(No Model.) 3 Sheets—Sheet 1.

E. BIEDERMANN & E. W. HARVEY.

APPARATUS FOR UTILIZING WASTE GASEOUS PRODUCTS.

No. 442,600. Patented Dec. 16. 1890.

Fig. 1

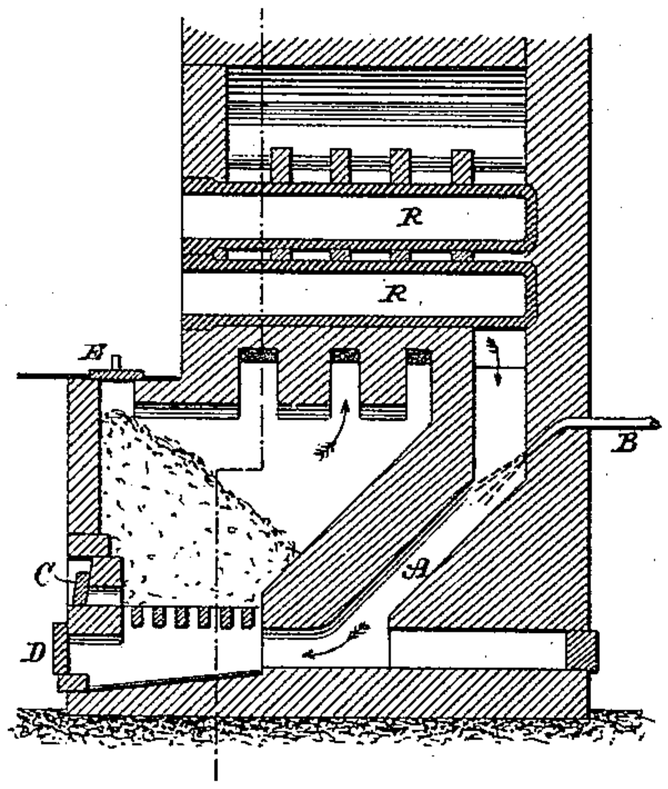


Fig. 2

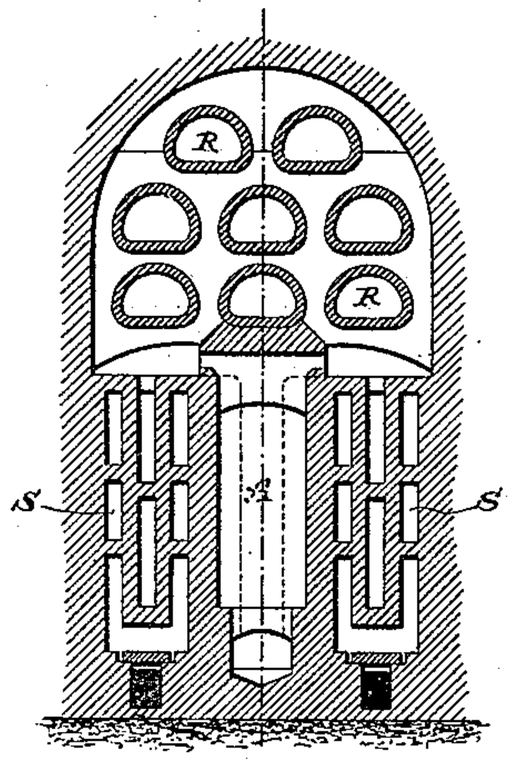


Fig. 3

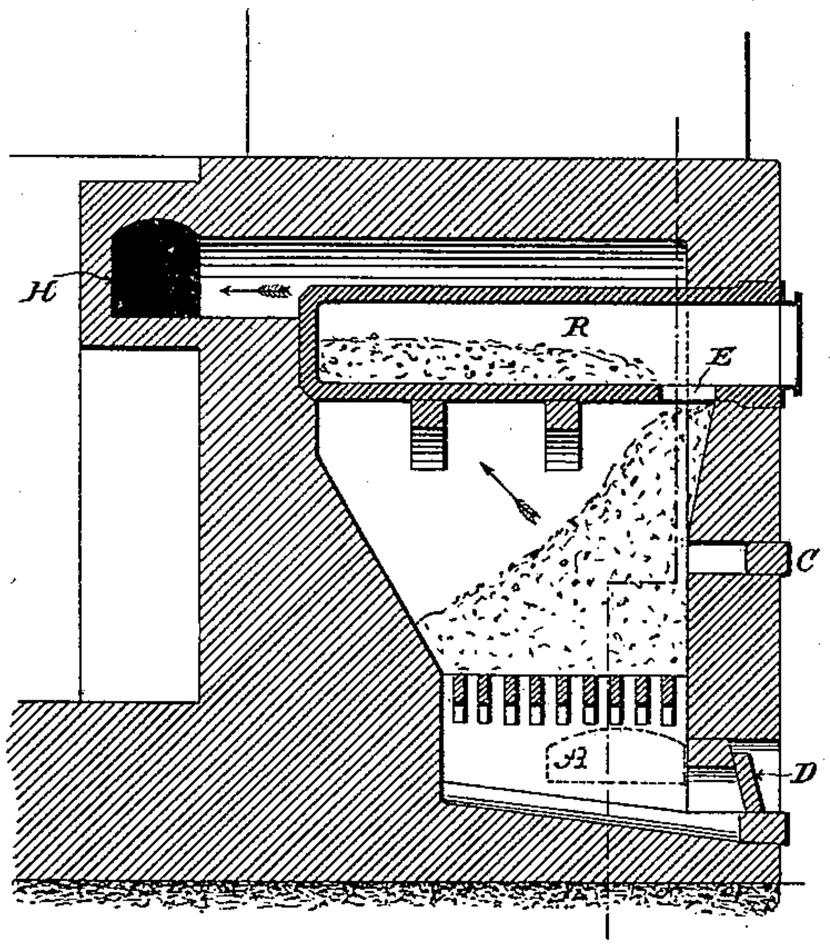
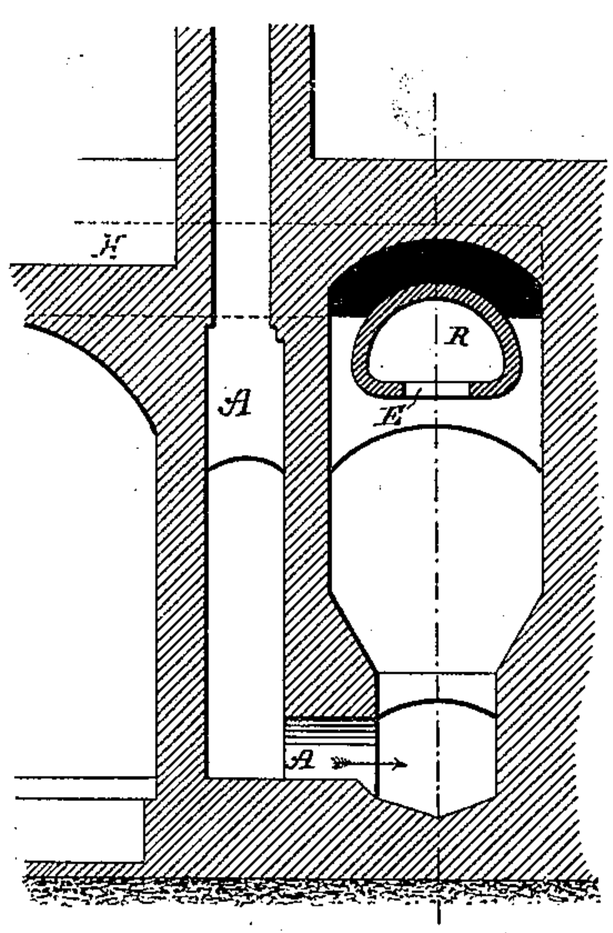


Fig. 4



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their Attorneys

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Fig. 5

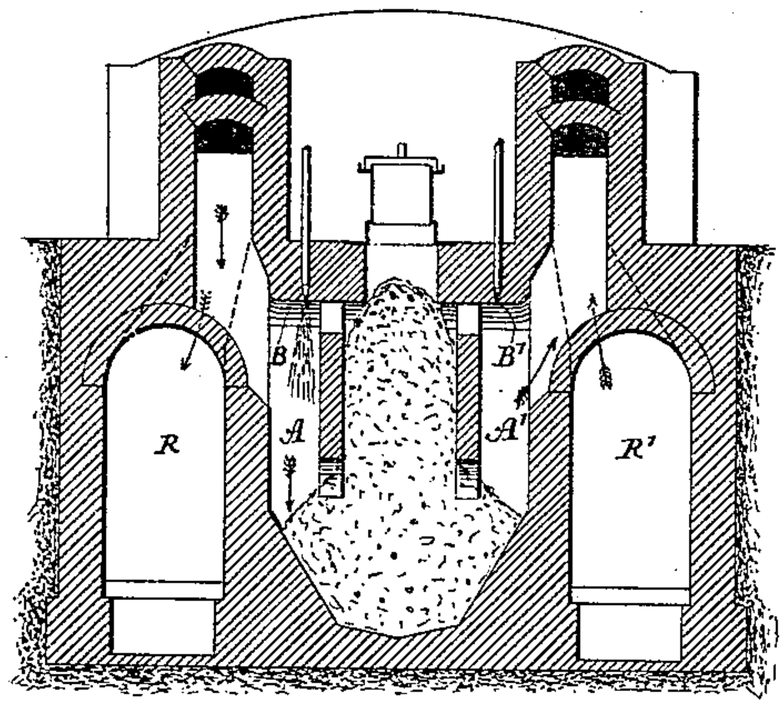

Fig. 6

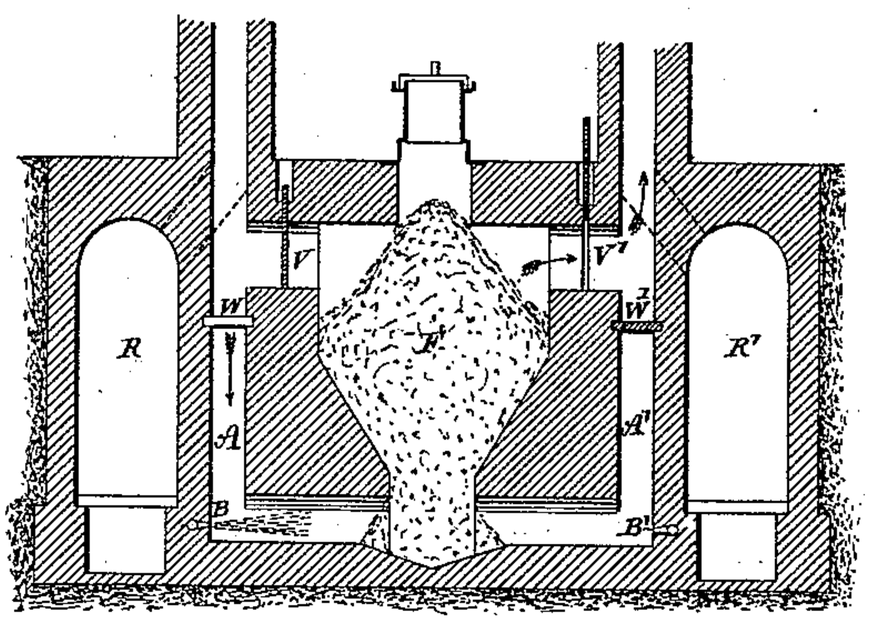

Fig. 7

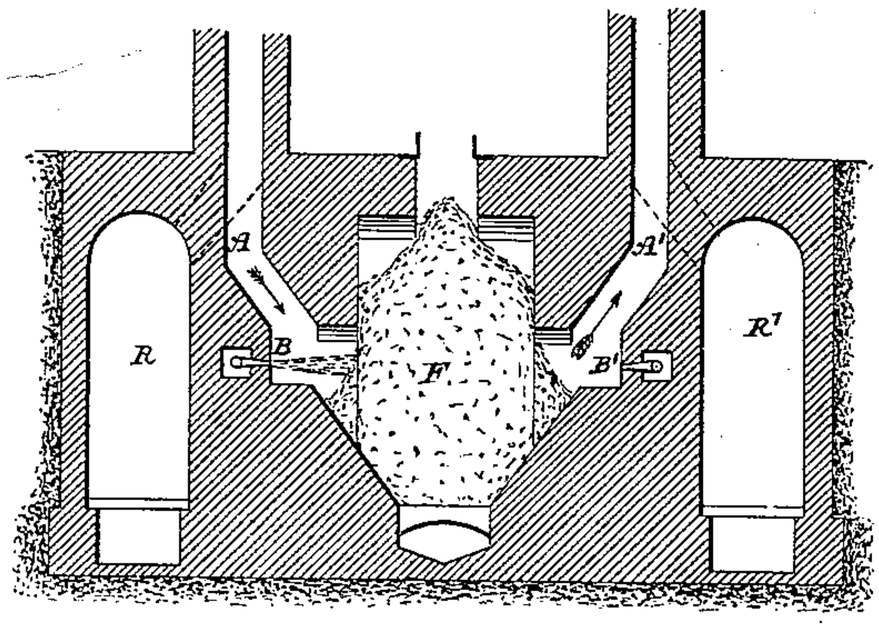

Fig. 12

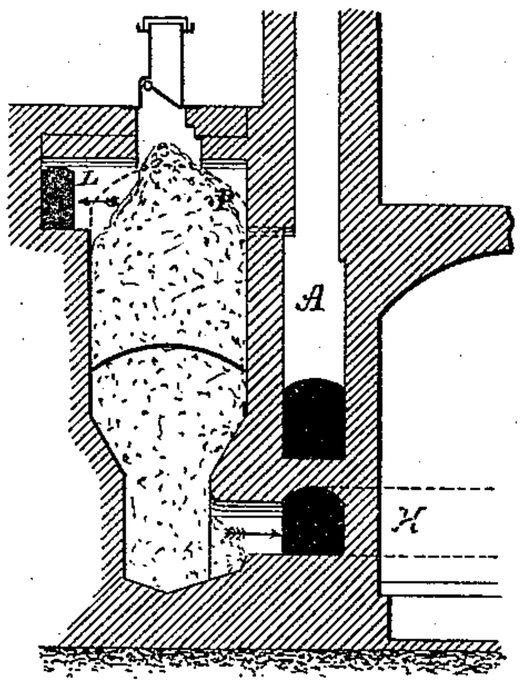

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Fig. 8

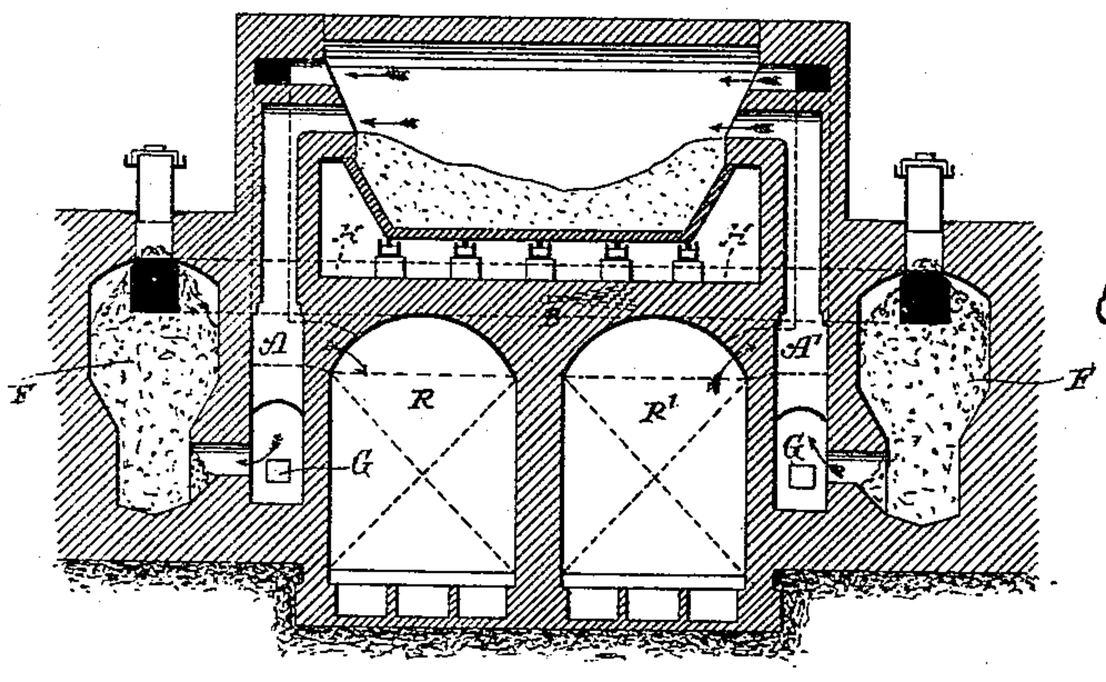


Fig. 9

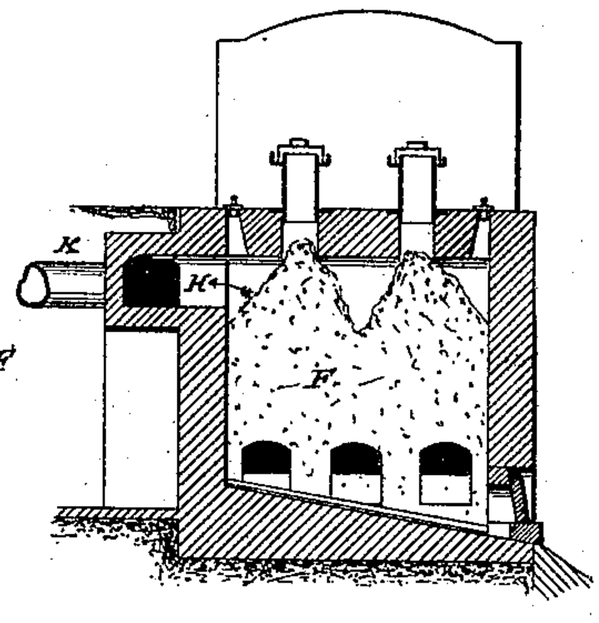


Fig. 10

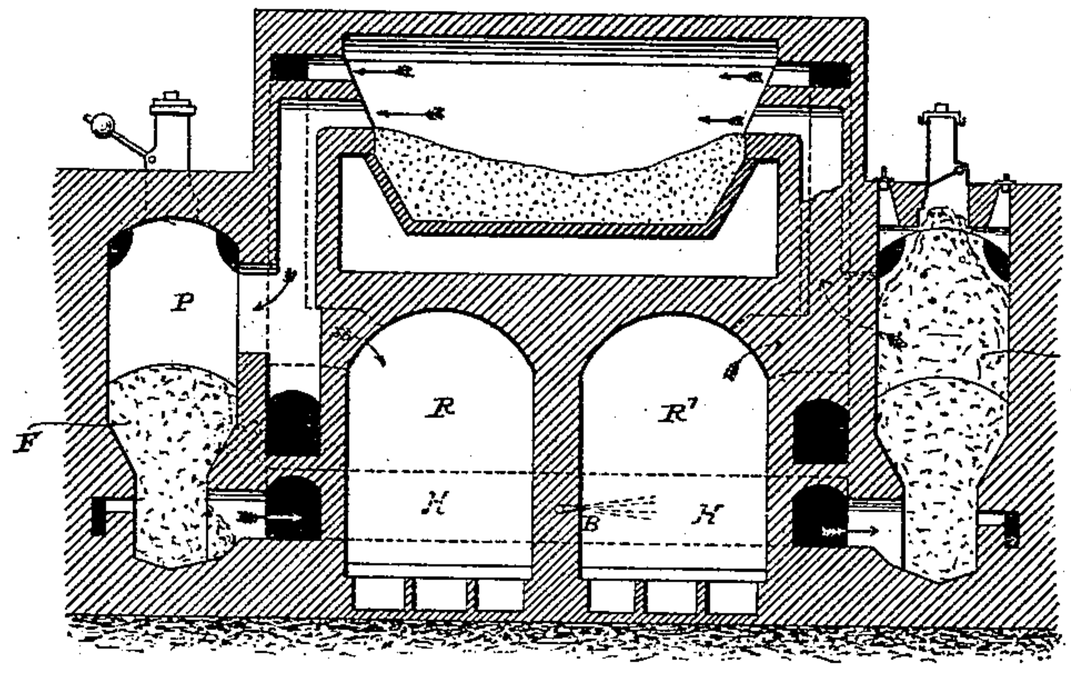
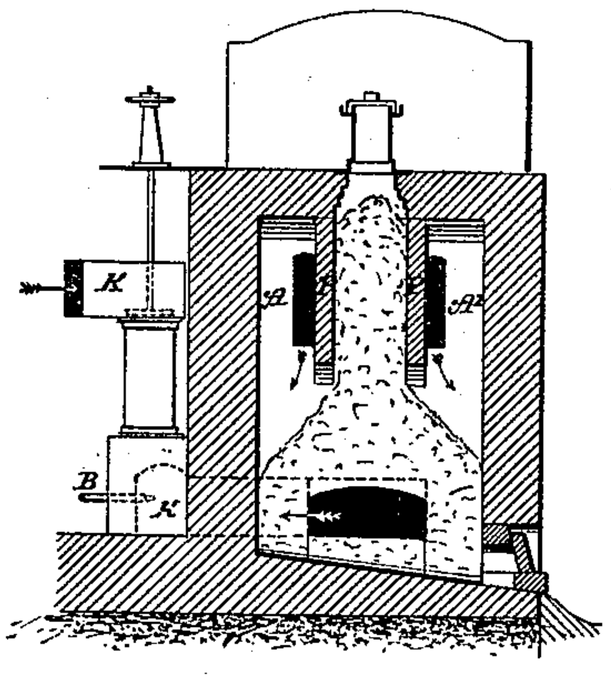


Fig. 11



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UNITED STATES PATENT OFFICE.

EMIL BIEDERMANN AND ERNEST WILLIAM HARVEY, OF WESTMINSTER, ENGLAND, ASSIGNORS TO FREDERICK SIEMENS AND ALEXANDER SIEMENS, OF SAME PLACE.

APPARATUS FOR UTILIZING WASTE GASEOUS PRODUCTS.

SPECIFICATION forming part of Letters Patent No. 442,600, dated December 16, 1890.

Application filed August 26, 1889. Serial No. 322,062. (No model.) Patented in England November 18, 1884, No. 15,127.

To all whom it may concern:

Be it known that we, EMIL BIEDERMANN, a citizen of the Swiss Confederation, and ERNEST WILLIAM HARVEY, a subject of the Queen of Great Britain, both residing at 10 Queen Anne's Gate, Westminster, in the county of Middlesex, England, have invented a new and useful Improved Apparatus for Utilizing Waste Gaseous Products, (for which we have obtained a patent in Great Britain, dated November 18, 1884, No. 15,127,) of which the following is a specification.

It has been proposed to utilize gaseous products of combustion from furnaces by causing them to pass through incandescent fuel, so that the carbonic anhydride which they contain may become converted into carbonic oxide capable of serving for combustion.

Our invention relates to means of thus utilizing products of combustion as they escape in a highly-heated state from regenerative gas-furnaces. For this purpose we provide near the furnace a chamber arranged with suitable means for charging it with fuel—such as coal, coke, or anthracite—and for removing ash, and with inlet and outlet passages for the gases. Having first raised the fuel to a state of incandescence, which may be done by admission of air, as in ordinary gas-producers, we by means of an artificial draft, which may be produced by a jet of steam or gas, or by a fan or blower, cause to pass through the hot fuel a portion of the hot gaseous products of combustion from the furnace, these having themselves sufficient heat to maintain the fuel at a temperature suitable for conversion of the carbonic anhydride into carbonic oxide, which, with other gases produced, is returned to the furnace to burn therein. Two fuel-chambers may be employed to operate alternately in the following manner: While the one chamber is acting, as above described, for conversion of carbonic anhydride into carbonic oxide, the other chamber, containing highly-heated fuel, may act as a regenerator, heating the combustible gases passed through it before they enter the furnace. As only a portion of the gaseous products of combustion can be heated in the manner described, the remainder is passed through a regenerator for the purpose of heating the air-supply of the furnace in the usual way. The forms and arrangements of the chamber or chambers may be varied.

The accompanying drawings show several arrangements as examples, illustrating how our invention may be carried out in practice.

Figure 1 is a longitudinal section, and Fig. 2 is a transverse section, showing our invention applied to a retort-furnace. From the upper chamber, containing the retorts R, a portion of the gaseous products of combustion is caused, by means of a jet B of steam or gas, to descend a flue A to the mass of hot fuel F, through which it passes, so that the carbonic anhydride which it contains, by taking up additional carbon from the fuel, becomes converted into carbonic oxide. This, with the other gases produced, ascends to the retort-chamber, where they are burned with the hot air supplied through the regenerators S S. C is a passage that can be opened when required for admitting air or stowing the fuel. D is a door for removal of ashes, and E the opening for feeding the fuel, which in this case may be hot coke as it is drawn from the retorts R.

Fig. 3 is a longitudinal section, and Fig. 4 a transverse section, of a retort-furnace operating as already described with reference to Figs 1 and 2, the feed-opening E being in this case made through the bottom of the retort R.

Figs. 5, 6, and 7 are sections showing several forms of chambers and their passages, suited for operating in correspondence with the alternating action of the regenerators of a regenerative gas-furnace. In these the passages are arranged symmetrically on each side of the fuel-chamber. The jets B B′ or valves V V′ and W W′ are provided in duplicate, so as to direct the current either as shown in the figures or in the opposite way. Thus when the regenerator R on the one side is being heated by the products of combustion from the furnace and the regenerator R′, which has been previously heated, is heating the air passing to the furnace a

portion of the products from the furnace is caused to pass through the hot fuel F in the direction shown. When the action of the regenerators is reversed, the jets and valves are also reversed to send the products in the opposite direction through F.

Fig. 8 is a section of a regenerative gas-furnace, to which two fuel-chambers F F′ are applied; and Fig. 9 is a longitudinal section of one of these chambers. While a portion of the products from the furnace is caused to descend the flue A and to pass through the hot fuel F, the combustible gases produced in the chamber F, along with such as may be supplied by a pipe K from another source, are caused to pass along a cross-flue H and down through the previously-heated fuel in F′, so as to become heated before they ascend the flue A′ to the furnace. The current through F and F′ may be caused by a jet B in the flue H, this jet being directed in the opposite way when the regenerators R R′ are reversed. G are passages for admitting air, if required.

Figs. 10 and 11 show a similar arrangement with the upper part of the fuel-chambers F and F′ made with cross-partitions P P, with openings through them, so that the hydrocarbons evolved from the upper layers of the fuel pass down with the products from the furnace and through the hot fuel below. These hydrocarbon products might, however, be led off separately, as shown in Fig. 12, by a flue L for that purpose.

Having thus described the nature of our invention and the best means we know for carrying the same into practical effect, we claim—

1. The combination, in a regenerative gas-furnace, of a furnace or combustion-chamber, a regenerator in which the air for supporting combustion is heated, a gas-producing or fuel chamber external to the combustion-chamber, flues for conducting the air and gas from the regenerator and the gas-producer to the combustion-chamber, and flues connecting the combustion-chamber with the regenerator and the gas-producer, whereby a part of the waste gases from the combustion-chamber passes through the regenerator and a part passes to the gas-producer, substantially as and for the purposes described.

2. The combination, in a regenerative gas-furnace, of a furnace or combustion-chamber, a regenerator in which the air for supporting combustion is heated, a gas-producing or fuel chamber external to the combustion-chamber, flues for conducting the air and gas from the regenerator and the gas-producer to the combustion-chamber, flues connecting the combustion-chamber with the regenerator and the gas-producer, whereby a part of the waste gases from the combustion-chamber passes through the regenerator and a part passes to the gas-producer, and a blast-pipe arranged in the flue leading from the combustion-chamber to the gas-producer, substantially as and for the purpose described.

3. The combination, in a regenerative gas-furnace, of a furnace or combustion-chamber, reversing-regenerators arranged in flues leading to the stack at the opposite sides of the combustion-chamber, a gas-producing chamber or chambers external to the combustion-chamber, flues leading from the regenerators and the gas-producer to both sides of the combustion-chamber, and flues leading from both sides of the combustion-chamber to the regenerator and the gas-producer, whereby a part of the waste gases from the combustion-chamber passes through the regenerator and a part passes to the gas-producer, substantially as and for the purposes described.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 9th day of August, A. D. 1889.

EMIL BIEDERMANN.
ERNEST WILLIAM HARVEY.

Witnesses:
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W. J. NORWOOD,
Both of 17 *Gracechurch Street, London, E. C.*