No. 876,575. PATENTED JAN. 14, 1908.

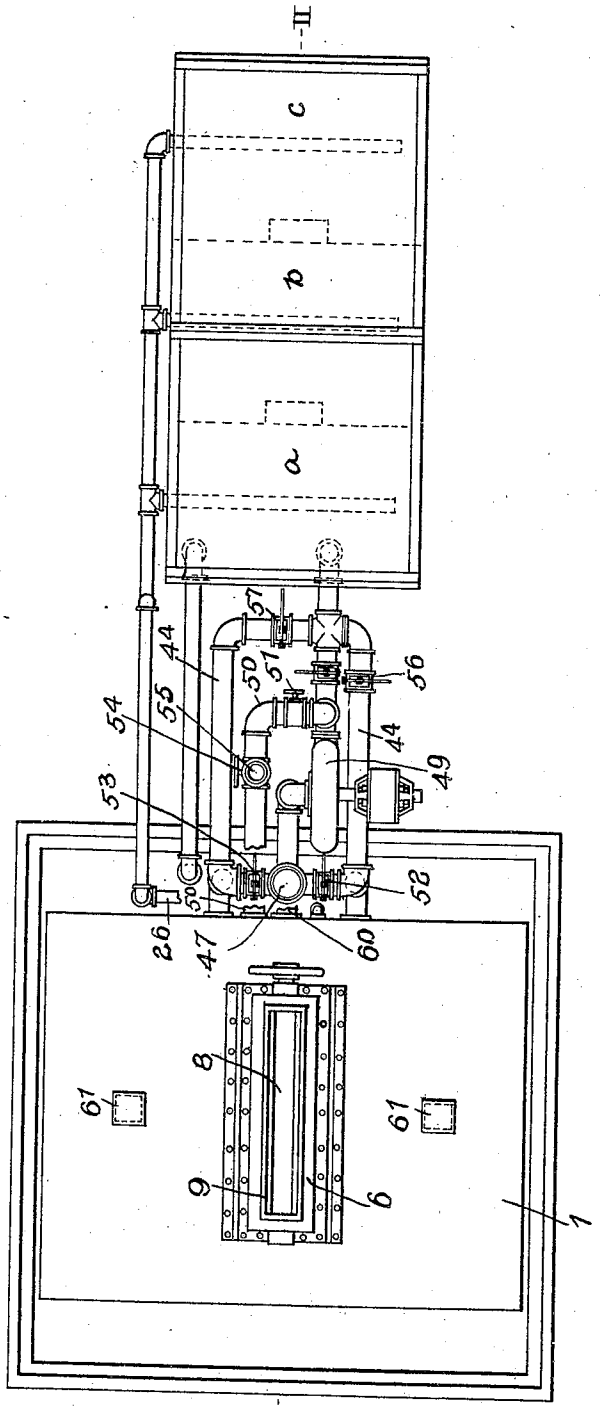
W. J. McCLURG.

GAS PRODUCER.

APPLICATION FILED AUG. 9, 1907.

5 SHEETS—SHEET 1.

FIG. 1.



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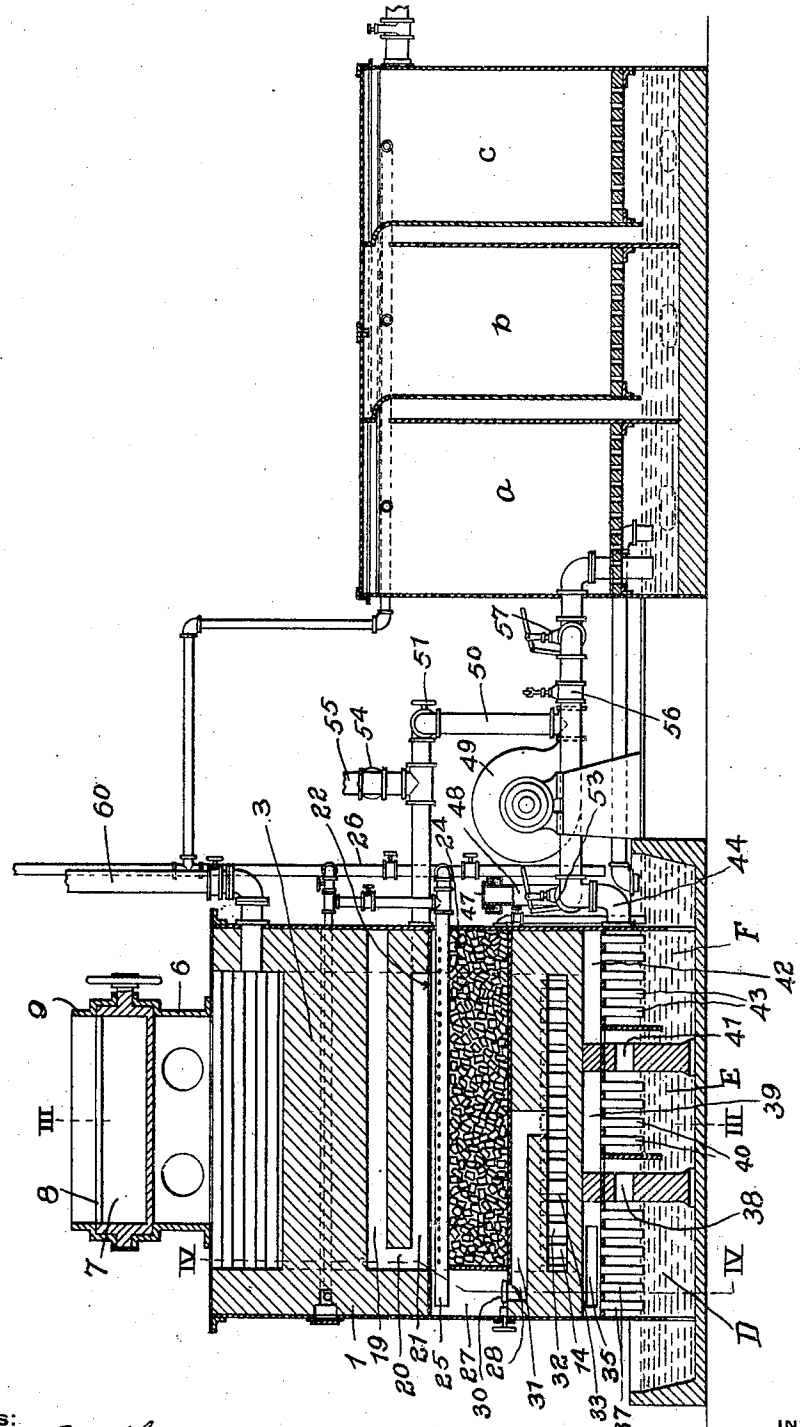
5 SHEETS—SHEET 2.

FIG. 2.



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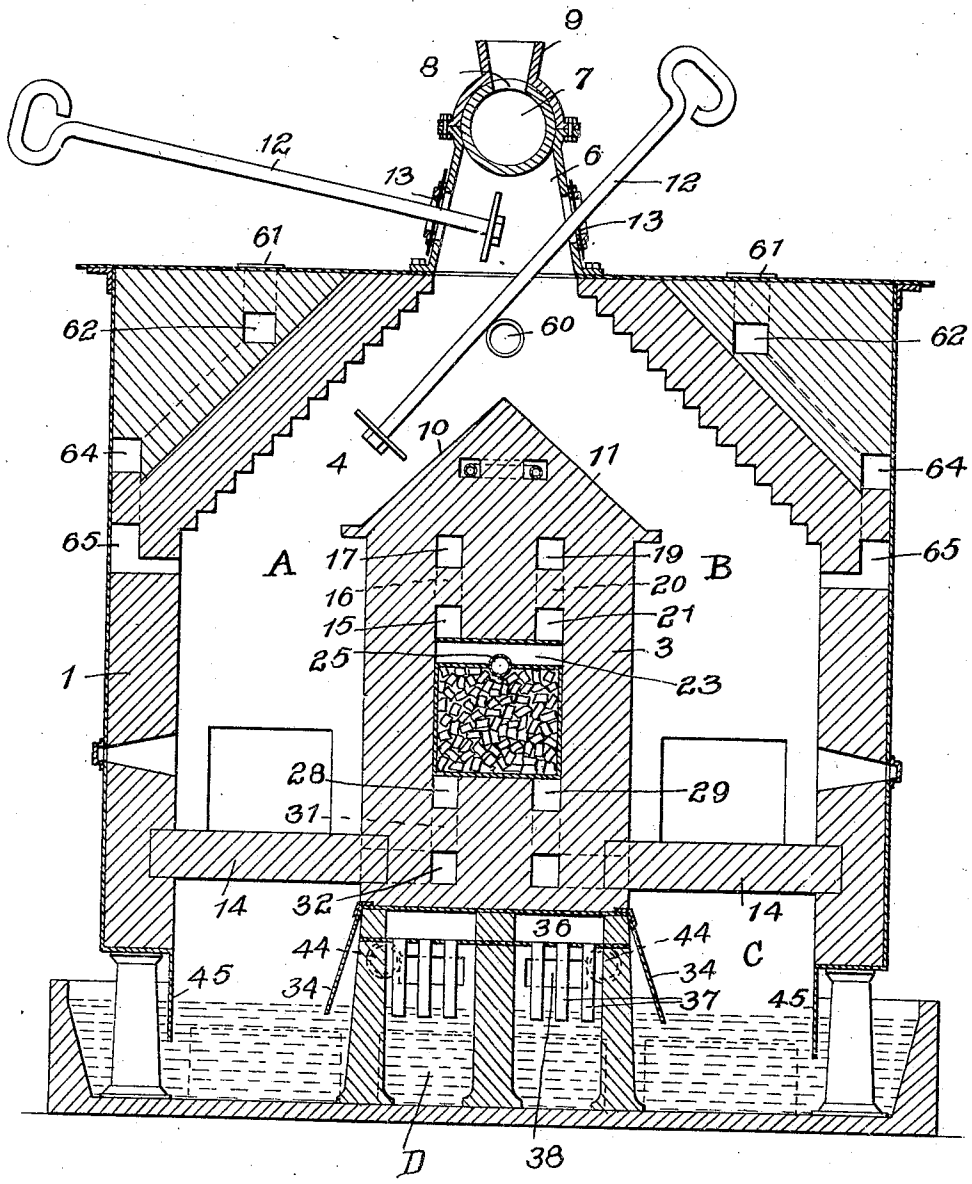
5 SHEETS—SHEET 3.

FIG. 3.



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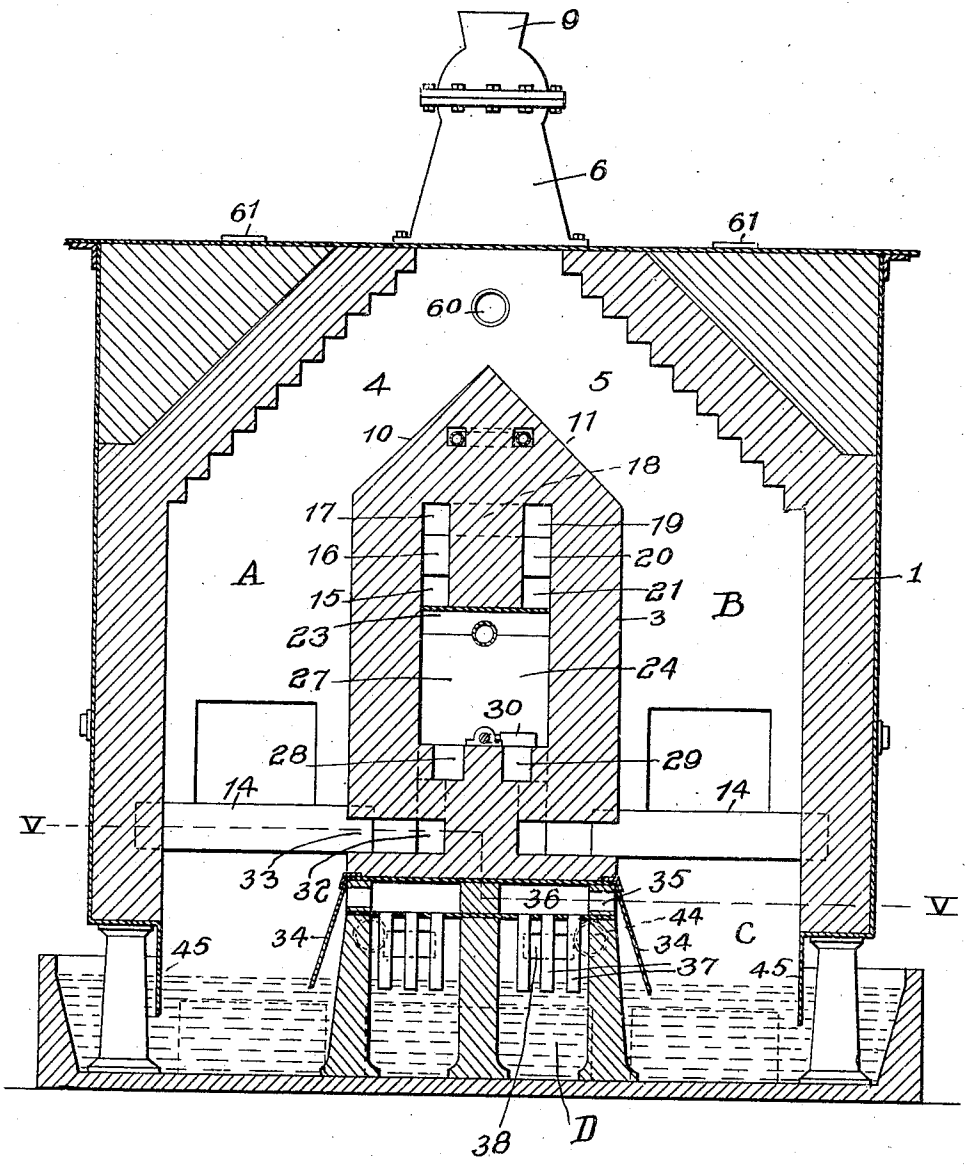
5 SHEETS—SHEET 4.

FIG. 4.



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5 SHEETS—SHEET 5.

FIG. 5.

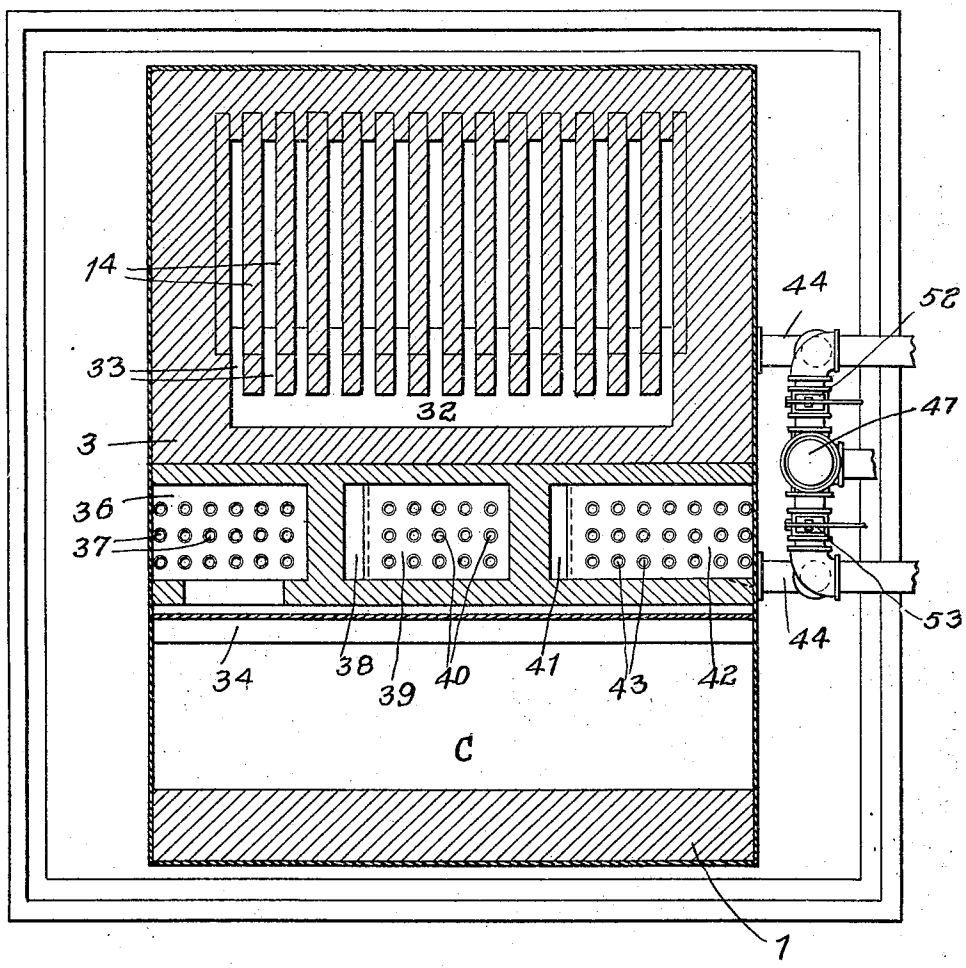
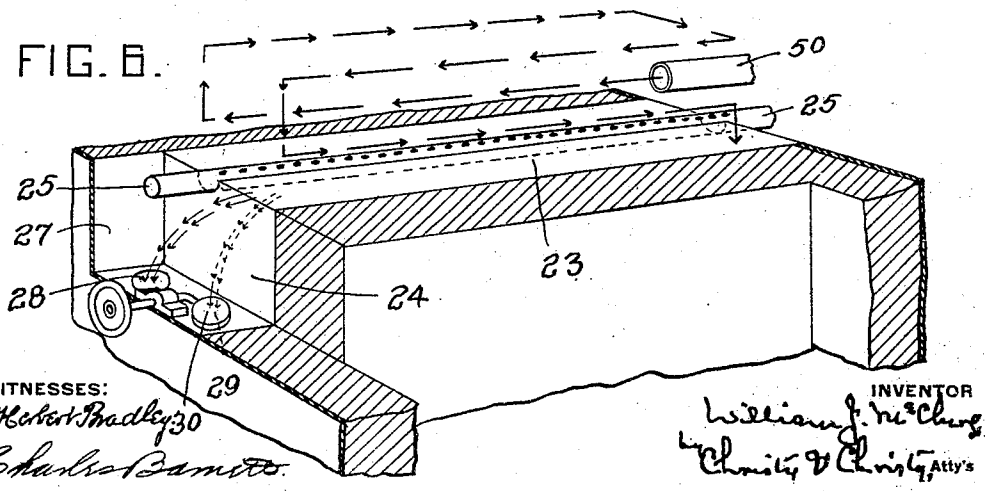


FIG. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM J. McCLURG, OF PITTSBURG, PENNSYLVANIA.

GAS-PRODUCER.

No. 876,575. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed August 9, 1907. Serial No. 387,845.

To all whom it may concern:

Be it known that I, WILLIAM J. McCLURG, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Gas-Producers, of which improvements the following is a specification.

The invention described herein relates to certain improvements in gas producers, and has for its object a construction wherein highly heated air and steam are mingled and caused to flow through a highly heated mass of carbonaceous material, and the gases so fixed are mingled with and enriched by the volatile constituents of hard or soft coal, and the enriched gases containing volatile but not fixed elements are then passed through a mass of incandescent material so as to fix the volatile constituents derived from the coal.

It is a further object of the invention to provide for a cleansing of the gases from ammoniacal vapors and other impurities so that it can be used as delivered from the producer.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this specification, Figure 1 is a plan view of my improved producer and showing in connection therewith suitable scrubbers for a further cleansing of the gas when necessary; Fig. 2 is a sectional elevation of my improved apparatus, the plane of section being indicated by the line II—II Fig. 1; Figs. 3 and 4 are sectional elevations on planes indicated respectively by the lines III—III and IV—IV Fig. 2; Fig. 5 is a sectional plan view on a plane indicated by the line V—V Fig. 4; and Fig. 6 is a diagrammatical view illustrating a portion of the course of flow of the air prior to its mixing with the steam.

In the practice of my invention the producer 1 is divided into two compartments or chambers A and B by a transverse wall or structure 3, said chambers being connected above this transverse wall by passages 4 and 5. While the fuel may be charged into these chambers in any suitable manner, it is preferred to employ means substantially such as shown, whereby fuel may be charged into the furnace without permitting any material escape of gas therefrom. As shown this fuel charging device consists of a hopper 6 in which is arranged a cradle or hollow cylinder 7 capable of being rotated on its axis. This cradle is provided with an opening 8 which when the cradle is turned to the position shown in Fig. 3 will be in register with the receiving spout 9 so as to be capable of receiving a charge of fuel. After being charged, this cradle or cylinder is rotated so as to bring the opening 8 to its lower side, permitting the discharge of the fuel into one or both of the chambers A and B.

The partition or transverse abutment 3 has its upper end so constructed as to form inclined faces 10 and 11. When using bituminous coal the inclination of these faces is less than the angle of repose of such coal, so that a very considerable quantity of the charge deposited at any one time into the furnace, will lodge and remain upon these inclined faces, from which it can be dislodged when required by means of pushers 12 passing through openings in the hopper 6 as shown in Fig. 3. In order to prevent the escape of gases and permit the free manipulation of these pushers, the latter are mounted in slides 13 covering the openings in the hopper but forming a tight joint around the pusher rod.

In manufacturing gas both chambers A and B have on their grates or supporting bars 14, a bed of fuel of sufficient depth, approximately three or four feet, more or less. If both beds of fuel are sufficiently incandescent, air is caused to enter a flue 15 along which it flows to a vertical passage 16 and along a horizontal passage 17. From the passage 17, the air will flow by a horizontal passage 18 transverse of the structure 3 to a flue 19, along this flue to a vertical passage 20 into a horizontal longitudinal passage 21 from which it escapes by a port 22 into a chamber containing a mass of highly heated material 23. This material is contained in a case or shell 24 arranged in the chamber in the central wall or abutment 3 and along the upper portion of this mass of highly heated material is arranged a pipe 25 connected to a water supply pipe 26 and perforated for the escape of steam generated by the heat from the mass of broken material 23. As the central wall or abutment 3 is arranged between the incandescent bodies of fuel in the chambers A and B, it will be highly heated, thereby heating the walls of the flues or passages 15 to 21 inclusive, and also the mass of broken material 23. The highly heated air and steam flow into a chamber 27 and thence by one or the other

of the ports 28 or 29, into horizontal flues or passages under the case or shell 24. The course of the air from the time it enters flue 15 to the ports 28 or 29 is diagrammatically illustrated in Fig. 6.

The ports 28 and 29 are controlled by a valve 30 which can be shifted from position over one port to a position over the other port, so as to reverse or change from this point to the direction of flow of the highly heated air and steam. The port 28 is connected by a passage 31 with a passage 32 from which branch a series of passages 33, the latter being in line with the openings between the grate bars 14 as clearly shown in Figs. 2, 3, 4 and 5.

The combined steam and air escaping from the ports 33 and the spaces between the bars 14 will flow up through the incandescent mass of carbonaceous material in the chamber A, where a fixed water or producer gas is formed and after passing through such bed of material on which will rest a fresh charge of coal, will pick up the volatile constituents from such charge and also the portions of the charge resting on the inclined bed 10. The gases thus enriched will then pass down into the chamber B through the incandescent material and the spaces between the grate bars 14 into a chamber C. From this chamber which contains water, the gases are forced through the water under an apron 34 and flow by a port 35 into a chamber 36. From this chamber the gases will flow through depending tubes 37 into water contained in a chamber D, and after passing through this water will flow by a port 38 into a chamber 39, thence by hanging tubes 40 into water contained in a chamber E. From this chamber the gas will pass through port 41 into a chamber 42 through depending tubes 43 into water contained in a chamber F from which it will escape by a pipe 44.

When the direction of the flow of the combined steam and air is reversed by shifting the valve 30 and valves 52 and 53, the combined steam and air will flow up through the chambers B through and over a fresh charge of coal on the incandescent material in B and on the surface 11, down through the incandescent material in chamber A through similar scrubbing chambers under the partition wall or abutment 3.

It will be observed that the producer is supported within a tank or basin D and that certain walls 45 extend down into water contained in this basin so as to form a seal for the producer.

Air may either be forced into the producer or the gases may be drawn from the producer, as desired. When the air is to be forced into the producer the cap 47 of the supply pipe 48 connected to the fan or other blowing engine 49 is removed and by the operation of this fan the air will be forced through the pipe 50 having a valve 51 into the flue 15. When the gas is to be drawn or exhausted from the producer the cap 47 will be placed on a pipe 48 and one or the other of the valves 52 or 53 in the connection from the pipes 44 to the pipes 48 will be opened dependent upon the position of the reversing valve 30. When the gas is drawn from the producer the valve 51 in pipe 50 is closed and the valve 54 in a branch pipe 55 extending from pipe 50 is opened so that air may flow freely into the flue 15. When blowing air into the producer through pipe 50 the valve 55 should be closed and the valves 56 and 57 one or the other in pipes 44 opened, dependent upon the position of the valve 30 so that gas may be delivered into a series of scrubbing chambers *a*, *b*, and *c*.

It will be observed that whether the air is being forced into the producer or gas drawn therefrom a reversal of the direction of flow through the producer proper can be changed by simply reversing the valve 30 and without changing any other parts, except the valves 56 and 57, whose position must correspond to that of the valve 30. When drawing gas or air from the producer, or when the fan 49 operates as an exhaust, the valves 52 and 53, one or the other, is shifted when the valve 30 is changed.

In order to bring the fuel in the compartments A and B to incandescence and to heat flues and passages for air and steam preparatory to the manufacture of gas, the valve 30 is placed in mid position so that both ports 28 and 29 will be open and the air flow through both passages 32 and into and up through both chambers. During the blowing up operation, the valve in escape pipe 60 is opened.

When gas is being exhausted from the producer, more air may be required than will flow in by the pipe 54. In such case, one or the other of the valves 61 closing passages 62 are opened. The passages 62 connect with horizontal passages 64 in the side walls of the producer, and the latter have ports 65 opening into the chambers. If when the air and steam are flowing up through chamber A and down through chamber B, more air is desired, the valve 61 on the same side of the producer as chamber A is opened admitting air just above the bed of fuel in chamber A.

I claim herein as my invention:

1. A gas producer having in combination two generating chambers connected above the normal fuel level in said chambers, independent air and steam passages adapted to be heated by the combustion of fuel in said chambers, two series of combined air and steam passages connected with the independent passages and connected respectively to the generating chambers below the normal fuel level, means for directing the

combined air and steam into one or the other of said chambers and means for causing a flow of air and steam into the producer and a flow of gas from the producer.

2. A gas producer having in combination two chambers connected above the normal fuel level in said chambers, independent air and steam passages formed in the division wall between said chambers, a chamber connected to said independent passages, two series of flues extending from said chamber to a point below the normal fuel level in the generating chambers, a reversing valve for causing the air and steam to flow into either of said passages and means for causing a flow of air and steam into the producer and a flow of gas from the producer.

3. A gas producer having in combination two chambers connected above the normal fuel level in said chambers, air and steam passages adapted to be heated by the combustion of the fuel in said chambers and connected to the generating chambers at points below the normal fuel level, valves for directing the air and steam into one or the other of said chambers, two series of gas scrubbers connected respectively to the lower portions of the generating chambers and means for causing a flow of air and steam into the producer and a flow of gas from the producer.

4. A gas producer having in combination two chambers connected above the normal fuel level in said chambers, independent air and steam passages adapted to be heated by the combustion of fuel in said chambers, two series of combined air and steam passages connected with the independent passages and connected respectively to the generating chambers at points below the normal fuel level, means for directing the combined air and steam into one or the other of said chambers, an air engine connected respectively to the air passages and to the lower portions of the generating chambers and valves arranged in said connections whereby the said engine may act to force air into said producer or exhaust the gas therefrom.

5. A gas producer having in combination a generating chamber, water receptacles arranged below the generating chamber, means for supporting the charge in the generating chamber, and means for causing the generated gases to pass through the water in said receptacles.

6. A gas producer having in combination a generating chamber, means for supporting the charge in said chamber, a water receptacle provided with baffles arranged below said support and means for causing the generated gases to pass through the water contained in said receptacles.

7. A gas producer having in combination two generating chambers connected above the normal fuel level in said chambers, each chamber being provided with a charge support, a receptacle for water arranged below the charge support, means for causing a flow of gas up through one chamber and down through the other and through the water contained in the receptacle under the latter chamber.

In testimony whereof, I have hereunto set my hand.

WILLIAM J. McCLURG.

Witnesses:
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FRIEDA E. WOLFF.