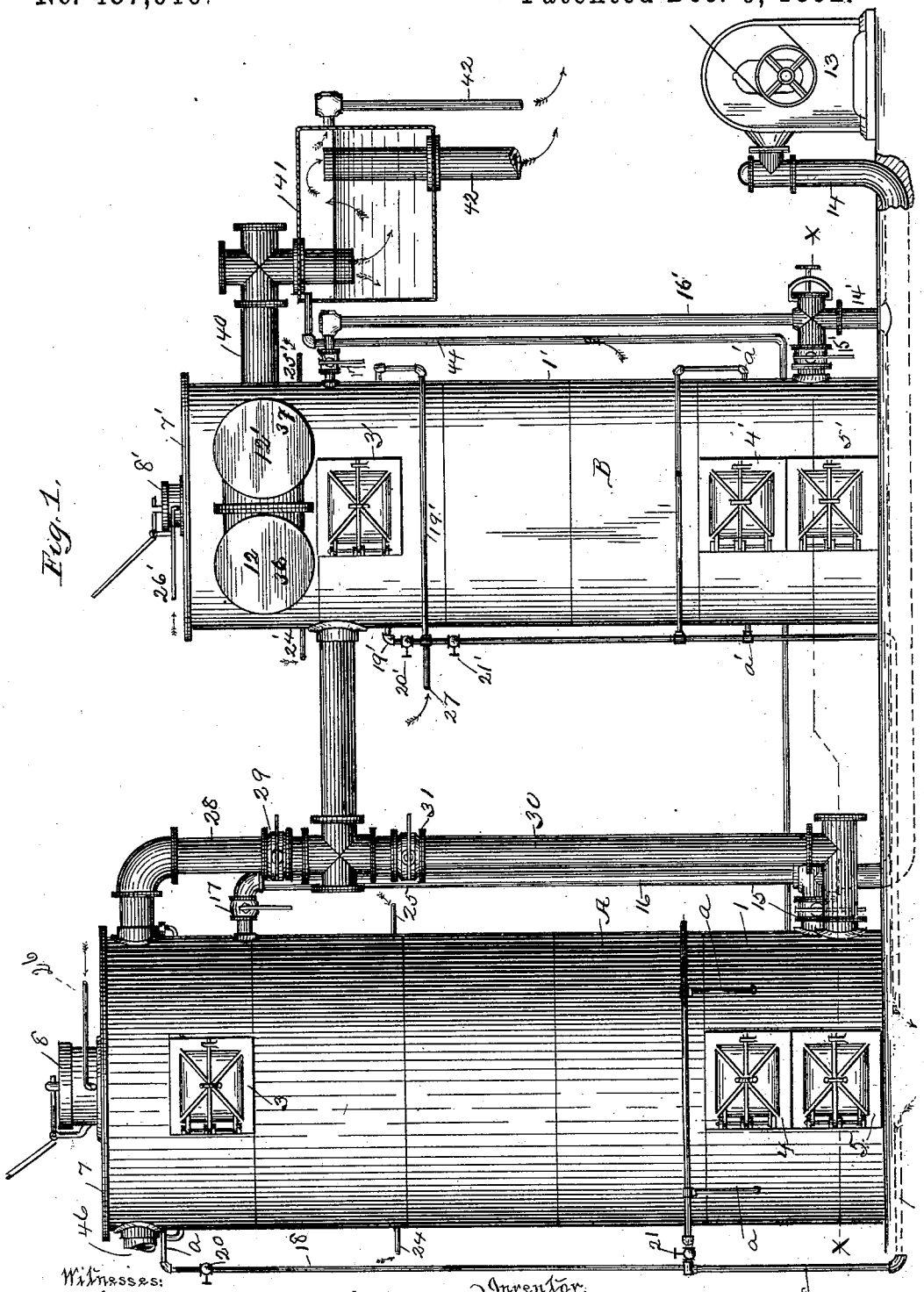
(No Model.) 5 Sheets—Sheet 1.

J. GRAY.

APPARATUS FOR MANUFACTURING GAS.

No. 487,616. Patented Dec. 6, 1892.

Fig. 1.



Witnesses:
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(No Model.) 5 Sheets—Sheet 2.

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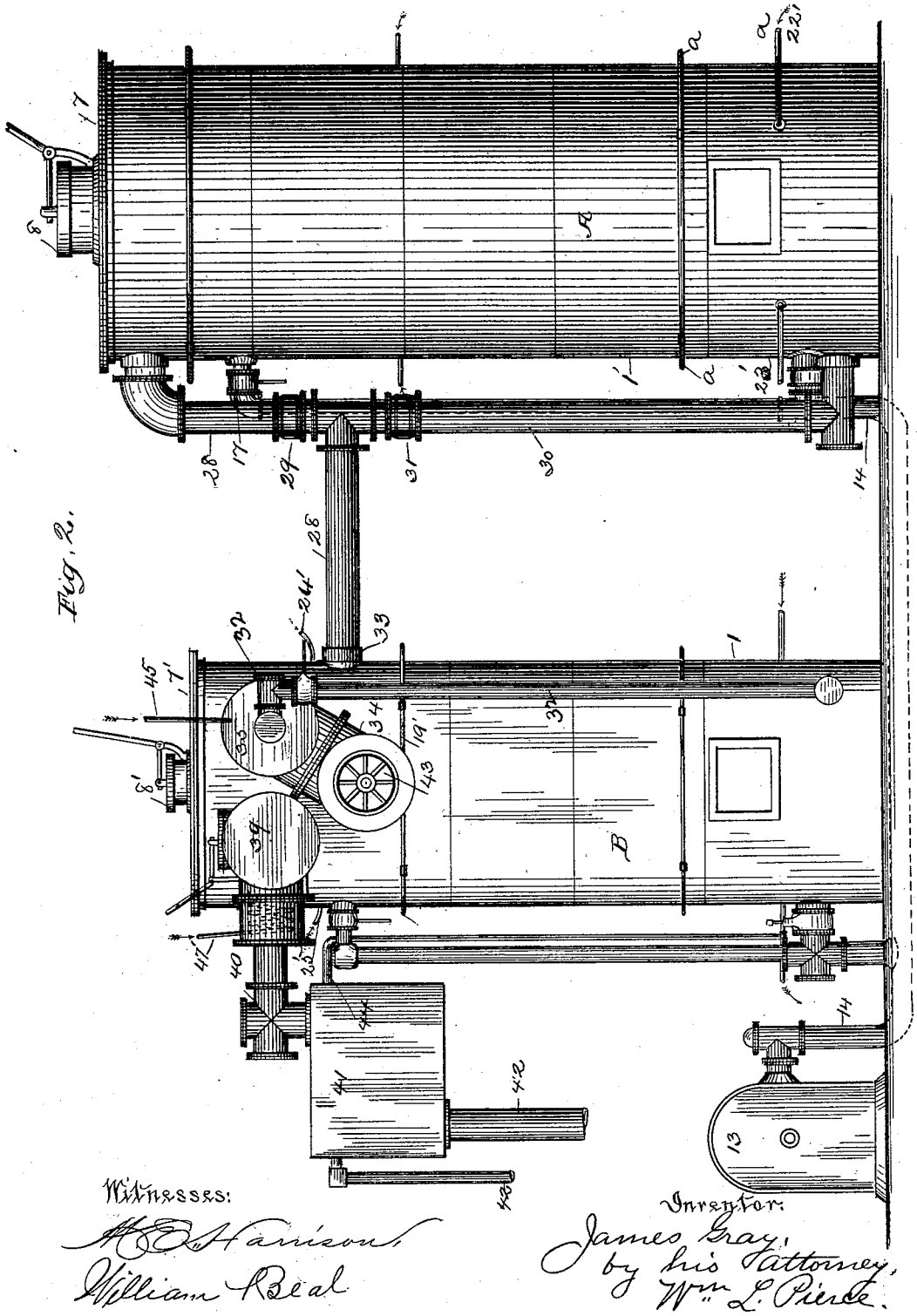

Fig. 2.

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Fig. 4.

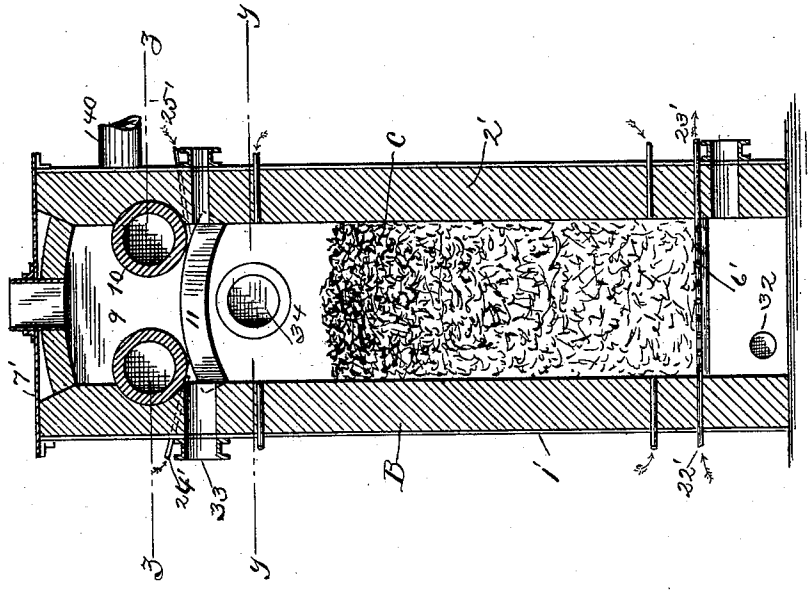
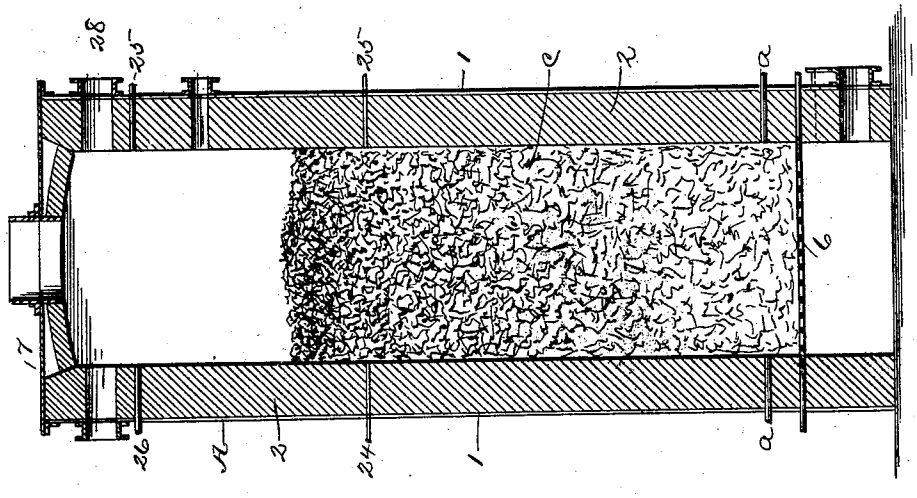


Fig. 3.



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(No Model.) 5 Sheets—Sheet 4.

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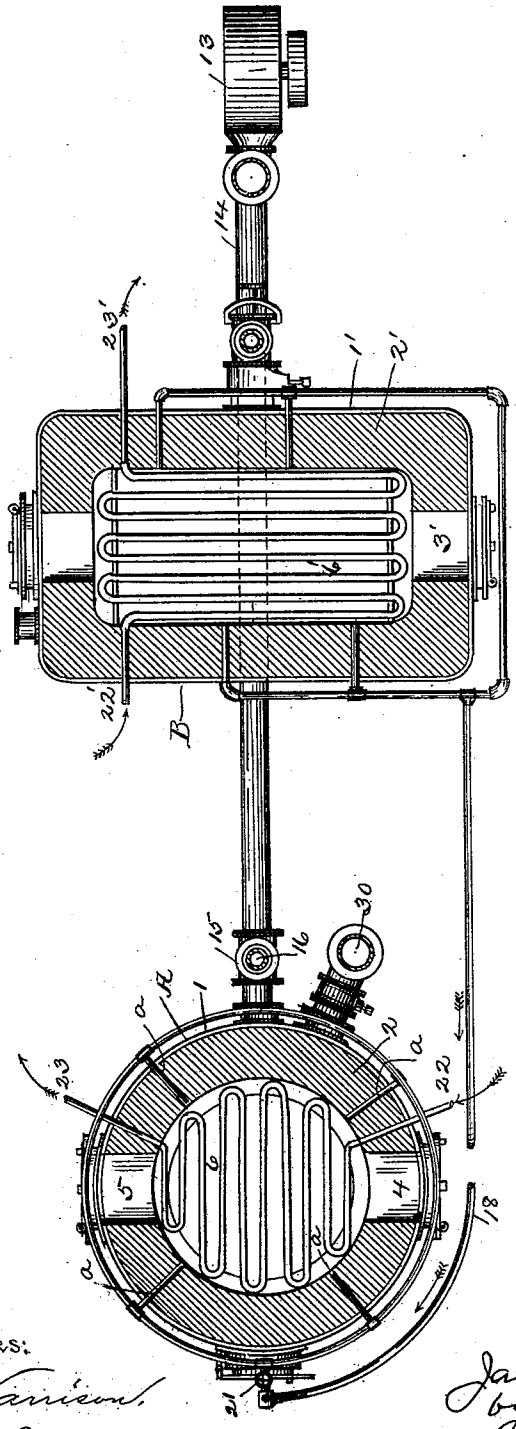

Fig. 6.

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APPARATUS FOR MANUFACTURING GAS.

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Fig. 7.

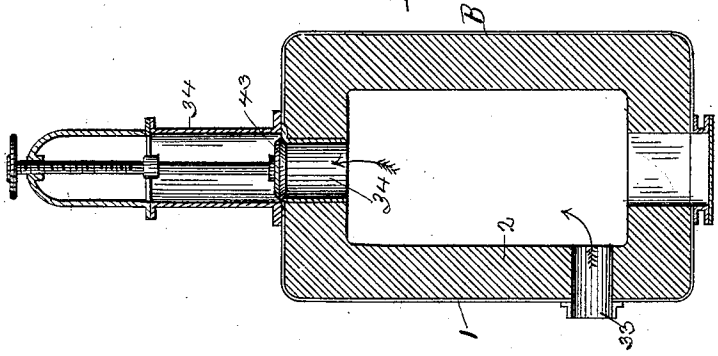
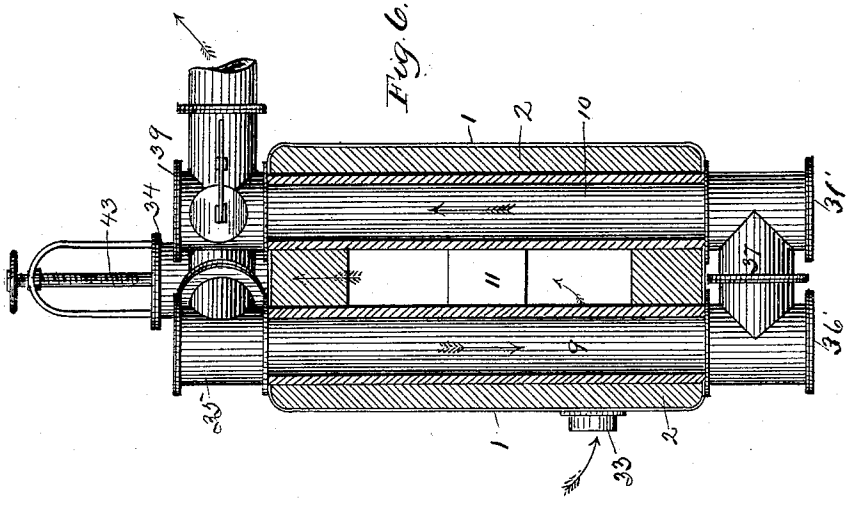


Fig. 6.



Witnesses:
H. E. Harrison.
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UNITED STATES PATENT OFFICE.

JAMES GRAY, OF LIMA, OHIO.

APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 487,616, dated December 6, 1892.

Application filed May 28, 1892. Serial No. 434,703. (No model.)

To all whom it may concern:

Be it known that I, JAMES GRAY, a citizen of the United States, residing at Lima, in the county of Allen and State of Ohio, have invented or discovered a new and useful Apparatus for Manufacturing Gas, of which the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a front elevation of my apparatus; Fig. 2, a rear elevation thereof; Fig. 3, a vertical section through the generator; Fig. 4, a like section through the combined generator and carburetor; Fig. 5, a horizontal section on line *x x* of Fig. 1; Fig. 6, a section on line *z z* of Fig. 4, and Fig. 7 a section on line *y y* of Fig. 4.

The purposes of my invention, generally stated, are to secure a continuous flow of gas from gas-generators in distinction from the intermittent flow heretofore attained; also, to locate the retorts inside the generator, so that they may be heated by the waste heat from the gas-producing fuel.

My invention is applicable to the manufacture of all ordinary kinds of heating and illuminating gas, except straight coal-gas.

Heretofore gas-producers of this type have been intermittent in their flow, because it has been impossible to control the fire. It has heretofore been necessary to interrupt the runs and alternate them with blasts. I am able to so control the fire that I obtain a continuous run.

In an application filed by me October 31, 1892, Serial No. 450,461, for improvements in the manufacture of gas I claim the combination of the generator and retorts when one or both are provided with purge-valves and used with only a natural draft, and hence make no claims to this particular combination in this application.

In the accompanying drawings, which make part of this application, A is a generator built of a sheet-metal cylindrical shell 1, lined on the inside with fire-brick 2. It has a charging-door 3, stoking-door 4, clinkering-door 5, and a circulating water-grate 6. Its lid 7 is provided with the valve 8, which acts as a purge-valve or pinge-valve. Thus far it is like a gas-generator of the usual cupola type.

B is a combined generator and carburetor built of sheet-iron shell 1′, lined with fire-brick 2′. It is preferably rectangular in horizontal sections, as seen in Fig. 5. It has a charging-door 3′, stoking-door 4′, clinkering-door 5′, and a circulating water-grate 6′. Its lid 7′ is provided with a valve 8′, which acts as a purge-valve or pinge-valve. Near the top of said shell are placed two retorts 9 and 10, resting on the skeleton arch 11. 12 12′ are two T's connecting said retorts at the front of the shell, the flanges of said T's being bolted to the shell and the retorts, which are either of metal or clay, being built into the solid masonry at each end and being of any desired shape.

13 is a blower of any approved form. 14 is an air-pipe leading from said blower through valve 15 to the lower part of the generator A.

16 is an extension of the air-pipe, leading through valve 17 to the upper part of generator A.

18 is a steam-pipe coming from any source of steam-supply. It encircles the generator A and discharges into same above the grate by four pipes *a a*. (Seen in Fig. 5.) 19 is an upward extension of said steam-pipe to the top of the generator, where it also discharges into same through four short pipes at almost the level shown in Figs. 1 and 2.

20 and 21 are valves to cut off upper and lower steam-pipes.

22 and 23 are the inlet and outlet water-pipes for the grate 6.

24 and 25 are oil-pipes entering the generator below the level of the fuel. 26 is an oil-pipe entering the top of the generator. All three lead to a source of oil-supply.

46 is the gas-outlet from the top and left of shell A.

The combined carburetor and generator has like steam-pipes *a′ a′* above the grate, fed by the steam-pipe 27, and like upward extensions 19′ of said steam-pipe, communicating with upper part of said carburetor and generator through four short pipes at about the level seen in Fig. 2. Air is supplied to base of generator B by pipe 14′, controlled by valve 15′, and to the upper part of generator by air-pipe 16′, controlled by valve 17′.

20′ and 21′ are two valves regulating the admission of the steam into the upper or lower part of shell B.

22′ and 23′ are inlet and outlet pipes for the water-grate 6′.

24′ and 25′ are oil-pipes entering the said carburetor and generator at about the level of the under side of the retorts, and 26′ an oil-pipe entering same at the top. 28 is a gas-pipe leading from generator A through valve 29 into generator and carburetor B. 30 is a downward extension of same, provided with valve 31 and which enters generator A at the bottom.

The gas from pipe 28 passes through the T 33, bolted upon shell B, and through an opening in the shell of B across the length of the fire in B, through a T 34, provided with valve 43, inclined at about forty-five degrees, into T 35, into retort 9, thence through retort 9 and through T's 36, 37, and 38 into retort 10, thence through T 39 and pipe 40 into seal 41. It passes out of seal 41 through pipe 42.

43 is a safety-pipe discharging from the seal in the event of 42 getting closed, and 44 is the water-supply pipe for said seal.

32 is a gas-pipe connecting base of shell B with rear end of retort 9, as seen in Fig. 2. The function of this pipe is to conduct the water-gas from the base of the shell B to the fixing-retort when shell B is used alone and the blast is downward, as more fully explained below when the operation of the apparatus is set forth.

45 is an oil-vapor-feed pipe entering retort 9.

The operation of my apparatus can now be understood. The generators A and B are charged with coke C or other suitable fuel. The valves at the top of said shells are opened for smoke-stacks and the air turned on to get up a heat. When this is accomplished, the valves are closed and steam or air, or both, are admitted in limited quantities to make fuel-gas. If we assume that the fire in A is blown from below, the air is admitted below the grate and the steam above the same, while the upper connections of steam and air are cut off. The steam, passing up through the mass of incandescent fuel, becomes decomposed, forming so-called "water-gas," which, escaping from said fuel, is met by an oil-vapor introduced through the oil-pipe 26, (the oil-vapor being formed from preheated oil.) The oil-vapor and water-gas here intermingle and both pass over to the second shell through valve 29, valve 31 being closed. The gas from shell A here meets and mixes with the gas produced in shell B. The commingled gases pass over the full length of the incandescent fuel in shell B, up through valve 43, through retorts 9 and 10, where they are thoroughly fixed and made non-condensible, and out into the seal, thence to scrubber and holder. (Not shown.) After running about half an hour by blowing beneath the fire it will be found that, while the fire at the bottom is bright, at the top it has been partially smothered by the heavy smoke from the oil-vapor settling down upon and partly deadening the fire at that point. To meet this difficulty, I reverse the blast by closing the air-valve 15 and opening the valve 17, thus blowing down through the fire from above. The steam in this case is admitted from the upper steam-pipes and is blown down through the incandescent fuel. The water-gas resulting escapes from the base of the shell A and passes over through pipe 30, valve 31, and pipe 28 (valve 29 being closed) to shell B and is carbureted by admitting oil into the second shell or into the retorts, or both, and is fixed in the same manner as above described. After running for a few hours the shells have to be refilled with fuel. The combustion is so regulated that the shells will be charged alternately. Assume it is necessary to recharge A. It will be disconnected and thrown out of use by manipulating the various valves already described and the gas is made and fixed in the shell B alone. In blowing down through shell B the valve 43 is closed, which by-passes the combustion-chamber from the retort. The steam then passes down through the fuel and out at the bottom of the shell and up through gas-pipe 32 to retort 9, where it is carbureted with oil through pipe 45 and permanently fixed in the retorts from the heat of the incandescent fuel in the generator. In blowing up through shell B the valve 43 is open, resuming communication with the combustion-chamber, and the production of the gas in the shell B proceeds the same as was described above when the production of gas in shell B was described in connection with the production of gas in shell A. If shell B is to be charged, it is disconnected and thrown out of use, while steam is forced up through shell A and oil-vapor is introduced by pipes 24 and 25 into the body of the incandescent fuel in shell A, thus carbureting and fixing the gas in shell A alone. The combined product passes out through the outlet 46 at the top and left of shell A to the scrubber. This method of working shell A is designed to be used principally when recharging shell B.

In practicing my process I run up or down through either shells with steam or air, or both, as desired.

My retorts may be used either with or without bafflers, by which I mean fire-brick blocks so arranged in the retorts that the gas must take a zigzag path in passing through said retorts, and hence will be detained.

Pure illuminating-gas can be made by the above process and carbureted up to any desired candle-power.

The retorts may be cleaned and heated by closing valves on top of the generators, ig-

niting the gas, and sending flame through said retorts to burn them out or heat them up. The flame escapes by valve 47 on top of retort 10.

My process I compute saves sixty per cent. in fuel over the old methods as practiced in analogous types of apparatus, as the blows in the old methods are always longer than the runs and the fuel used in the blows is entirely wasted. By securing a continuous run I save this fuel and gasify everything that goes into the shells. It will thus be seen that my process produces gas continuously and only shutting down to clinker out.

The oil charged into the generators may be very satisfactorily preheated by inserting a coil of pipe at some point in the path of the escaping gases—as, for instance, as shown at 47′ in the T 39.

Having described my invention, I claim—

1. In gas-producing apparatus, the combination of a gas-generator, one or more retorts located in the combustion-chamber of said generator and communicating with said combustion-chamber, a valve controlling the communication between said combustion-chamber and said retort or retorts, a pipe connecting the bottom of said generator with said retort or retorts, controlled by suitable valves, and a blast device connected with the upper and lower parts of said generator, and valves in said blast connections, substantially as set forth.

2. In gas-producing apparatus, the combination of a gas-generator, a blast device connected with the upper and lower parts of said generator, gas connections from the upper and lower parts of said generator to a second gas-generator, said second gas-generator, and one or more retorts located in the combustion-chamber of said second generator and communicating with said combustion-chamber, the whole system being provided with suitable valves, substantially as set forth.

3. In gas-producing apparatus, the combination of a gas-generator, a blast device connected with said generator, a gas connection to a second gas-generator, said second gas-generator, one or more retorts located in the combustion-chamber of said generator and communicating with said combustion-chamber, a valve controlling the communication between said combustion-chamber and said retort or retorts, a pipe connecting the bottom of said generator with said retort or retorts, controlled by suitable valves, and a blast device connected with the upper and lower parts of said generator, and valves in said blast connections, substantially as set forth.

4. In gas-producing apparatus, the combination of a gas-generator, a blast device connected with said generator, a gas connection to a second gas-generator, said second gas-generator, one or more retorts located in the combustion-chamber of said second generator and communicating with said combustion-chamber, and a valve controlling the communication between said retort or retorts and the combustion-chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand this 25th day of May, A. D. 1892.

JAMES GRAY.

Witnesses:

WM. L. PIERCE,

GEORGE R. WATERS.