J. R. GEORGE.

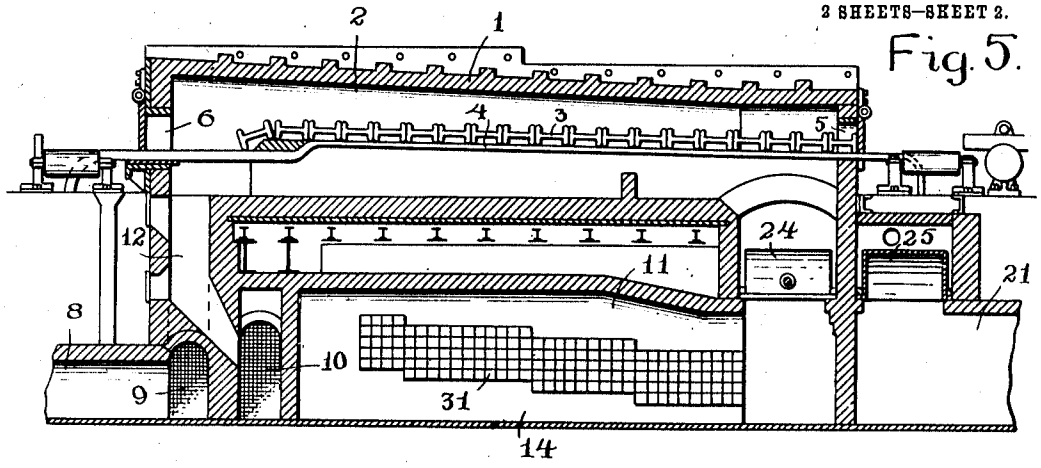
REGENERATIVE METAL HEATING FURNACE.

APPLICATION FILED MAR. 18, 1907.

**1,003,733.** **Patented Sept. 19, 1911.**

2 SHEETS—SHEET 2.

Fig. 5.



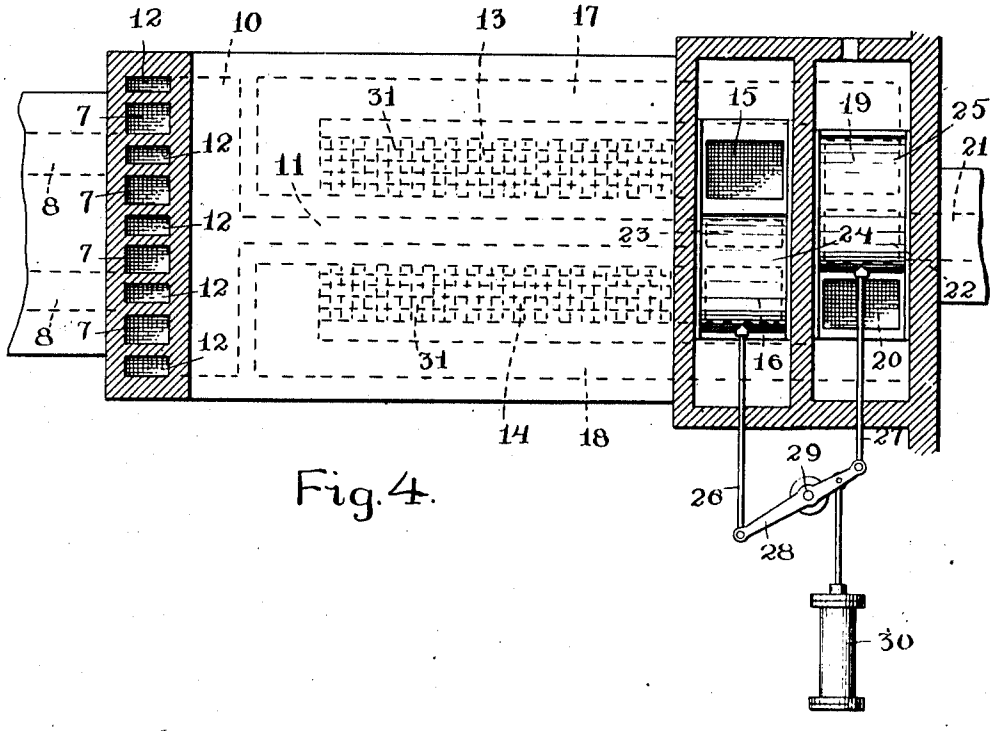




Fig. 4.

Witnesses

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2 SHEETS—SHEET 1.

Fig.1

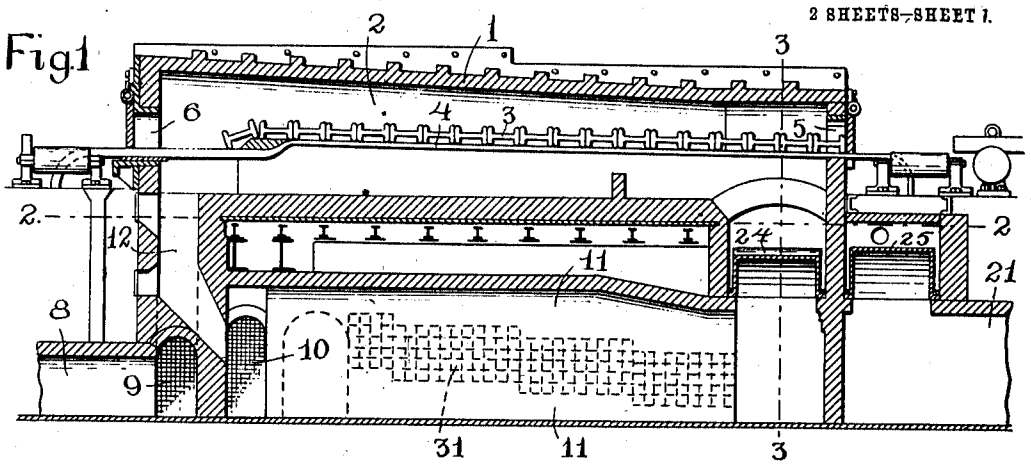



Fig.2.

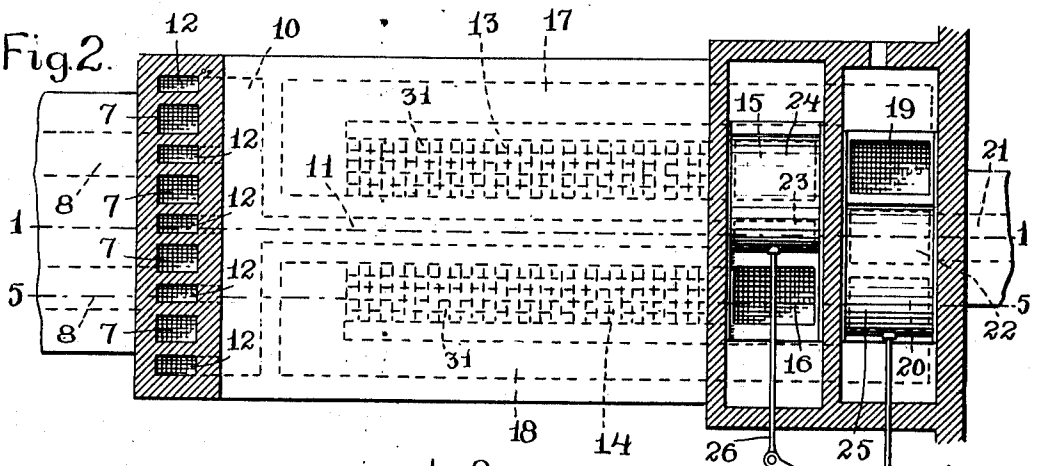
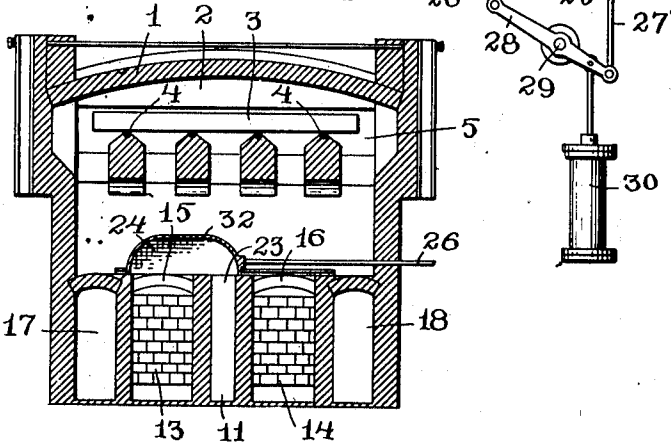



Fig.3.




Witnesses

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# UNITED STATES PATENT OFFICE.

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## REGENERATIVE METAL-HEATING FURNACE.

1,003,733. Specification of Letters Patent. Patented Sept. 19, 1911.

Application filed March 18, 1907. Serial No. 362,840.

*To all whom it may concern:*

Be it known that I, JEROME R. GEORGE, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Regenerative Metal-Heating Furnaces, of which the following is a specification, accompanied by drawings forming a part of the same, in which—

Figure 1 represents a central vertical sectional view of a regenerative furnace embodying my invention, the section being shown on the plane of the broken line 1—1, Fig. 2. Fig. 2 is a horizontal sectional view on the plane of the broken line 2—2, Fig. 1. Fig. 3 is a transverse vertical sectional view on the plane of the broken line 3—3, Fig. 1. Fig. 4 represents the same horizontal sectional view as Fig. 2, but with the valves 24 and 25 reversed, and Fig. 5 is a vertical sectional view on line 5—5, Fig. 2.

Similar reference letters and figures refer to similar parts in the different views.

My present invention relates to that class of regenerative furnaces in which duplicate regenerative passages or flues are provided which are alternately used for the admission of air to the fuel charge as the latter is admitted to the heating chamber, and for the passage of the products of combustion to the stack, and it has for its object to provide a simple and efficient means for controlling the inlets to said duplicate passages or flues, whereby each passage may be converted from an air admission passage to the heating chamber into an exhaust passage for the products of combustion from the heating chamber, and vice versa, and my invention consists in the construction and arrangement of parts as hereinafter described and pointed out in the annexed claim.

Referring to the accompanying drawings 1 denotes a metal heating furnace containing a heating chamber 2, adapted for heating a continuous row of billets or metal bars 3, which are progressively advanced through the heating chamber upon a longitudinal track 4, said bars being received through an admission opening 5 at one end of the chamber, and removed through a delivery opening 6 at the opposite end of the chamber. At the delivery end of the chamber are provided a series of vertical gas ports 7 for the admission of fuel gas received from horizontal gas conduits 8. The gas ports 7 communicate at their lower ends with a transverse chamber 9 into which gas is delivered through the conduits 8.

At the rear of the transverse chamber 9 is a similar transverse chamber 10 communicating on one side with a longitudinal air passage 11, and on the opposite side with a series of vertical air ports 12, which alternate with the series of vertical gas ports 7. Through the ports 7 and 12 currents of air and gas are admitted to the delivery end of the heating chamber supplying gaseous fuel. Upon opposite sides of the central longitudinal air passage 11 are longitudinal passages or flues 13 and 14 communicating at one end by inlet openings 15 and 16 with the exhaust end of the heating chamber. The passages 13 and 14 communicate at their opposite ends with the longitudinal passages 17 and 18 which pass through the end wall of the furnace and are turned inwardly at right angles, and are provided with outlet openings 19 and 20 on the upper sides of the passages. Between the inturned ends of the passages 17 and 18 is a passage 21 leading to the stack, having an inlet opening 22 in its upper surface, and between the outlet openings 19 and 20. The central longitudinal air passage 11 is provided at its upper side with an inlet opening 23 between the openings 15 and 16. A sliding D-valve 24 is provided, capable of covering the central air inlet opening 23 and one of the flue openings 15 and 16. A similar D-valve 25 is provided capable of simultaneously covering the central opening 22 leading to the stack and one of the flue openings 17 and 18. The D-valves 24 and 25 are connected by links 26 and 27 with the opposite ends of an oscillating lever 28, pivoted at its center at 29 and operatively connected with a piston equipped cylinder 30 for either steam or water under pressure. The flue passages 13 and 14, and 17 and 18 are provided with a checker work of brick, as represented by the broken lines 31, Fig. 1, after the usual manner of regenerative furnaces. The D-valves 24 and 25 are duplicates in construction and they comprise curved or arched plates, as shown at 32, which serve to connect the two openings spanned by the valve.

In Fig. 2 of the drawings the valve 24

is represented as connecting the opening 15 with the central air opening 23, thereby connecting the central longitudinal air passage 11 with the regenerative flue passages 13 and 17, and the valve 25 is represented as uniting the central opening 22 leading to the stack, and the flue opening 20. In the position of the valves 24 and 25 as shown in Fig. 2, the flue passage 16 is left open to receive the products of combustion from the heating chamber, and the flue passage 19 is left open to receive air which is supplied under pressure by any convenient apparatus usually employed for the purpose, not shown. In the position of the valves 24 and 25, as represented, the products of combustion pass from the heating chamber 2 through the regenerative flue passages 14 and 18 through openings 20 and 22 beneath the valve 25 into the passage 21 leading to the stack. The charge of air entering through the opening 19 passes through the passages 17 and 13, and through the openings 15 and 23 beneath the valve 24 into the central longitudinal air passage 11, from which it is delivered to the transverse chamber 10, and passes thence upwardly through the vertical air ports 12, mingling with the gas received through the gas ports 7 and entering the fuel inlet end of the heating chamber. By oscillating the lever 28 the valves 24 and 25 are shifted into the position shown in Fig. 4, causing the products of combustion to pass through the opening 15, flue passages 13 and 17, and beneath the valve 25 into the passage 21 to the stack, at the same time that air is received through the opening 20, flue passages 18 and 14, and beneath the valve 24 into the central air passage 11 leading to the fuel inlet end of the furnace. In the operation of the furnace the valves 24 and 25 are periodically shifted, causing the flue passages to be alternately employed as exhaust passages for the products of combustion, and as an air admission passage to the fuel ports. By occasionally shifting the valves the deposits of tar or soot which would clog the flue passages when continuously used as exhaust flues, become cleared by the passage of air.

By my present improvement I greatly simplify the construction of furnaces of this class and I enable the operator to shift the regenerative flues and alternately connect them with the passage to the stack and the air passage to the fuel ports by the use of a single pair of valves both located at the same end of the furnace, and in convenient position to be simultaneously operated by a single actuating mechanism.

I claim,

In a regenerative furnace, the combination with a heating chamber and a stack, a port for the admission of fuel and a port for the admission of air to combine with the fuel as admitted to said chamber, of a single central air passage beneath said chamber communicating with said air port, longitudinal flues on either side of said central air passage communicating therewith, each flue having an inlet opening from the exhaust end of said chamber, a longitudinal passage on the outside of each flue communicating with the opposite end of said flue from said inlet opening, and said passage having openings at the exhaust end of the furnace arranged to communicate with said stack, valves arranged to connect the inlet opening in one of said flues with said air passage and at the same time connect the opening in the opposite longitudinal passage with the stack, said valves arranged at the same end of the heating chamber, and means for operating said valves simultaneously.

Dated this 15th day of March, 1907.

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Witnesses:

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