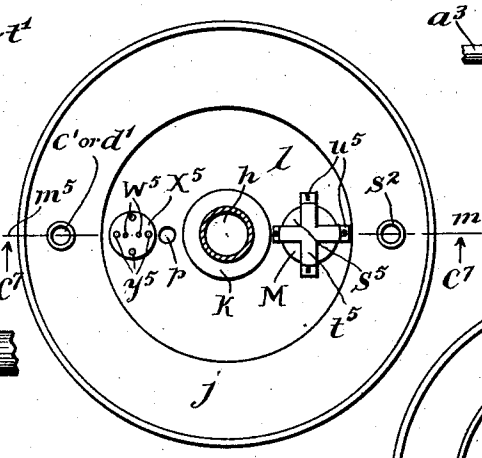


Fig. 14.

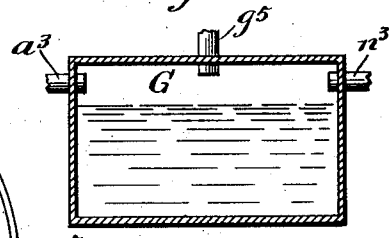


Fig. 10.

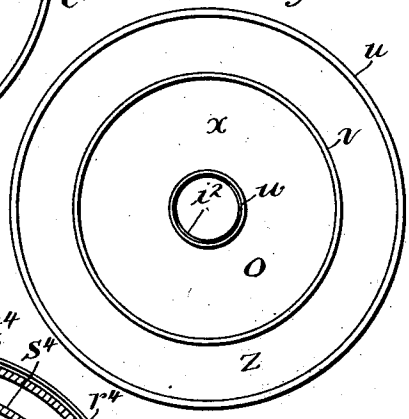


Fig. 11.

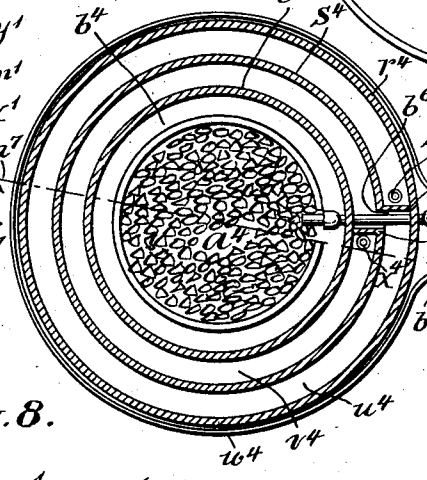


Fig. 8.

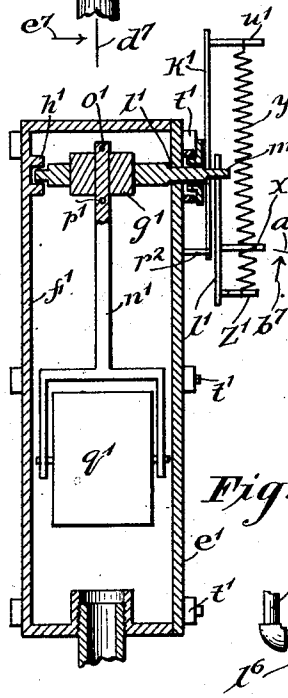


Fig. 13.

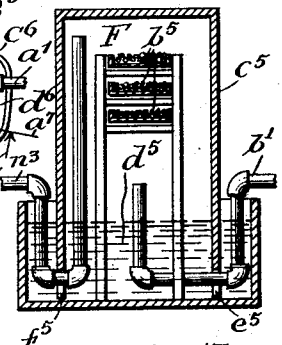
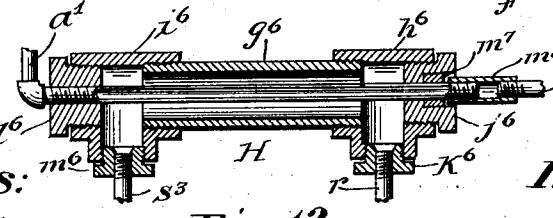


Fig. 12.



Witnesses:

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4 SHEETS—SHEET 4.

Fig. 17.

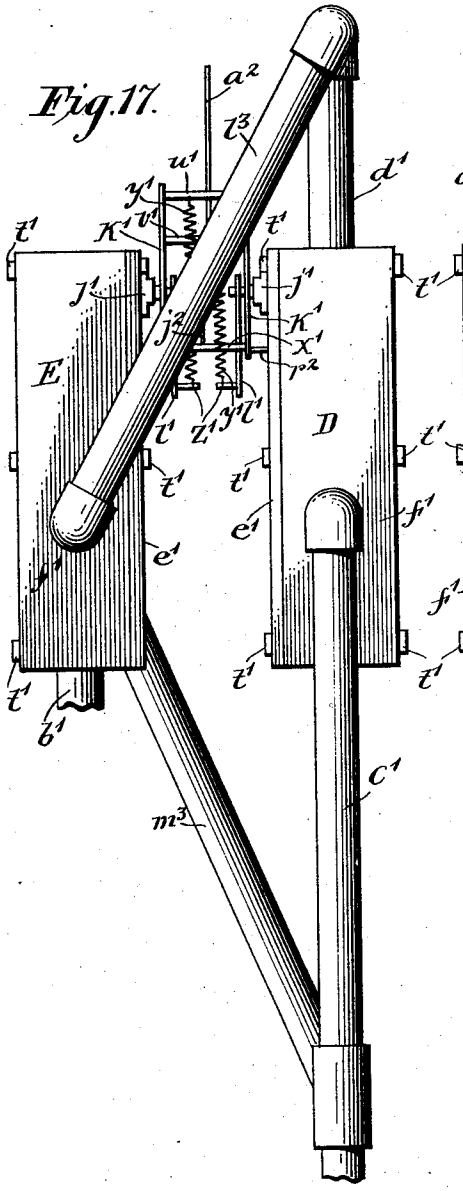


Fig. 16.

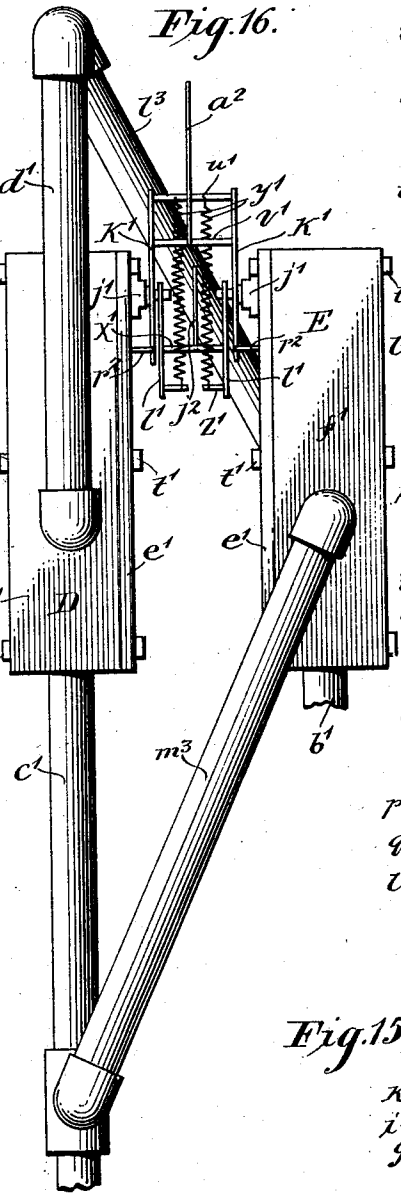
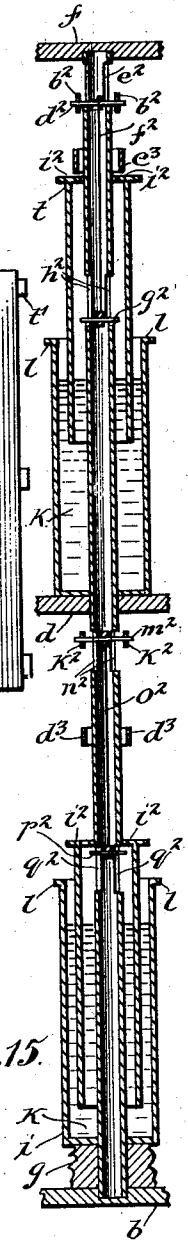


Fig. 15.



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UNITED STATES PATENT OFFICE.

LINFORD H. UPTON, OF CHICAGO, ILLINOIS.

GAS-PRODUCING APPARATUS.

1,011,530. Specification of Letters Patent. **Patented Dec. 12, 1911.**

Application filed January 20, 1908. Serial No. 411,652.

To all whom it may concern:

Be it known that I, LINFORD H. UPTON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Gas-Producing Apparatus, of which the following is a specification.

My invention relates to improvements in gas-producing apparatus in which air is forced into a combustion chamber; and the objects of my improvements are, first, to provide simple, automatic means of forcing the air into the combustion chamber; second, to conserve and utilize the radiated heat; and, third, to provide means for enriching the gas. I attain these objects by the mechanism illustrated in the accompanying drawings, in which,—

Figure 1, is a front elevation of the entire machine; Fig. 2, a vertical section through the producer on the line, a^7 a^7, looking in the direction indicated by the arrows, b^7 b^7, see Fig. 11; Fig. 3, a vertical section through one of the double gasometers on the line, m^5 m^5, looking in the direction indicated by the arrows, c^7 c^7, see Fig. 9; Fig. 4, a vertical section through an air inlet check valve on the same line as Fig. 3; Fig. 5, a vertical section through an air outlet check valve on the same line as Fig. 3, showing the details of the valve and the air passages to and from it; Fig. 6, a front view of one of the throw-over valves, showing the means of throwing the valve and holding it closed; Fig. 7, a view of one of the throw-over valves with the cover removed; Fig. 8, a vertical section through one of the throw-over valves on the line, d^7 d^7, looking in the direction indicated by the arrows, e^7 e^7, see Fig. 6 and Fig. 7; Fig. 9, a top view of one of the double gasometers with the bell removed, showing the two annular water chambers; Fig. 10, a view of one of the gasometer bells from below, showing the two annular chambers; Fig. 11, a horizontal section through the producer on the line, f^7 f^7, looking down, see Fig. 1 and Fig. 2; Fig. 12, a vertical section through the center of the air jacket; Fig. 13, a vertical section through the calcium carbid drier and carbureter; Fig. 14, a vertical section through the liquid hydrocarbon carbureter; Fig. 15, a vertical section through the steadying pipe on the line, g^7 g^7, looking in the direction indicated by the arrows, h^7 h^7, see Fig. 1, showing the connection of the steadying pipe with the two gasometers and part of the valve operating mechanism; Fig. 16, a side view of the two throw-over valves, looking in the direction indicated by the arrow, k^7, see Fig. 1, showing their pipe connections and part of the valve operating mechanism; and Fig. 17, a view of the same from the opposite side.

Similar letters refer to similar parts throughout the several views.

The four posts, *a a a a*, rest on the floor, *b*, and support the cross pieces, *c c*, carrying the platform, *d*, and the cross pieces, *e e*, carrying the platform, *f*. The platform, *g*, rests on the floor, *b*, and supports the double gasometer, A. The double gasometer, B, rests on the platform, *d*. The steadying pipe, *h*, passes from the platform, *f*, through the platform, *d*, and the platform, *g*, to the floor, *b*, and steadies the gasometers, A and B, which, together with their pipe and valve connections, constitute the pumping mechanism. The gasometers, A and B, each have a water reservoir, *i*, consisting of two annular water chambers, *j* and *k*, surrounding the pipe, *h*, and an annular head, *l*, also surrounding the pipe, *h*, and provided with an inlet check valve, M, and an outlet check valve, N. The double gasometer bell, *t*, consists of the tubular walls, *u*, *v* and *w*, all attached to the annular cover, *x*. The water reservoir, *i*, and the bell, *t*, together, form two annular gas chambers, *o* and *z*, which vary in capacity with the rise and fall of the bell, *t*. The chamber, *o*, is for air and the chamber, *z*, for producer gas. The chamber, *z*, must be larger than the chamber, *o*, in the area of its horizontal cross section. It should be enough larger so that the amount of producer gas formed by forcing the air in the chamber, *o*, through the gas producer, C, will be sufficient to fill the chamber, *z*, to the same height, and but little, if any, more. The bell, *t*, is raised by the introduction of gas from the producer, C, through the pipe, a^1, the valve, D, and pipe, c^1, if to the gasometer, A, or the pipe, d^1, if to the gasometer, B, into the chamber, *z*. The bell, *t*, falls by force of gravity when the gas is allowed to escape from its chamber, *z*, through the pipes, c^1 and m^3 and the valve, E, if from gasometer A, and through the pipes, d^1 and l^3, and the valve, E, if from gasometer B. When the bell, *t*, rises, air is drawn into its chamber, *o*, through the check valve, M, and when the

bell, t, falls, the air is forced out through the pipe, p, the check valve, N, the pipe, r^3, the pipe, r, the air jacket, H, and the pipe, s^3, to the producer, C. Thus the gas from the producer is made to pump the air blast for the producer, by means of the power available from the excess in horizontal cross section area of chamber, z, over chamber, o.

The flow of gas into the chamber, z, is controlled by a throw-over valve, D, and the flow of gas from the chamber, z, is controlled by a similar throw-over valve, E. Figs. 6, 7 and 8 show the details of the throw-over valves, D and E. The valve case, f^1, incloses a valve stem, g^1, which pivots, at one end, in the hole, h^1, in the case, f^1. The other end of the valve stem, g^1, passes through the hole, i^1, in the cover plate, e^1, and the stuffing box, j^1, and forms a pivot for the T lever, k^1, through which it passes, and terminates in a squared end on which the crank, l^1, is secured by the pin, m^1. The forked rod, n^1, passes through the stem, g^1, and is secured by the pins, o^1, and p^1, so that it can rotate freely. The plate, q^1, is pivoted between the forks of the rod, n^1, and is made to close either the port r^1, or the port, s^1, by the operation of the crank, l^1, which is parallel with the rod, n^1. The cover plate, e^1, is secured to the valve case, f^1, by the six bolts, t^1. The two valves, D and E are alike, and stand facing each other with their two cranks, l^1 l^1 and their two rods, n^1 and n^1, all parallel. The three arms of one T lever, k^1, are parallel with the three arms of the other T lever, k^1, and the corresponding arms are connected together by the rods, u^1, v^1 and x^1. To the rod, u^1, are attached two springs, y^1 y^1, one of which connects with the pin, z^1, on the crank, l^1, of the valve, D, and the other to the pin, z^1, on the crank, l^1, of the valve, E, tending to draw them toward the rod, u^1. The wire, a^2, is attached to the rod, v^1, and at the other end to the lever, b^2, which is pivoted to the lug, c^2, extending from the platform, f. The other end of the lever, b^2, is forked around the pipe, h. The pin, d^2, passes through the forks of the lever, b^2, and works in the slot, e^2, of the pipe, h. Within the pipe, h, the pin, d^2, passes through the head of the rod, f^2, which extends downward within the pipe, h, and carries, at its lower end, the pin, g^2, which extends through the slot, h^2, in the pipe, h, so that as the bell, t, of the gasometer, B, descends, the flange, i^2, will engage the pin, g^2, and by forcing it down move the T levers, k^1, k^1. The wire, j^2, is attached to the rod, x^1, and, at its other end, to the lever, k^2, which is pivoted to the lug, l^2, extending down from the platform, d. The other end of the lever, k^2, is forked around the pipe, h. The pin, m^2, passes through the forks of the lever, k^2, and works in the slot, n^2, of the pipe, h. Within the pipe, h, the pin, m^2, passes through the head of the rod, o^2, which extends downward within the pipe, h, and carries, at its lower end, the pin, p^2, which extends through the slot, q^2, in the pipe, h, so that as the bell, t, of gasometer, A, descends, its flange, i^2, will engage the pin, p^2, and, by forcing it down, move the T levers, k^1 k^1, in the opposite direction from the movement caused by the descent of the pin, g^2. The rotation of the T levers, k^1 k^1, carries the rod, u^1, past the line of the crank, l^1, extended, which causes the tension of the spring, v^1, to work on the opposite side, drawing the T levers, k^1 k^1, farther around until they are stopped by the stop pins, r^2, which are attached to the cover plates, e^1 e^1, and drawing the crank, l^1, over to the opposite side, thus instantly changing the open passages in the valves, D and E, from one side to the other. The pipe, s^2, connects the chambers, z z, of the gasometers, A and B, and is opened and closed by the gas cock, t^2, which is operated by the double grooved wheel, u^2. The clip, v^2, is attached to the pipe, s^2. The wire, w^2, is attached to the groove, x^2, of wheel, u^2, at y^2, and passes along the groove, x^2, and downward to a connection with the tension spring, z^2, which is attached to the clip, v^2, and by its tension, tends to keep the gas cock, t^2, closed. The wire, a^3, is attached to the groove, b^3, of the wheel, u^2, at, c^3, and passes along the groove, b^3, and upward to connection with the lever, d^3, thence on upward to connection with the lever, e^3, and tends, when either the lever, d^3 or e^3, is raised, to open the gas cock, t^2. The lever, d^3, is pivoted to the lug, f^3, which descends from the platform, d. The lug, g^3, descends from the platform, d, and carries the stop pin, h^3, which supports the lever, d^3. The lever, d^3, is forked around the pipe, h, and when the bell, t, of the gasometer, A, tends to rise too high it strikes and raises the forked end of the lever, d^3, and thereby opens the gas cock, t^2. Similarly, the lever, e^3, is pivoted to the lug, i^3, which descends from the platform, f. The lug, j^3, descends from the platform, f, and carries the stop pin, k^3, which supports the lever, e^3. The lever, e^3, is forked around the pipe, h, and when the bell, t, of the gasometer, B, tends to rise too high it strikes and raises the forked end, of the lever, e^3, thereby opening the gas cock, t^2. The pipe, d^1, connects the chamber, z, of the gasometer, B, with one side of the valve, D, and is connected, by the pipe, l^3, with the opposite side of the valve, E. The pipe, c^1, connects the chamber, z, of the gasometer, A, with the valve, D, opposite the pipe, d^1, and is connected, by the pipe, m^3, with the valve, E, opposite the pipe, l^3. The producer, C, is provided with a combustion chamber, a^4, surrounded by a water jacket, b^4, closed at the bottom by

the water seal, c^4, and, at the top, by the cover, d^4. The water jacket, b^4, is broadened at the top and serves as a water seal for the cover, d^4. The cover, d^4, is provided with a filling hopper, e^4, which is provided with a conical valve, f^4, controlled by the weighted lever, g^4, carrying the weight, k^4. The cover, h^4, closes the top of the filling hopper, e^4, and is made gas tight by the water seal, i^4, and is held in position by the buttons, j^4 j^4.

The fuel in the combustion chamber, a^4, is supported by the fire pot, l^4, and the grate, m^4. The fire pot, l^4, is supported by the flange, n^4. The grate, m^4, is supported by the flange, o^4, on the fire pot, l^4, and is rotated by the shaking lever, p^4, which is attached to it and passes downward through the water in the water seal, c^4, and out and up through the ash removing passage, q^4. The walls, r^4, s^4 and t^4, descending from the cover, d^4, into the water of the water jacket, b^4, form two annular passages, u^4 and v^4, see Figs. 2 and 11. The partition, c^6, crosses the chamber, u^4, the partition, d^6, crosses the chamber, v^4, and the wall, s^4, is left open between them, forming the passage, b^6, which unites the chambers, u^4 and v^4, into a continuous passage from the pipe, s^3, nearly twice around the combustion chamber, a^4, to the pipe, x^4. The pipe, a^1, starts from the combustion chamber, a^4, of the producer, C, passes through the water in the water seal, b^4, under the walls, t^4 and r^4, and through the air jacket, H, to the valve, D. The pipe, s^3, passes from the air jacket, H, through the wall, w^4, of the water jacket, b^4, and up, through the water, into the chamber, u^4, see Figs. 2 and 11. The pipe, x^4, starts in the chamber, v^4, passes out through the wall, w^4, then through the walls of the water jacket, b^4, into the combustion chamber, a^4, then it coils around the fire pot, l^4, and terminates under the grate, m^4. The calcium carbid drier and carbureter, F, see Fig. 13, consists of the rack, a^5, supporting trays of calcium carbid, b^5, the whole covered by the open bottomed box, c^5, which rests in the water seal, d^5. The gas enters through the pipe, b^1, which passes through the water seal and the notch, e^5, in the wall of the box, c^5. The gas leaves through the pipe, n^3, which passes through the water seal and the notch, f^5, in the wall of the box, c^5. The liquid hydrocarbon carbureter, G, is a box partly filled with gasolene or other suitable hydrocarbon, into which the gas enters through the pipe, n^3, and leaves through the pipe, a^3, see Fig. 14. The pipe, g^5, with the cock, h^5, (see Fig. 1) form a channel for introducing gasolene or other liquid hydrocarbon into the carbureter, G, and the cock, i^5, is used to shut off the gas supply to the carbureters, F and G, when one or both of them is to be refilled. In the check valve, M, (shown in detail in Fig. 4, which is a vertical section along the line, m^5 m^5, Fig. 9) the tube, o^5, rising from the plate, l, and having its edge covered with leather packing, p^5, held in position by the rings, q^5 and r^5, is covered by the disk, s^5, which is loosely held in position over the tube, o^5, by the cage, t^5, which is secured to the plate, l, by the bolts, u^5. The check valve, n, and the valves, D and E, are packed in the same way. The air from the chamber, o, reaches the check valve, N, through the pipe, p, which passes through the wall of the pipe, r^3. The air passes from the check valve, N, through the pipes, r^3 and r. The disk, v^5, is held loosely in position by the four pins, w^5, which descend from the plate, x^5, and surround it. The plate, x^5, is secured by the screws, y^5, which pass through the packing gasket, z^5, and the plate, l, and screw into the stiffening ring, a^6. In the drawings the thickness of the metal in the bells, t t, has been exaggerated to permit the indication of cross section. The bells should be made of thin metal so that their weight will not exceed the pressure desired on their contents. The air jacket, H, (see Fig. 12) consists of the pipe, g^6, and T's, h^6 and i^6, all surrounding the pipe, a^1. The T, h^6, is bushed down to the pipe, a^1, by the bushing, j^6, which is recessed to hold the packing, m^7, which is compressed by the coupling, m^8, of the pipe, a^1. The T, i^6, is bushed down to the pipe, a^1, by the bushing, l^6, and to the pipe, s^3, by the bushing, m^6. The pipe, r, screws into the bushing, k^6, which screws into the T, h^6. The air jacket serves to abstract heat from the hot gas escaping from the producer through the pipe, a^1, and impart the heat to the cold air on its way to the producer.

To operate the apparatus a fire is started in the combustion chamber, a^4, which is nearly filled with coal or other suitable fuel. If necessary in starting the fire a draft can be forced through the fire by raising the bells, t t, and allowing them to fall alternately, one rising while the other is falling. When the fire is well started, with one gasometer bell, t, up and the other bell, t, down, and with gas allowed to escape through the pipe, o^3 or p^3, the apparatus will operate automatically. The gas in the chamber, z, of the elevated bell, t, will escape through the valve, E, and the pipe, b^1, thus allowing the elevated bell, t, to fall and force the air in its chamber, o, out through its valve, N, the pipe, r, the air jacket, H, and the pipe, s^3, to the annular chamber, u^4, in the producer, C, thence through the chamber, u^4, the opening, b^6, and the annular chamber, v^4, to the pipe, x^4, then through the pipe, x^4, to its opening under the grate, m^4, where the air, together with the moisture it has taken up on its passage through the chambers, u^4 and v^4,

is allowed to pass through the grate, m^4, to the fire and the overlying bed of coal, generating a combustible gas which passes out through the pipe, a^1, the valve, D, and the connecting pipes to the chamber, z, in the depressed bell, t, causing the depressed bell, t, to rise. As it rises air is drawn into its chamber, o, through its check valve, M. When the descending bell, t, gets low enough so that its flange, i^2, engages the pin, g^2 or p^2, and forces it downward, it throws the valves, D and E, so that the ascending gas receiving bell becomes the descending gas expelling bell, and the prior descending gas expelling bell becomes the ascending gas receiving bell, and so the alternation continues indefinitely. Whenever the ascending bell, t, reaches the lever, d^3 or e^3, before the descending bell throws the valves, D and E, the lever, d^3 or e^3, opens the gas cock, t^2, and lets the surplus gas flow through the pipe, s^2, into the descending bell, t, until the valves, D and E, are thrown by the descending bell t. As the gas passes through the drier, f, the moisture in the gas unites with the calcium carbid to form acetylene gas, thus drying and enriching the gas, which is further enriched as it passes through the carbureter, G, by taking up hydrocarbon vapor.

It is obvious that any form of gas producing mechanism into which air is forced under pressure and which yields gas of greater volume than the air forced into it, can be substituted for the gas producer, C. The gasometers instead of being made double, can be made single and mechanically connected. Packing can be substituted for the water seals, and cylinders and pistons can be substituted for the gasometers. Mechanically operated valves can be substituted for any or all of the check valves. The overflow gas can be conveyed to a storage tank or directly to the service pipe instead of to the descending gasometer. Various substantial equivalents can be substituted for the valves, valve mechanism and pipe connections here shown, and size and proportions of all parts may be varied.

I do not limit myself to the apparatus shown and described herein, but

What I claim as new and desire to secure by Letters Patent is:

1. In a gas making machine, the combination with a gas producer having a combustion chamber, of two gas chambers, means permitting the capacity of each of said gas chambers to vary, two air chambers, means for permitting the capacity of the two air chambers to vary, each of said gas chambers being connected to an air chamber to operate the air chamber to vary its capacity, a connection between the gas producer and each gas chamber, through which gas may flow from the producer to the chamber, and connections between each air chamber and the producer through which air may flow from the chambers to the producer.

2. In a gas making machine, the combination with a gas producer having a combustion chamber, of a pair of gasometer bells, means operating to connect the bells alternately with the combustion chamber, a pair of air containing chambers one connected with each gas bell, means operating to cause each air chamber to fill with air when the gas bell to which it is connected is being filled up and to deliver air to the combustion chamber when the gas bell is delivering gas.

3. In a gas making machine, the combination with a gas producer having a combustion chamber, of a pair of gasometer bells, automatic means operated by the movement of the bells to connect the bells alternately with the combustion chamber, a pair of air containing chambers one connected with each gas bell, means operating to cause each air chamber to fill with air when the gas bell to which it is connected is being filled up and to deliver air to the combustion chamber when the gas bell is delivering gas.

4. In a gas making machine, the combination with a gas producer having a combustion chamber, of a pair of gasometer bells, pipe connections from the gas producer to the bells, valves for controlling the flow of gas from the producer to the bells, a pair of air containing chambers, one connected to each gas bell, means operating to cause the air chambers to alternately fill with air and supply air to the gas producer, said means being operated by the movement of the bells.

5. In a gas making machine, the combination with a gas producer having a combustion chamber, of a pair of gasometers adapted to alternately receive gas from the gas producer, a pair of air containing chambers adapted to alternately supply air to the gas producer and means operated by the gasometers for alternately connecting the air chambers with the gas producer, whereby air is supplied to the producer from the air chambers alternately.

6. In a gas making machine the combination with a gas producer having a combustion chamber, of a pair of bells each comprising a gas receiving chamber and an air chamber, connections between the gas receiving chamber of each bell and the gas producer, means for controlling said connections operated by the bells whereby the gas receiving sections will be alternately connected to the gas producer to receive gas therefrom, and valved connections between the air chambers and the gas producer whereby they will alternately supply air to the producer.

7. In a gas producing apparatus, the combination of a gas producer of the pressure type, two gasometer chambers, each pro-

vided with an inlet and an outlet check valve, the outlet valves of both of said gasometer chambers communicating with the air supply pipes of the producer so that they form air pumps for the producer, another, and larger, gasometer chamber surrounding each of said gasometer chambers and so united that it will rise and fall with it, means for automatically admitting gas from the producer into said larger gasometer chambers alternately, means for automatically discharging gas from the said larger gasometer chambers alternately, means for automatically passing surplus gas from one of said larger gasometer chambers to the other, a calcium carbid chamber for drying and enriching the gas, a liquid hydrocarbon carbureter and means for passing heat from the hot gas to the air blast, substantially as described.

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Witnesses:
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