

(No Model.)

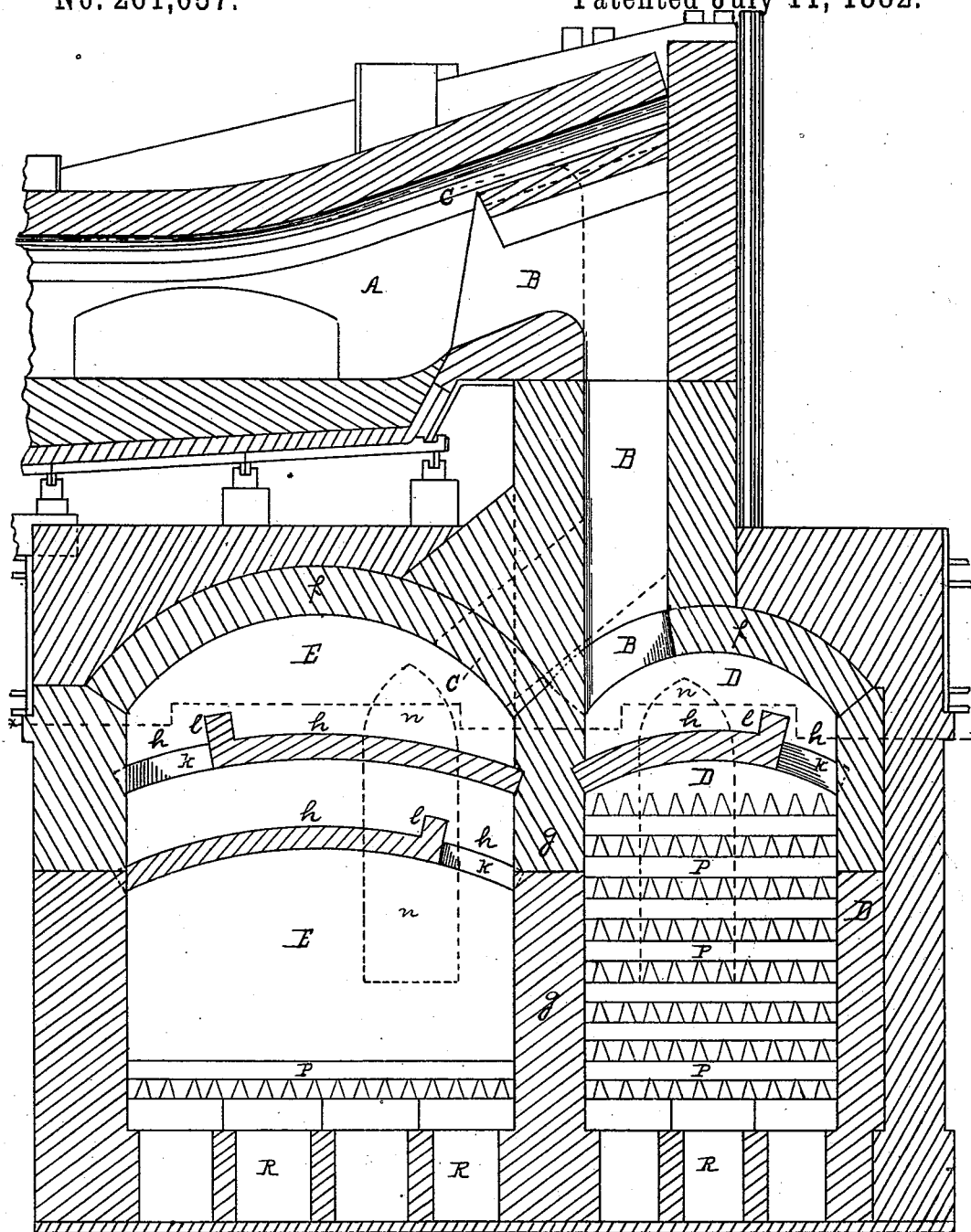
2 Sheets—Sheet 1.

M. V. SMITH.

REGENERATOR FOR METALLURGIC AND OTHER FURNACES.

No. 261,057.

Patented July 11, 1882.



WITNESSES

J. L. May

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Fig. 1.

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by James S. Kay
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(No Model.)

2 Sheets—Sheet 2.

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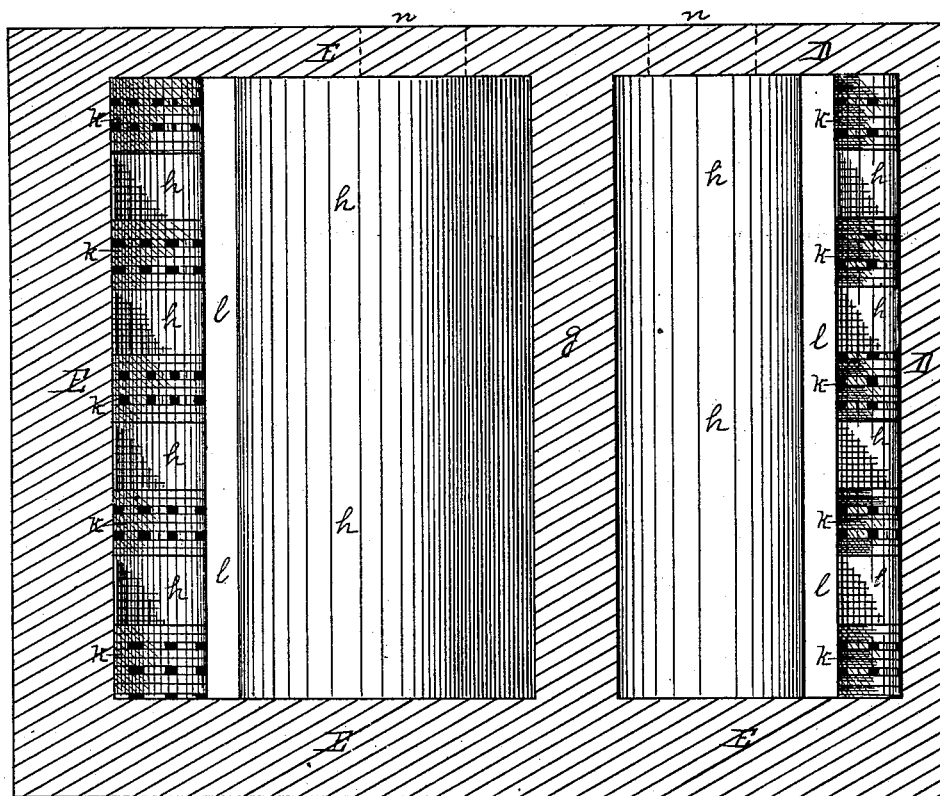


FIG. 2.

WITNESSES

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UNITED STATES PATENT OFFICE.

MARTIN V. SMITH, OF McKEESPORT, PENNSYLVANIA.

REGENERATOR FOR METALLURGIC AND OTHER FURNACES.

SPECIFICATION forming part of Letters Patent No. 261,057, dated July 11, 1882.

Application filed January 31, 1882. (No model.)

To all whom it may concern:

Be it known that I, MARTIN V. SMITH, of McKeesport, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Regenerators for Metallurgic and other Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a vertical section of a pair of regenerators and part of a metallurgic furnace, and Fig. 2 is a cross-section of the regenerators on the line *x x*, Fig. 1.

Like letters of reference indicate like parts in each.

My invention relates to the regenerators used for heating the gas or air in regenerative metallurgic, blast, glass, and other furnaces.

In metallurgic furnaces these regenerators are generally located under or below the furnace, and the heated gas and air pass up through their respective regenerators into the furnace above, while on the reversal of the draft the heated products of combustion pass down into and through the regenerators. The heat in these furnaces is so great that it melts the fire-brick forming the surface of the flues and causes it to run down into the regenerators, and, where no provision is made to retain it in the upper part of the regenerators, unites with the red oxide of iron, soot, and other substances carried over by the draft and clogs up the spaces in the checker-work of the regenerators, finally filling them up to such an extent that they are rendered useless. In the usual regenerator provision is made to retain this melted fire-brick and other substances by means of a shelf formed of tiles resting on top of the checker-work; but it is found that this shelf fills rapidly and is exceedingly difficult to clean, the fire-brick and other substances caking and uniting with the tile of the shelf, and, as it is not sufficiently supported to withstand the jarring necessary to break off the substances, it is generally necessary to remove the shelf, and as the debris fills the checker-work in so doing, that must also be removed. Regenerators have also been formed with a

shelf supported by the walls below the furnace-

flue, the shelf being slightly inclined and arranged to shed the substances from the flue into a pocket at the side of the checker-work, the pocket necessarily increasing the size of the regenerator, which is greatly objectionable where they are built under the furnace.

By my invention the objections found in these different constructions of regenerators are entirely overcome.

It consists essentially in a regenerator having a shelf for retaining the substances from the furnace-flue, supported by the regenerator-walls below the furnace-flue and above the checker-work, the shelf being provided with one or more ports and a ridge-wall extending along the shelf between the ports and the furnace-flue.

To this end it consists in forming the regenerators with one or more shelves or receptacles for retaining the melted fire-brick and other substances, supported by the regenerator-walls below the furnace-flue and above the checker-work, and provided with one or more ports at one side of the receptacle for the passage of the air, gas, or products of combustion out of or into the checker-work.

To enable others skilled in the art to make and use my invention, I will describe the same more fully.

In the drawings referred to, A represents one end of a metallurgic furnace; B, the gas-flue, leading from the gas-regenerator D into the furnace; and C, the air-flue, (shown partly by dotted lines,) leading from the air-regenerator E into the furnace. The regenerators are built below the furnace, and their respective flues B or C enter through the top walls or roofs, *f*, which are generally formed of arches meeting on the dividing-wall *g* between the regenerators. Extending across each regenerator below the arched top wall, *f*, is the arched shelf *h*, which fits into and is supported by the side and end walls of the regenerator. The arched shelf *h* has one or more ports or openings, *k*, extending through it at the side opposite the flue leading to the furnace, the gas or air passing up through the regenerator through the ports *k*, over the arched shelf *h*, and from thence through the flue to the furnace. The size of the ports *k* corresponds to that of the flue B

or C, thus giving a free passage of the air, gas, or products of combustion from or into the checker-work. If desired, the arched shelf may be supported by the end walls of the regenerator, and an opening left along one side instead of the ports, as shown. Along the top of the arched shelf *h*, beside or near the ports or opening, is the ridge-wall *l*, which enables the shelf or receptacle to hold a larger amount of melted fire-brick or other substances, as well as prevents any of these substances falling through the ports or opening into the checker-work below when the shelf is cleaned. If desired, two or more of these arched shelves *h* may be employed, as shown, in the air-regenerator E, to give more surface for the deposit of soot, red oxide of iron, and other substances carried over by the draft, and to retain any substances running over from the upper shelf in case it should overflow. In this case the ports *k* of the lower shelf are at the opposite side from those of the upper shelf, so that the draft will necessarily pass between the shelves into or out of the checker-work. When more than one arched shelf are employed the height of the regenerator should be proportionately increased to allow full space for the checker-work. The regenerators are built up with brick in the usual manner, forming the checker-work P below the arched shelves. As the checker-work is separate from and does not support the receptacle for the melted fire-brick, &c., it can be built of lighter brick, and therefore expose a larger heating-surface than where the receptacle rests on the checker-work. The man-hole *n*, by which the regenerator is entered, is shown in dotted lines.

R is the pit of the regenerator under the checker-work.

When my improved regenerators are employed the gas or air passes up through the checker-work, absorbing the heat therefrom, and then, if but one arched shelf is employed, through the port or ports *k*, over the arched shelf, from which it passes through the flue B or C into the furnace-chamber. After combustion in this chamber the products of combustion pass down the flues on the other side, over the arched shelves *h* in the regenerator, and through the ports *k* and checker-work *p* to the stack. The heat from the draft and products of combustion in passing from the furnace-chamber is so great that it melts the fire-brick on its downward passage, and this melted fire-brick runs down onto the arched shelf or receptacle *h*, and is retained thereby, the red oxide of iron, soot, and other substances

carried over by the draft being also to a great extent retained on this shelf and with the melted fire-brick caking thereon. Where two or more of these shelves are employed the upward draft or blast passes up through the ports of the lower one and between the shelves, absorbing the heat from their walls, and then through the ports of the upper shelf, following the course described above, and the products of combustion in passing down pass through the ports of the upper shelf, between the shelves, and through the ports of the lower one, the surface for the deposit of the soot and other substances being doubled, so that very little passes into the checker-work, and the lower shelf retains any of the melted fire-brick which might run over from the upper shelf. Upon the reversal of the draft these substances are retained in the same manner by the shelves in the other regenerators. As the shelves or receptacles are much larger than the shelves formerly employed and the draft passes entirely over them, a much larger proportion of the oxide, soot, and other substances is retained thereon and the clogging or choking up of the checker-work by these substances is prevented.

When it is desired to empty or clean off the shelves, all that is necessary is to take down the upper part of the man-holes *n*, thus obtaining access to them, and if the melted fire-brick and other substances are caked thereon they can be cut or broken off without disturbing the checker-work below or permitting any part thereof to fall into the checker-work, as the arched shelf is firmly supported independently of the checker-work, and the arch extends entirely across the regenerator, except where the ports are located, and that edge is protected by the ridge-wall *l*. The checker-work can also be renewed without disturbing the shelf or its ports.

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

In a regenerative gas-furnace, a regenerator having a shelf supported by the regenerator-walls below the furnace-flue and above the checker-work, said shelf having one or more ports and a ridge-wall extending along the shelf between the port and the furnace-flue, substantially as and for the purposes set forth.

In testimony whereof I, the said MARTIN V. SMITH, have hereunto set my hand.

MARTIN V. SMITH.

Witnesses:

JAMES I. KAY,
F. G. KAY.