

(No Model.)

2 Sheets—Sheet 1.

G. JONES.
REGENERATOR FURNACE.

No. 296,174.

Patented Apr. 1, 1884.

Fig. 1.

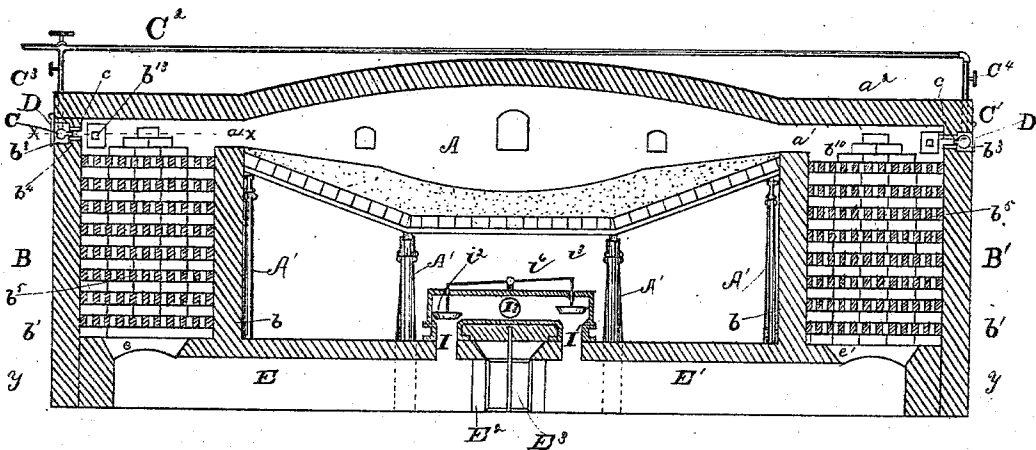
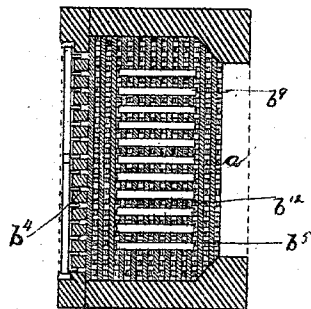


Fig. 2.



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his attys.

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Fig. 3.

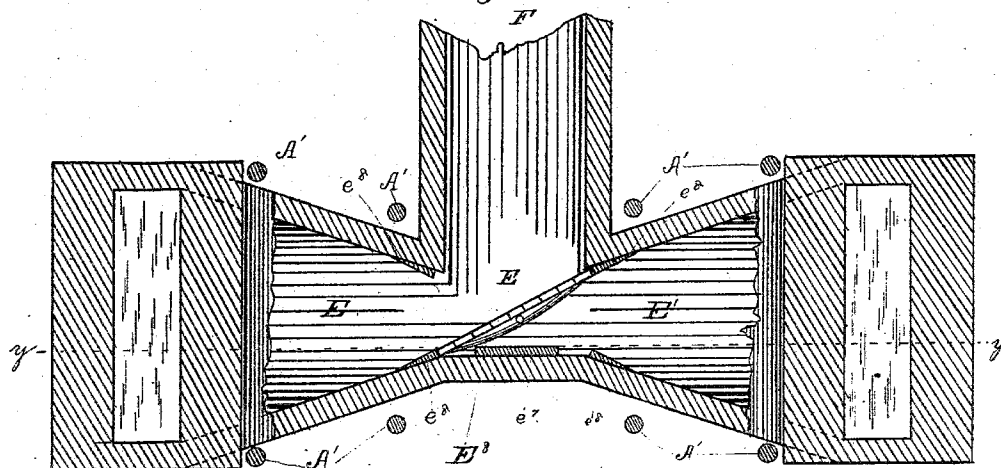


Fig. 4.

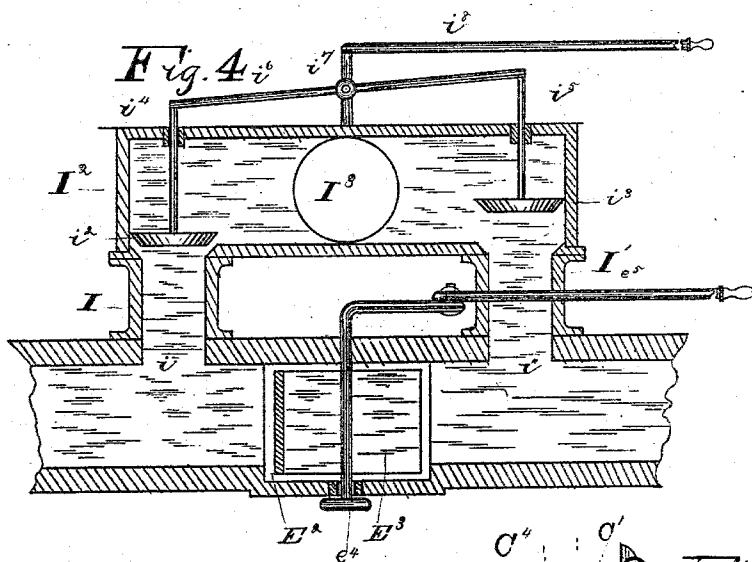
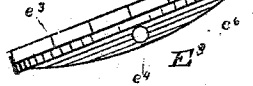
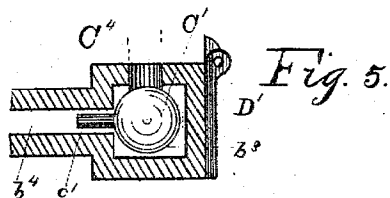


Fig. 6.



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UNITED STATES PATENT OFFICE.

GOMER JONES, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE
STANDARD VAPOR FUEL IRON AND STEEL COMPANY OF NEW YORK.

REGENERATOR-FURNACE.

SPECIFICATION forming part of Letters Patent No. 296,174, dated April 1, 1884.

Application filed November 9, 1883. (No model.)

To all whom it may concern:

Be it known that I, GOMER JONES, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Regenerator-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to that class of furnaces commonly known as "regenerator-furnaces."

Heretofore it has been the practice to force air and gas through separate regenerators formed at the ends of the furnace, the gas being forced through the inner one, so that the air which is in the outer one will pass over the throat of the gas-regenerator and into the furnace with the gas in practically two streams, the upper one being oxidizing and the lower one being partly oxidizing or neutral. In using this construction thorough admixture of the gas and air is a very difficult or impossible operation. The object of my invention is to remedy this defect, and the result is accomplished by projecting the gas in a thin sheet or jets against the air, which ascends at right angles to the line of projection of the gas, and becomes thoroughly mixed with the latter in a chamber, and is forced in the furnace as a solid sheet of flame. This result is produced by increasing the brick in the regenerator until they are opposite the throat of the furnace to form transverse passages for the gas, which is projected through said passages from a gas-supplier in that part of the wall of the regenerator opposite the throat of the furnace. The gas which is generated from hydrocarbons by means of superheated steam strikes the currents of heated air rising through the bricks and is thoroughly commingled. The steam, which serves as a vehicle for the hydrocarbon vapors, is by contact with said bricks heated beyond the point of decomposition and gives its oxygen to the hydrocarbon vapors, thus releasing the hydrogen which contributes to the fuel used by the furnace.

The nature of these improvements will fully appear in the following description, and the

novelty pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section; Fig. 2, a section on line *x x*, Fig. 1; Fig. 3, a section on line *y y*, the flues being somewhat shortened; Fig. 4, a vertical section through the flues and air-box; Fig. 5, a detail showing the burner, and Fig. 6 a detail view of the valve.

The furnace A may be of any desired form, and is supported by pillars A'. At the ends of the furnace are the regenerators B B', connected therewith by the opening *a a'*, formed by making the walls *b* of less height than the walls *b'*. The walls *b'* are provided with recesses *b''*, having ports *b'''*, which open above the bricks *b⁵* in the regenerator, and are on the same plane as the openings *a*.

Within the recess *b''* are the gas-suppliers C C', one at each end of the furnace. The gas-suppliers are provided with lips *c c'*, which project into the ports *b'''*. The recesses are closed by hanging doors D D', which, when the furnace is in operation, are luted in place or otherwise made air-tight. The gas-suppliers are connected with a supply-tube, C², by pipes C³ C⁴, each provided with a cock and removably attached to the burner, so that the latter can be readily removed by opening the door D or D'.

It is obvious that while one of the burners is being used the other can be removed and returned to place without interfering with the operation of the furnace.

The regenerators B B' are provided with the usual openings, *e e'*, which respectively open into the flues E E'. These flues are preferably of a truncated wedge shape, the truncated parts terminating in the valve-box E², which opens into the exit-flue F, leading to the chimney. The flues are preferably located beneath the furnace, to make the whole as compact as possible; but it will be obvious that the location of these flues is not essential to the main object of my invention, which will hereinafter be described. When the truncated flues are used for products of combustion, the latter are more or less retarded, so that the bricks will fully absorb the heat, while on the

other hand, when the flues are used for the passage of air, the flues gradually increase in size, so that the air will be distributed evenly to the bricks in the regenerators. If the latter is of the same size from top to bottom, it keeps the air, which expands by absorbing heat, from obtaining a pressure greater than it was when first admitted to the flue, and thus counteracting the pressure which is deemed essential to the proper commingling of the air and gas.

The valve-box E^2 is provided with a valve, E^3 , which alternately presents the side e^2 to the flues E and E' , to deflect the products of combustion into flue F .

The side e^2 is covered with fire-brick e^3 , which protects the metallic part of the valve from the heat passing through the flues E and E' .

The valve is provided with a spindle, e^4 , which projects through the top of the valve-box and bent in the form of a crank, which is pivoted to a rod, e^5 , extending outside the furnace, for operating the valve. Upon the under side of the valve is a curved flange, e^6 , which rests upon an abutment, e^7 , to hold the valve at an angle to the flues E and E' .

To protect the ends of the valve, abutments e^8 , preferably wedge-shaped, are formed upon the walls of the flues E and E' , as shown in Fig. 3.

In the upper walls of flues E and E' are formed openings i^1 , which serve as outlets for the air-pipes I and I' of the air-box I^2 , having pipe I^3 , which leads to a blower, or, in case natural draft is used, to properly control openings for admission of air. The pipes I and I' are alternately closed by valves i^2 and i^3 , which have seats in the bottom of the box or top of the pipes, as may be desired. These valves are provided with stems i^4 and i^5 , attached to a pivoted rod, i^6 , which may be either in the valve-box or fulcrumed upon a standard mounted upon the top of the box. In the latter case the stems project through the top of the box, and are connected to the ends of the rod i^6 .

The openings in the air-box for the stems may be enlarged to allow for the curve of the rod i^6 in moving up or down; or the ends of rod i^6 may be slotted, so that the end of the stem will have free play. If desired, gate-valves may be substituted for the valves i^2 and i^3 ; but as that form is common, description of them is unnecessary.

The rod i^6 is provided with a crank, i^7 , pivoted to a rod, i^8 , which extends outside of the furnace, and is used to alternately raise and lower the valves i^2 and i^3 . By this construction the air-box is not exposed to the heat of the products of combustion, which would warp the box, valve, and valve-stems if passed through the air-box in the usual manner.

The operation of the device is as follows: The valve i^2 is made to close the pipe I , and the valve E^3 turned so as to present the side e^2 to the flue E . Air is now forced through pipe

I^3 , through the air-box and pipe I' to flue E' , from which it passes through regenerator B' into the furnace by way of opening a' , making its exit through opening a into regenerator B and flue E , where it is deflected into the flue F by the valve E^3 . As soon as the circulation of air is insured, the gas-supplier C' is lighted and the gas projected across the incoming current of air, with which it commingles. The projection of the gas across the current of air deflects the heat from the roof at a' , and prevents the latter from being burned out by the flame, which is projected directly in the furnace, as the burner is on the same plane as the opening a' . The products of combustion follow the course which the air had taken, as above described, and heats the bricks in regenerator B . The valve, as before described, is protected on its flue-presenting face from the heat. Its rear side is protected by the incoming air, which keeps the back from warping. As soon as the bricks in regenerator B have become thoroughly heated, pipe I' is closed and pipe I opened, the valve-face e^2 turned toward flue E' , and the supply of gas to gas-supplier C' cut off. The burner C is now brought into use and the current changed, so that the products of combustion will pass to flue E' through regenerator B' , for the purpose of heating the bricks therein. The air passing through flue E takes the heat from the bricks in regenerator B and feeds the gas-supplier C with hot air, which, thoroughly combined with the gas, passes into the furnace A . This result is accomplished by projecting the gas at right angles into the ascending currents of air, which absorbs the gas in its passage upward, so that the air which reaches the roof is fully combined with the gas, and passes to the furnace thoroughly commingled. The amount of gas and air which meet in the mixing-chamber can be regulated by means of the cocks and valves, so that the flame admitted to the furnace will be from a homogeneous gas having exactly the proper proportions to produce complete combustion.

To make the mixture of hot air and gas more thorough, bricks forming transverse passages between the gas-supplier and throat of the furnace are placed upon the bricks in the regenerator. The preferred form is to arrange the bricks in a series of rows to form passages b^2 , which register with the ports for the gas-suppliers. The object of these bricks is to thoroughly commingle the gas and air by breaking the latter up into currents, and when the burner C is used the bricks b^{10} break the force of the impact of the flame against wall b' of the regenerator B' and protect the gas-suppliers C' from the intense heat. Of course, when burner C' is used, the same object is accomplished for burner C by bricks b^9 . If desired, ports b^{13} may be placed in the side walls of the furnace for inspecting the flame. By this construction I am enabled to burn vapor fuel produced by any suitable generator by means of superheated steam, and, by making

the distance between the top a^2 and the bricks b^5 very little, form a mixing-chamber which will serve all the purpose of those now in use, and dispense with many of their features, rendering the admixture of the gaseous fuel and hot air more perfect, and decomposing, by contact with heated brick, the steam contained in it into its original elements—hydrogen and oxygen—the former adding greatly to the intensity of the flame, and, as it is produced as an incident to the operation of the furnace, adding nothing to the cost of the fuel.

I am aware that oil has been sprayed in the top of a regenerator, and that regenerators have been made with the bricks reaching to the throat of the furnace, and these I do not claim.

What I claim as new is—

1. The combination of a furnace having openings or throats at each end, air-regenerators having their top layer of bricks near the said throats or openings, bricks resting upon said top layer to form transverse passages in front of the throats or openings of said furnace, and a gas-supplier in the front wall of the regenerators at a point opposite the bricks.

2. The combination of a furnace having openings or throats at each end, air-regenerators having the top layer of bricks near the said

throats or openings, and provided with a series of rows of brick resting upon the top layer to form passages leading to the furnace, and a gas-supplier in the front walls of the regenerators, and having jets which register with the passages formed by said brick, substantially as described.

3. The combination of a furnace open at each end, regenerators of the same size from top to bottom at each end of the furnace, gas-suppliers in the front wall of the regenerators, and truncated wedge-shape flues having their base joined to the regenerators, substantially as described.

4. In a furnace, the combination of the regenerators, flues E and E', having a valve-box leading to the chimney, and provided with a valve for alternately shutting each flue, and an air-box connected with each of the flues at a point between the inlets to the valve-box and the regenerators, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GOMER JONES.

Witnesses:

GEO. H. WHITNEY,
THOS. H. PERKINS.