(No Model.) 2 Sheets—Sheet 1.

C. W. ISBELL.

APPARATUS FOR MAKING ILLUMINATING GAS.

No. 330,122. Patented Nov. 10, 1885.

Fig 1.

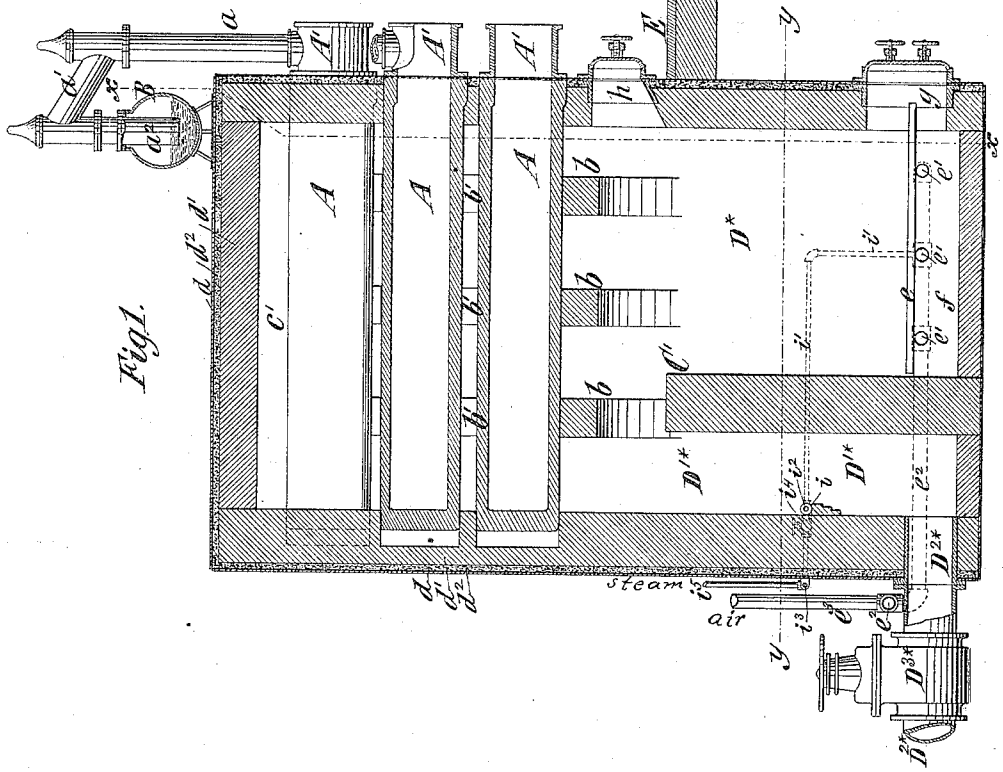
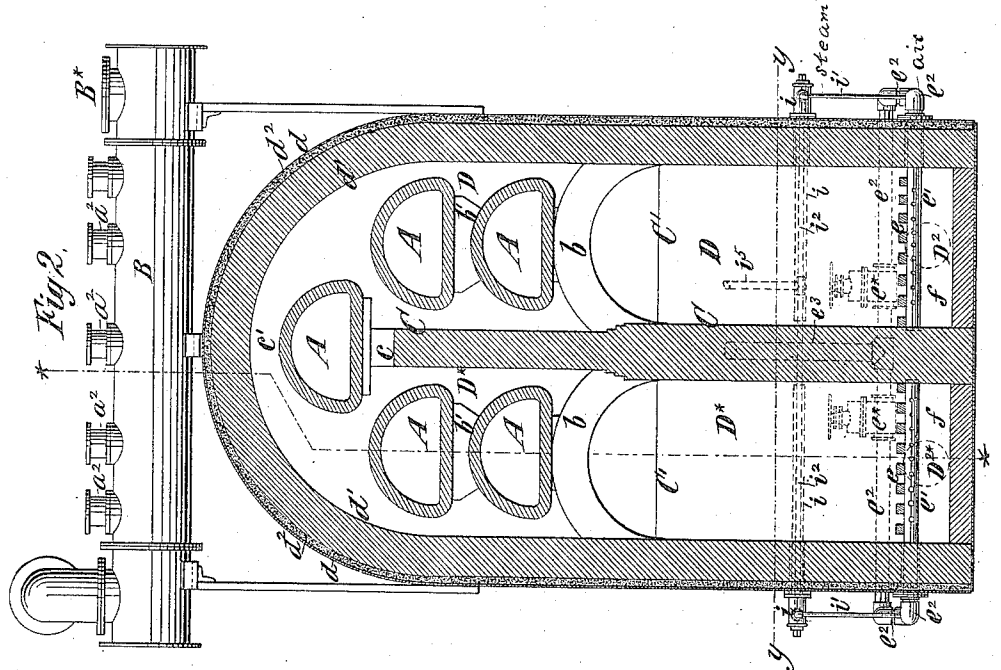


Fig 2.



Witnesses:
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Matthew Pollock

Inventor
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

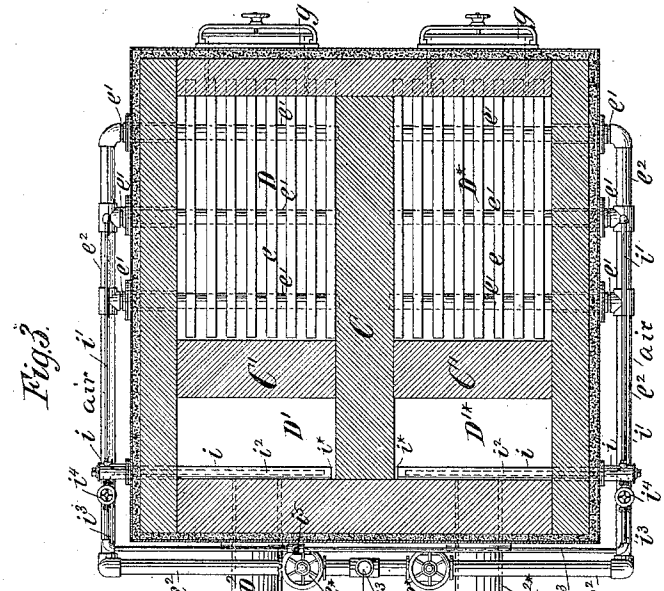
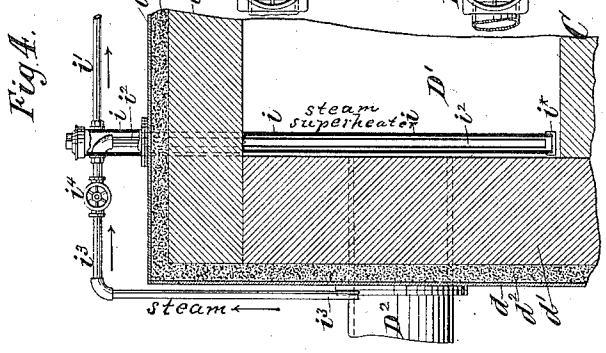


Fig. 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

CHARLES W. ISBELL, OF NEW YORK, N. Y.

APPARATUS FOR MAKING ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 330,122, dated November 10, 1885.

Application filed January 10, 1885. Serial No. 152,469. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. ISBELL, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Apparatus for Making Illuminating-Gas, of which the following is a specification.

My invention is applicable, generally, to apparatus for making what is commonly known as "water-gas" by passing superheated steam through a mass of incandescent coal or fuel; but the invention is more particularly intended for apparatus comprising a generating-furnace, through which steam may be passed for the purpose of decomposing it, and which has in its upper part a number of closed retorts which are adapted to receive bituminous coal, and which are heated by the products of combustion while blowing up the fire in the generating-furnace, and by the hot products of decomposition while passing steam through the furnace for the purpose of distilling the charges of bituminous coal within the retorts.

In apparatus for producing gas by the decomposition of steam it is common to employ a generating-furnace containing two chambers, which are alternately blown up to raise the fire therein to a point of incandescence, and are also alternately employed for producing gas by passing steam through such fires. In the operation of apparatus of this kind it has been usual both in blowing up with air and in decomposing steam to pass the blast of air or current of steam from below one grate upward through the fire in one chamber, and thence downward through the fire in the other chamber and the other grate, and it is found by pursuing this course that the grates are quickly burned out and have to be frequently replaced.

The object of my invention is to provide an apparatus which will be more durable than those before used for a like purpose; and the invention consists in the combination, with a double-chambered generating-furnace having separate grates, and a partition-wall above which the chambers communicate with each other, of a wall extending transversely across the back of each chamber, forming therein a downwardly-extending flue or passage from which leads an outlet-pipe, and pipes for supplying steam and air alternately to said chambers.

The invention also consists in the combination, with the above, of a number of closed retorts arranged in the upper part of the furnace-chambers, and adapted to be heated by the products of combustion while blowing up either chamber, and by the products of decomposition while admitting steam to either chamber for the purpose of decomposing it and producing gas.

In the accompanying drawings I have represented an apparatus for carrying out my invention.

Figure 1 is a vertical section of an apparatus embodying my invention in a plane parallel with the length of the retorts, as indicated by the dotted line * * of Fig. 2, which is a vertical section on the plane of the dotted line *x x*, Fig. 1. Fig. 3 is a horizontal section on the plane of the dotted line *y y*, Figs. 1 and 2; and Fig. 4 is a sectional view similar to Fig. 3, showing one corner portion of the apparatus on a larger scale.

Similar letters of reference designate corresponding parts in all the figures.

A designate closed retorts of the ordinary construction, and here shown as five in number, though a greater or less number may be so arranged. Each retort has its mouth A′ closed by a lid, (not here shown,) and is connected by a stand-pipe, *a*, a bridge-pipe, *a′*, and a dip-pipe, a^2, with a hydraulic main, B, placed and supported above the apparatus in a well-known manner. The lower retorts are supported upon arches *b* in the usual way. The retorts above them are supported by tiles or blocks *b′*, resting on the lower retorts, and the upper and middle retort is supported on a wall, C, which extends upward from the bottom of the apparatus. The wall C has openings *c* under the upper retort, and through these openings and the space *c′*, above the upper retort, the chambers D D*, on both sides of the wall C, are in free and uninterrupted communication.

The outer shell, *d*, of the structure may be of sheet metal, and the walls *d′* built of brick in the usual way, and between the brick walls *d′* and the metal shell or casing *d* is a space,

d^2, which may be filled with ashes or other loose material to provide for expansion. The structure, therefore, comprises two communicating chambers, D D*, in which are grates *e e*, ash-pits *f f*, ash-pit doors *g g*, and feeding or stoking doors *h*, only one of which is shown, in the upper part of the chambers, and just above the floor E of the retort-house. In the rear of the furnace-chambers D D* is a transverse wall, C', which forms downwardly-extending flues or passages D' D'* within the apparatus, and from the bottom of which lead outlet-pipes D^2 D^{2*}, controlled by suitable valves, D^3 D^{3*}. The grates *e e* are each supported upon air-pipes *e' e' e'*, which are perforated, and form branches of main air-pipes e^2, which extend along the sides of the apparatus, as shown in Fig. 3, and are provided with valves e^*, whereby the flow of air may be permitted through one or both of them. The air from a blower or other source of supply is admitted through a common supply-pipe, e^3, to the pipes e^2.

In each flue or passage D' D'* is or may be arranged a superheater for steam. As shown most clearly in Figs. 3 and 4, these superheaters each consist of a large horizontal pipe, *i*, closed at the inner end, i^*, and also at the outer end, and having a pipe, *i'*, leading from it near the outer end to the air-pipe e^2. Within the large pipe *i* is a small pipe, i^2, which extends nearly to the closed inner end thereof, and delivers its steam thereinto, and the pipes i^2 are supplied by branch pipes i^3, containing valves i^4, and receiving steam from a common supply-pipe, i^5. Steam from the pipe i^5, when one or other of the valves i^4 is open, passes along that pipe i^3, to and through the pipe i^2, and is delivered at the inner end thereof into the large pipe *i*, and after passing in the reverse direction through the pipe *i* the steam passes by the pipe *i'* to the perforated pipes *e'* of one or other chamber D or D*, into which it is delivered in a highly-superheated condition, and ready to be decomposed by passing upward through the fire therein. Superheaters of any other suitable construction may be arranged in said flues or passages D' D'*.

The operation of the apparatus is very simple. The fires are first lighted in the chambers D D*, and are blown up to heat the retorts A to a distilling-point, one or both the valves D^3 D^{3*} being open. After this is done the retorts are charged with bituminous coal and the furnace-chambers are thereafter to be used alternately for blowing up and for decomposition. Suppose, for example, that the right-hand chamber, D, is to be first used, the air is shut off the chamber D*, but the outlet-valve D^{3*}, leading from the flue or passage D'* at the back thereof is left open, and the draft passes from the furnace-chamber D upward over the wall C, and thence down through the flue or passage D'*, whereby the retorts are heated and coal therein is subjected to distillation. When the coal in the chamber D reaches a decomposing-point, I shut off the air from that chamber and turn on steam, and the steam is thereby decomposed, and the gas thereby produced takes the same course upward over the wall C, and then downward through the flue or passage D'*. The valve D^{3*} is shut and the valve D^3 opened, and then air is admitted to the chamber D* to blow it up, and the products of combustion pass up over the wall C and down through the flue or passage D', thereby heating the retorts and raising the fuel in the chamber D* to a point of incandescence. Steam is then turned on the chamber D*, and is therein decomposed, and the products of decomposition take the same course and issue from the outlet D^2. If the heat at any time falls below that required to heat the retorts, both fires may be blown up to heat them. By this method of operation I do not continue the admission of steam until the fires have become cooled to a point at which they will not effect decomposition, but shut off steam when the fires become so cooled that the gases resulting from decomposition would cool the retorts; hence but a very few minutes are required each time to blow up the fires, and the alternate operation is very rapid. The fires are always very hot, and hence there is a more rapid combustion in the furnaces and less liability of the fires clinkering and clogging so as to produce trouble in operating the apparatus.

Ordinarily in gas-generating furnaces having two chambers the draft in blowing up is upward through one grate and fire and downward through the other fire and grate, and consequently the grates are soon worn or burned out.

In my apparatus the draft is upward through either grate and chamber; but the downward draft is not through the grate, but in the flue or passage D' or D'*, and consequently the grates are far more durable.

During the time the fires are being blown up and steam is being decomposed therein, the gases are evolved from the coal in the retorts A and delivered into the hydraulic main B, and when the coal in the retorts is brought to a coking-point the coke is withdrawn onto the retort-floor E, and as much as desired is fed into the furnace-chambers through the doors *h h*.

The outlets D^2 D^{2*} beyond the valves D^3 D^{3*} should be provided with suitable valves for controlling the products of combustion and water-gas. These valves are well understood, and form no part of my invention. The water-gas may after its escape from the furnace have added to it vapor of naphtha or other liquid hydrocarbon to give it illuminating power, and may then be added to the volume of coal-gas in the hydraulic main through the inlet-pipe B*; or it may be maintained separate from the coal-gas.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with a double-cham-

bered generating-furnace having separate grates and a partition-wall, above which the chambers communicate with each other, of a wall extending transversely across the back of each chamber, forming therein a downwardly-extending flue or passage, from which leads an outlet-pipe, and pipes for supplying steam and air alternately to said chambers, substantially as herein described.

2. The combination, with a double-chambered generating-furnace having a central partition-wall, above which the chambers communicate, and a number of retorts arranged in the upper part of said chambers, of a transverse wall at the back of said chambers forming downwardly-extending flues or passages, from which lead outlet-pipes, and pipes for supplying to said chambers air for blowing up and steam for decomposition, substantially as herein described.

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