

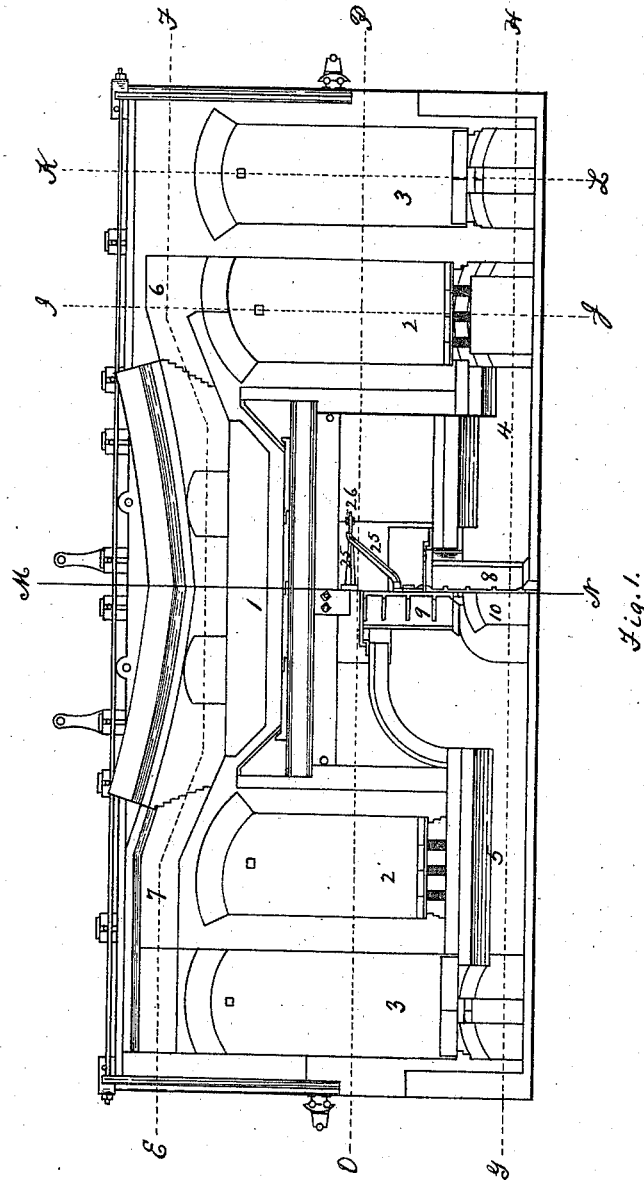
(No Model.)

6 Sheets—Sheet 1.

W. SWINDELL.
REGENERATOR FURNACE.

No. 305,408.

Patented Sept. 16, 1884.



Witnesses.

W. B. Corwin
J. M. K. Smith

Inventor.

William Swindell
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Bakewell & Kerr

(No Model.)

6 Sheets—Sheet 2.

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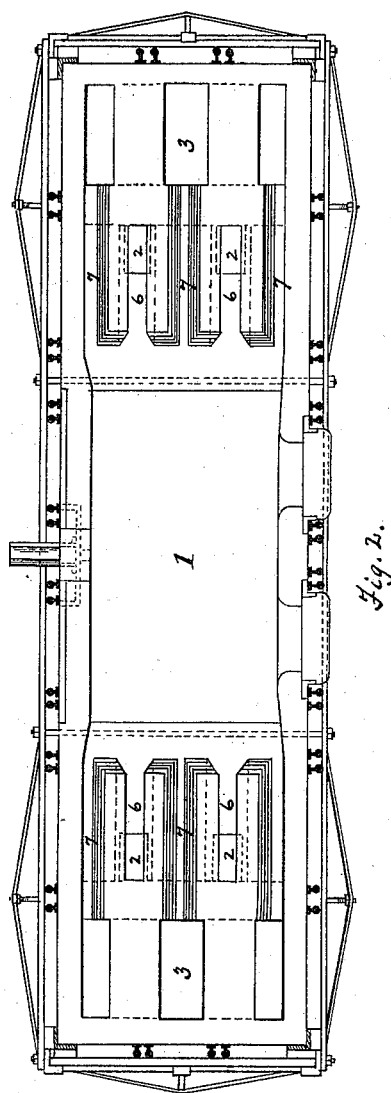


Fig. 2.

WITNESSES.

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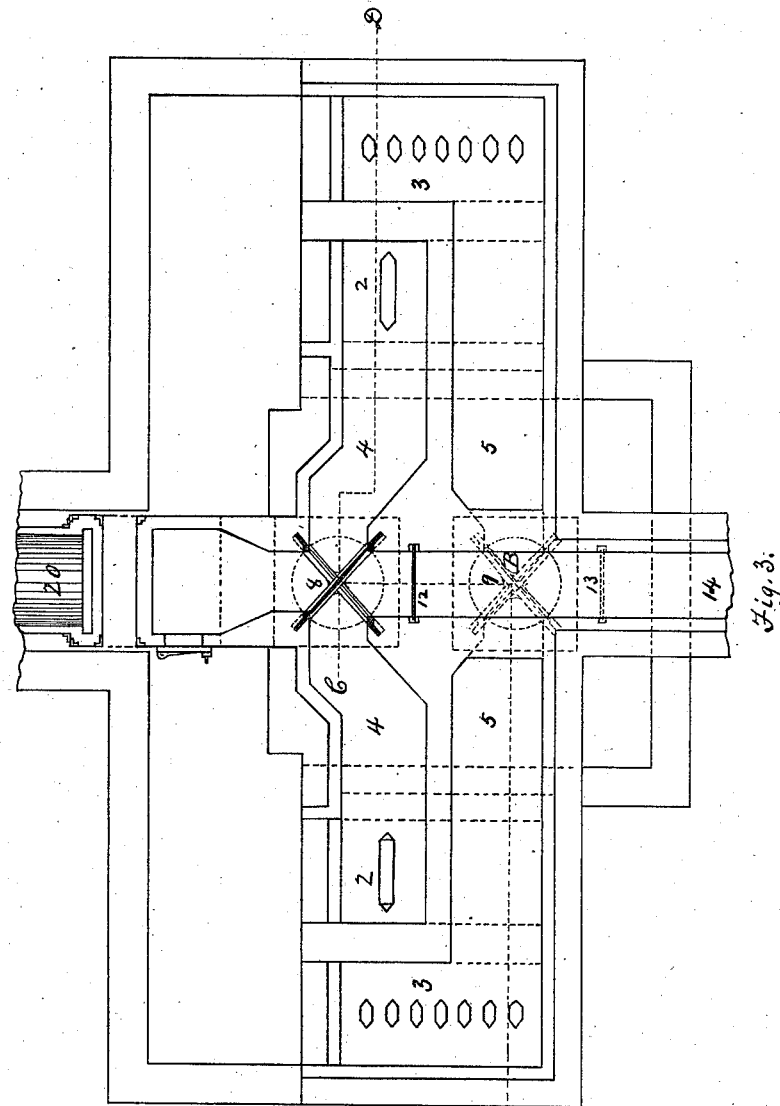
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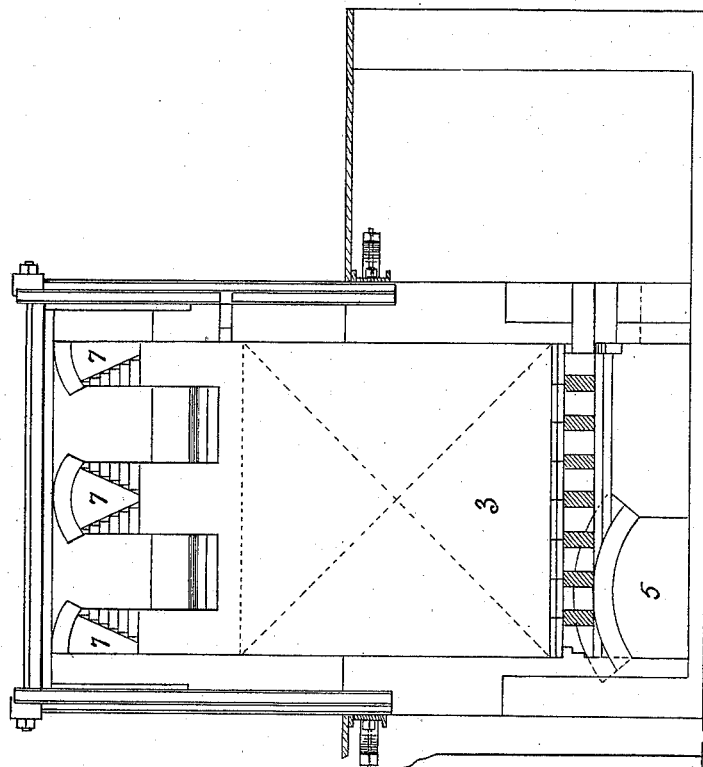


Fig. 5.

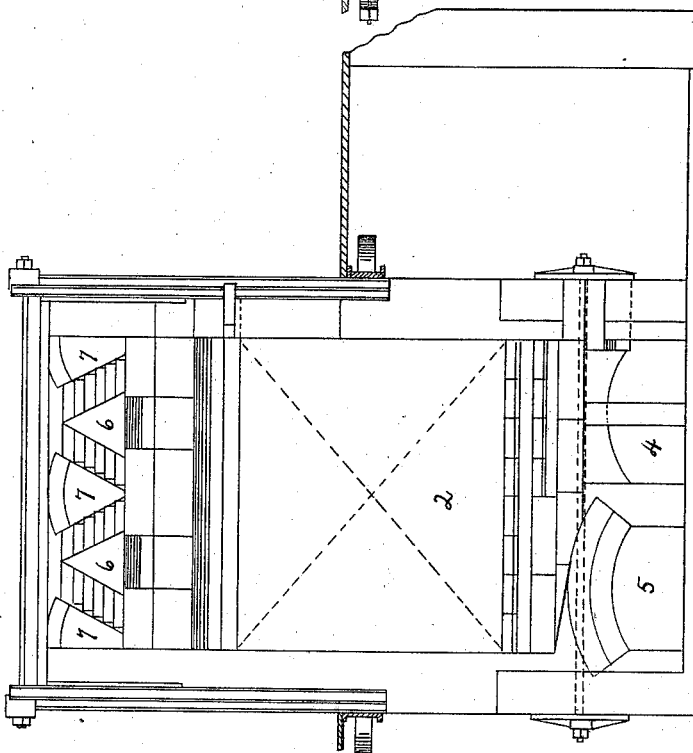


Fig. 4.

WITNESSES.

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(No Model.)

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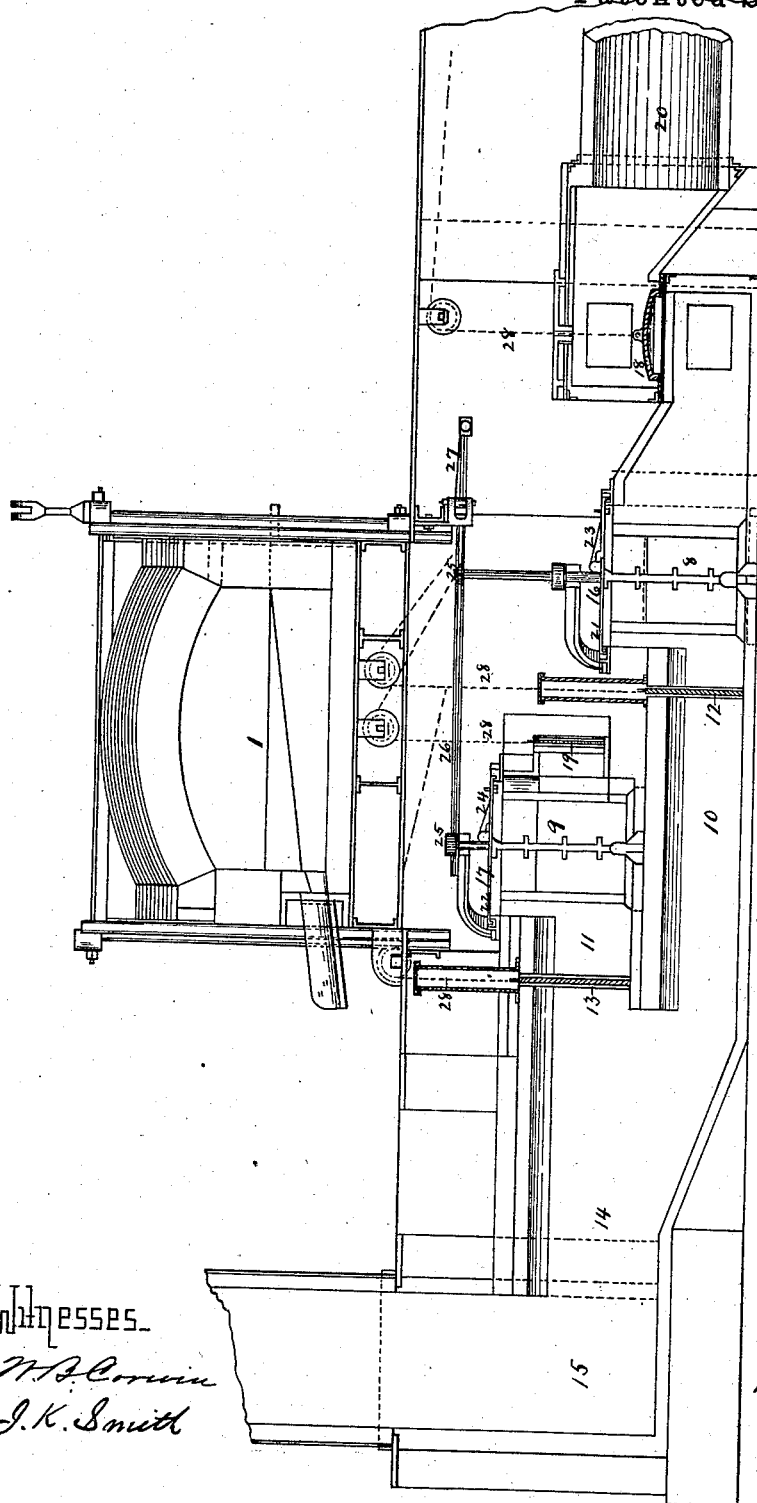


Fig. 6.

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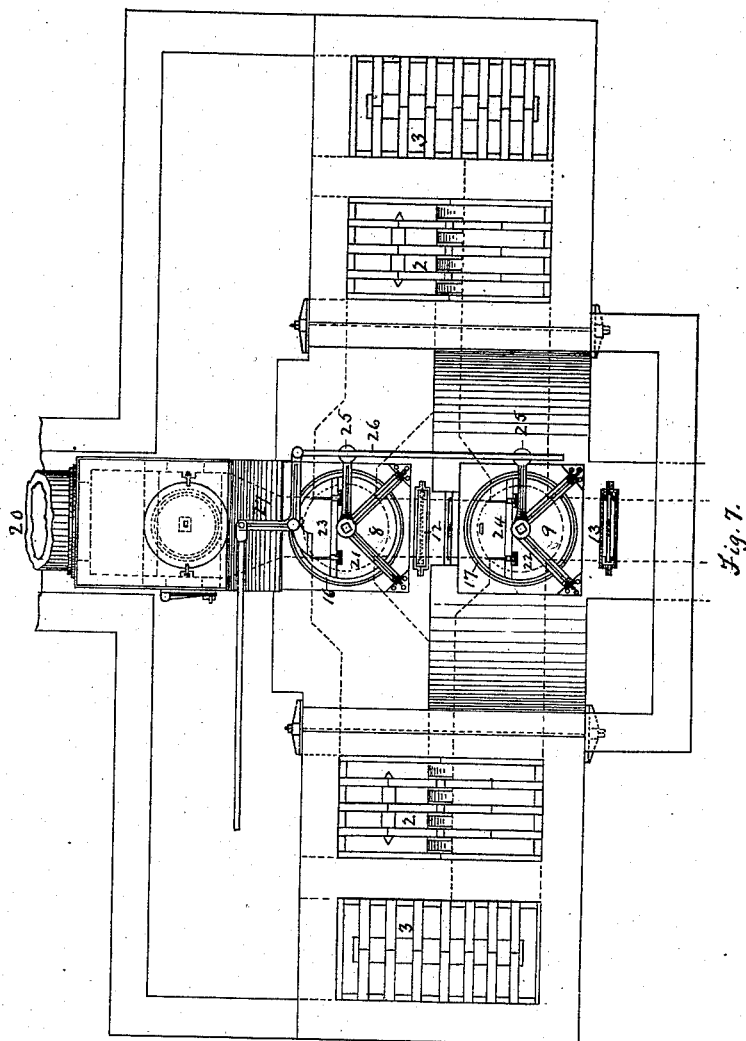
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UNITED STATES PATENT OFFICE.

WILLIAM SWINDELL, OF ALLEGHENY CITY, PENNSYLVANIA.

REGENERATOR-FURNACE.

SPECIFICATION forming part of Letters Patent No. 305,408, dated September 16, 1884.

Application filed April 3, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SWINDELL, of Allegheny City, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Regenerator-Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof.

Heretofore the valves of metallurgical regenerator-furnaces have been arranged on the same level. This construction necessitated the use of crown boxes or caps over the valve-chambers through which the air and gas had to descend to pass into the flues which give access to the regenerators. It also necessitated the placing of one of the waste-flues leading from the valve-chambers below the other, so that the waste from one of the regenerators, customarily the air-regenerator, had to descend in a vertical direction through and from the valve-chamber before it could enter the horizontal waste-flue. The waste-flues are usually arranged one over the other in the same vertical plane, and as I construct them are controlled by separate valves. They then merge into a common stack-flue. When the inlet-valves are arranged on the same level, they are side by side, and the remaining sides are surrounded by the inlet and outlet flues in such a manner that the air and gas must enter above and descend through them. After passing through the valves the currents are again turned and pass downward to lateral horizontal flues which lead to the regenerators. In entering these lateral horizontal flues the direction of the currents is again changed and are forced to traverse a comparatively long distance before they enter the regenerators. The waste products in passing from the furnace-bed to the stack traverse the same course in the opposite direction, and are compelled to make an equal number of turns, because, although not going out of the crown-boxes after passing the valves, they descend from the valves and turn into the waste-flues. The result of these frequent changes of direction is that the draft is retarded by the reactions or back-pressure occurring at each turn, and the efficiency of the furnace is correspondingly reduced. The longer the vertical run the greater the retardation, because the gases acquire a greater momentum and produce a

greater back-pressure at the turning-point. If the gases are entered in an inclined direction, the retardation is decreased, because the turn is less abrupt. The length of the vertical runs through the crown-boxes to the valves and from the valves to the lateral horizontal flues is great enough for the currents to acquire a considerable back-pressure at the turning-points. The long distance the gas passes from the valve before it enters the regenerators when arranged laterally, as heretofore, causes a considerable loss of gas at each reversal, because when the gas-valve is turned all the gas in the regenerator and in the gas-flues between the regenerator and valve is immediately driven into the stack-flue and lost. Therefore the shorter the flues are the less this loss will be.

My present invention consists in certain improvements in arranging the gas and air valves on different levels, so that the gas and air may be caused to enter their chambers by direct and horizontal passages instead of by vertical and lateral passages, thereby reducing the obstructions to the currents and the length of intermediate run, so as to increase their effective velocity and the efficiency of the furnace. By the same construction I am enabled to cause the waste currents to pass horizontally or nearly so into the waste-flues, so that the same principle of operation is carried consistently through the entire system of bottom flues. The regenerators being arranged mainly below the level of the bed, it is of course necessary that the currents rise vertically through them; but, aside from this, I aim to secure as nearly as possible a horizontal run of the currents, and thereby reduce greatly the obstruction to the draft.

To enable others skilled in the art to make and use my improvements, I will now describe them by reference to the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of the furnace on the line A B C D, Fig. 3, being a vertical cut through the gas valve and port to the right of the center line, and a like cut through the air valve and port to the left of the center line. Fig. 2 is a sectional plan of the heating-chamber and ports of the furnace on the line E F, Fig. 1. Fig. 3 is a sectional plan on the line G H, Fig. 1. Fig.

4 is a vertical section of one of the gas-regenerators on the line J J, Fig. 1. Fig. 5 is a vertical section of one of the air-regenerators on the line K L, Fig. 1. Fig. 6 is a vertical section through the heating-chamber and the valves on the line M N, Fig. 1. Fig. 7 is a horizontal section on the line O P, Fig. 1, showing a plan of the valves.

Like letters of reference indicate like parts in each.

I will not enter into an elaborate description of the furnace shown, except so far as is necessary in describing my improvements. It has a bed or heating-chamber, 1, of the usual form, gas-regenerators 2 2, arranged between the bed and the air-regenerators 3 3, flues 4 4, leading directly from the gas-valve to the lower ends of the gas-regenerators 3, flues 5 5, leading directly from the air-valve to the lower ends of the air-regenerators, flues 6 6 and 7 7, alternately arranged, leading from the upper ends of the gas and air-regenerators to the bed, vertical reversing-valves 8 9, for controlling the admission of the gas and air, waste-flues 10 11, leading directly from the reversing-valves to the stack-flue, and controlled by separate valves 12 13, and a stack-flue, 14, leading to the stack 15. The valves 8 9 are arranged directly under the bed, and communicate with the regenerators, which are arranged outside of them, by the direct intermediate flues, 4 5.

Instead of arranging the reversing-valves and their regenerator-flues as heretofore on the same level and providing crown-boxes above them for the entrance of the air and gas, I arrange the air-valve 9 on a higher plane than the gas-valve 8, as shown in Figs. 1 and 6.

In Fig. 3 the air-valve and the waste-flue valve 13, although above the section-line, are shown in broken lines to indicate their relative positions to the flues and the other valves. The air enters the valve-box 17 of the air-valve 9 through an opening in its side, which is closed by a slide or valve, 19, Fig. 6, so that it passes horizontally into the valve-box and thence into the regenerator-flue 5, Fig. 1. The gas passes from the main 20, Figs. 6 and 7, through an opening controlled by the valve-box 16 entering it horizontally through its

side, and thence into the flue 4, Figs. 1 and 3. The waste in passing from the furnace flows horizontally from the reversing-valves by the waste-flues 10 11 into the stack-flue 14, as will be understood from Fig. 6. Thus I cause the currents both to enter and leave the reversing-valve boxes at the sides and in a horizontal or practically horizontal plane, and to pass horizontally to the regenerators by a single direct intermediate flue. By this construction I avoid much of the retardation caused by the creation of back-pressure or reaction in the bottom flues, and increase greatly the efficiency of the furnace. I also reduce the loss of gas occasioned by reversal of the furnace when the gas-flues are full. The valve-boxes 16 17 are provided with disk-covers 21 22, in which are hinged doors 23 24, Fig. 7, by which access may be had conveniently to the valves. The valves 8 9 are operated by levers 25, connected to the rod 26, which is actuated by the lever 27, Figs. 6 and 7. The valves 12, 13, 18, and 19 are raised by separate chains 28, which are operated by suitable levers or other means.

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

1. A regenerator-furnace having its reversing-valves arranged on different horizontal planes, substantially as and for the purposes described.

2. A regenerator-furnace having its reversing-valves and their respective flues arranged on different horizontal planes, and reversing-valve boxes with provision for admitting the air and gas through the sides, substantially as and for the purposes described.

3. A regenerator-furnace having its reversing-valves arranged between the regenerators on different horizontal planes, and horizontal regenerator-flues leading directly from the valves to the regenerators, substantially as and for the purposes specified.

In testimony whereof I have hereunto set my hand this 31st day of March, A. D. 1884.

WILLIAM SWINDELL.

Witnesses:

W. D. CORWIN,
THOMAS B. KERR.