

No. 624,388.

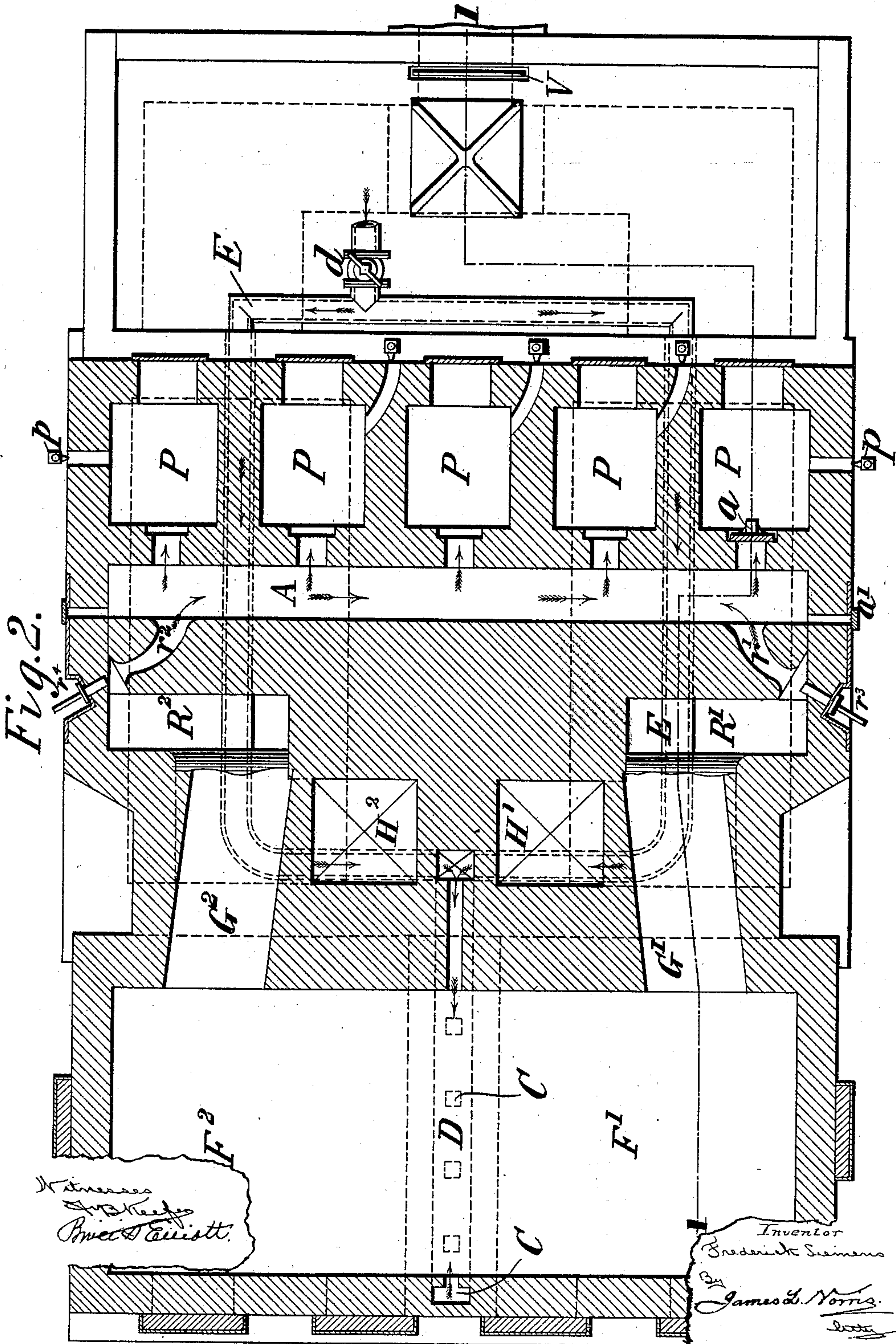
Patented May 2, 1899.

F. SIEMENS.
REGENERATIVE FURNACE.

(Application filed Oct. 22, 1898.)

(No Model.)

3 Sheets—Sheet 2.



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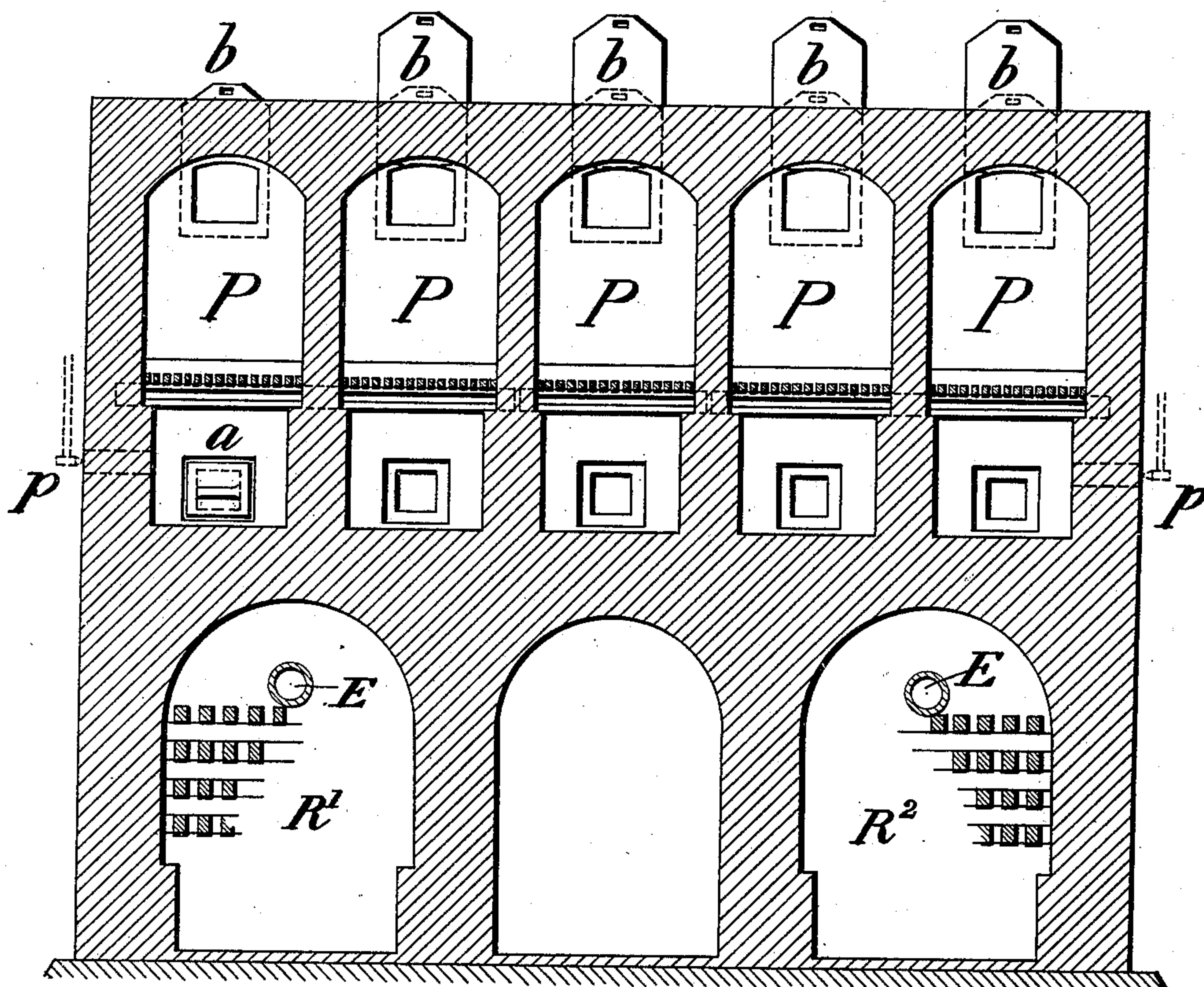
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3 Sheets—Sheet 3.

Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

FREDERICK SIEMENS, OF DRESDEN, GERMANY.

REGENERATIVE FURNACE.

SPECIFICATION forming part of Letters Patent No. 624,388, dated May 2, 1899.

Application filed October 22, 1898. Serial No. 694,293. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK SIEMENS, a citizen of Saxony, residing at 43 Freiburgerstrasse, Dresden, Germany, have invented certain new and useful Improvements in Regenerative Gas-Furnaces, (for which an application has been made for a patent in Great Britain, dated April 7, 1898, No. 8,355,) of which the following is a specification.

In the specifications of the British patents—namely, No. 4,644 of 1889, No. 20,083 of 1889, No. 16,207 of 1890, and No. 11,433 of 1896—are described regenerative gas-furnaces having the gas-producers arranged close to the beds, with reversing-valves both for gas and air, and provided with means for working with hot or cold air alone or when desired with air more or less mixed with hot products of combustion. In the specification No. 11,433 of 1896 is described an arrangement of two separate gas-producers and their valves in such a way that one of them can be worked alone while the other is being cleaned or repaired. It is found, however, that unless these producers are made considerably larger than is necessary for ordinary working the stoppage of one of them makes a difference in the working of the furnace which is practically objectionable. Again, furnaces of the kind described when applied for heating piles of iron or steel are conveniently worked in such a manner that while the heated metal is being removed from part of the bed near the one end metal is being heated near the other end. As, however, when the metal has attained its full heat before its removal from the bed the air-supply has to be very much lessened in order to avoid overheating and oxidation of the heated metal, and the flame at the other end is lowered in temperature owing to the deficient supply of air.

The present invention relates to certain modifications of producers and furnaces of the kind referred to, so as to provide for maintaining sufficient heat when it is necessary to clean or repair the producers or to lessen the air-supply at the end of the furnace-bed. For this purpose I construct the furnace and producers as I shall describe, referring to the accompanying drawings.

Figure 1 is a longitudinal section on the

line 1 1 of Fig. 2, which is a horizontal section on the line 2 2 of Fig. 1, and Fig. 3 is a transverse section on the line 3 3 of Fig. 1, of a furnace and producers according to this invention.

Three or more (as shown in the drawings five) producers P are arranged in a row behind the furnace-chamber F' F² parallel to its length. Between the row of producers and the structure forming the back of the furnace-chamber there are formed two flues A and B. The lower flue A communicates with the spaces below the fire-grates of all the producers P by openings provided with valves or dampers *a*, and the upper flue B communicates with the upper parts of all the producers P by openings provided with valves or dampers *b*. In Fig. 3 the lower and upper openings to one of the producers—that on the left—are shown closed, those to the others being open.

At each end of the lower flue A there is an inlet for air governed by a damper *a'*, and near the ends there are passages *r'* *r*² from the regenerative chambers R' R², injectors *r*³ *r*⁴ being arranged for impelling through these passages portions of the products of combustion when desired. Injectors *p* are also provided for impelling air into the lower spaces of the producers in the usual way.

From the upper flue B two openings, each provided with a valve *g*, lead into the two gas-flues G' G², which open into the furnace-chamber F' F². The regenerators R' R² communicate with the furnace-chamber F' F² by the flues H' H², and they communicate in the usual way with the outer air and with a chimney by passages governed by valves at V.

At about the middle of the length of the furnace-chamber F' F² there is formed in the roof a flue D, having openings C down into the chamber. This flue communicates with an inlet provided with a valve *d* through a set of pipes E, which extend through the regenerators R' R².

The apparatus works as follows: The producers P, having their lower spaces supplied with air only or with the addition of some of the products of combustion from one regenerator R², as determined by the injector *r*⁴, produce gas which passes to the flue B and

thence by one of the openings from it, as determined by opening one of the valves *g*, to the flue *G'* and into the furnace-chamber. At the same time air entering one of the regenerators *R'*, as determined by the valve at *V*, becomes heated in passing through the regenerator and enters the furnace-chamber by the flue *H'* over the entering gas, mingling with it and producing flame and hot combustion gases which sweep through the furnace-chamber and pass by the flue *H²* through the regenerator *R²*, and thence to the chimney. When the one regenerator becomes cooled and the other heated, the valves at *V* and *g* are changed, so as to send air to the regenerator *R²* and flue *H²* and gas to the flue *G²*, while the products of combustion from the furnace-chamber pass through the regenerator *R'*. Some of the products of combustion may then be sent into the flue *A* and the producers by putting the injector *r³* in action. So far the operation is the same as that of regenerative gas-furnaces of ordinary construction.

When it happens that any one of the producers requires to be cleaned or repaired, its valves *a* and *b* are closed, and the rest of the producers continue in action and may be urged somewhat more than usual, so that the absence of one out of three or more does not materially affect the working of the furnaces.

When the furnace is employed for heating piles, ingots, or other pieces of metal, it is often necessary to reduce the air-supply when the pieces at the one end—say in the part *F'*—are sufficiently heated and are about to be taken out, otherwise; if the air were supplied in full measure, the metal would be more or less oxidized. In consequence of deficiency of air the other part *F²* of the furnace, which may have just been charged with pieces to be heated, would receive only a dull flame incapable of giving the heat desired. In that case the valve *d* is opened, so that air becoming heated in passing along the pipes *E* enters the furnace-chamber by the openings in the roof from the flue *D* and supplies the dull flame as it passes with additional air,

so that the flame becomes more intense and the part *F²* and its charge are effectually heated.

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

1. A regenerative gas-furnace consisting of a furnace-chamber, in combination with two air-regenerators, a plurality of gas-producers arranged in a row parallel with the length of the chamber, each producer having its lower part communicating by a valved opening with a lower flue, a lower flue communicating by passages provided with injectors with the two air-regenerators, and an upper flue communicating by a valved opening with the upper parts of all the gas-producers and with each of the gas-flues leading to the respective ends of the furnace-chamber, substantially as described.

2. The combination with the furnace-chamber and the upper and lower flues, and the regenerative chamber, of the plurality of gas-producers behind the furnace-chamber, the lower flue communicating by openings with the spaces below the fire-grates of all the gas-producers, valves for said openings, and the upper flue communicating with the upper parts of all the gas-producers by openings having valves, passages from the regenerative chambers to each end of the lower flue, injectors disposed at openings near the ends of said flue for impelling the products of combustion through said passages, flues connecting the regenerators with the furnace-chamber, a flue in the roof of the furnace-chamber having openings directly into said chamber and air-pipes extending through the regenerators and having a valve and connected with the flue in the roof of the furnace-chamber, all as and for the purpose specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FREDERICK SIEMENS.

Witnesses:

O. MÜSCHLICH,
HERNANDO DE SOTO.