(No Model.)

J. SHIMA.

SMOKE CONSUMING FURNACE.

No. 537,651. Patented Apr. 16, 1895.

FIG. 1.

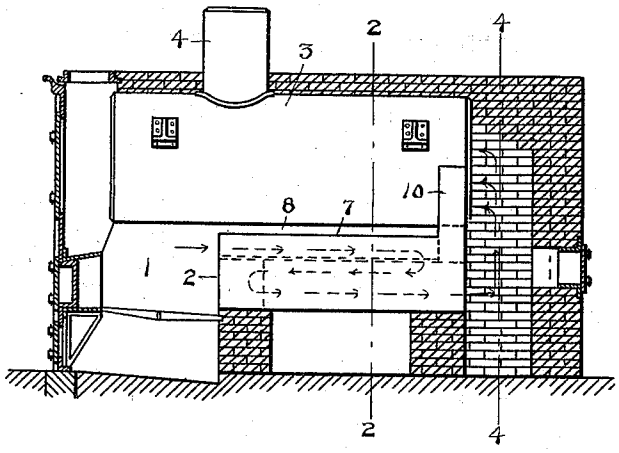


FIG. 2.

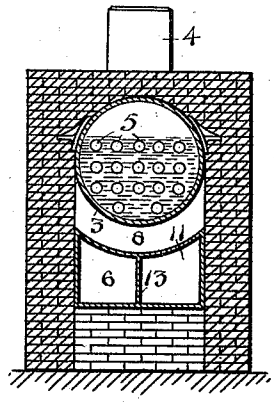


FIG. 3.

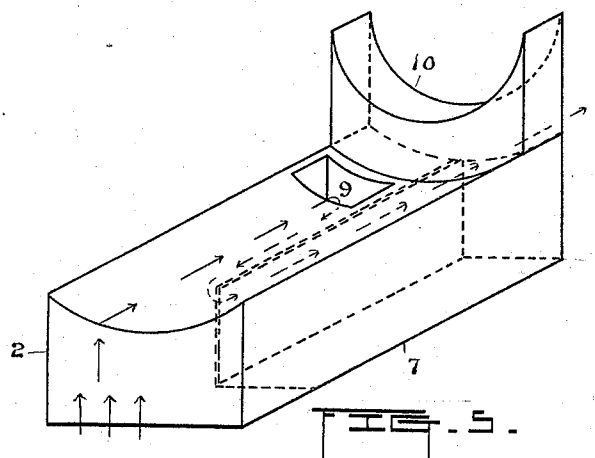


FIG. 4.

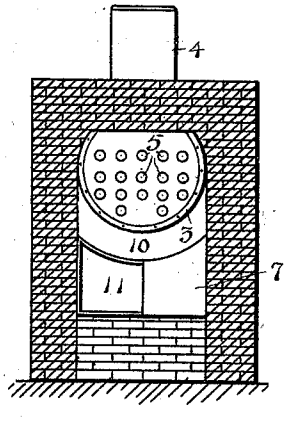
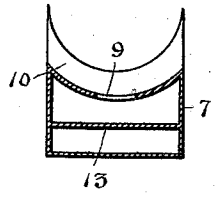


FIG. 5.



WITNESSES

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JOSEPH SHIMA, OF CHICAGO, ILLINOIS.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 537,651, dated April 16, 1895.

Application filed January 19, 1895. Serial No. 535,526. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH SHIMA, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Smoke-Consuming 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 pertains to make and use the same.

The invention relates to devices for perfecting combustion in furnaces.

It has for its object to provide means whereby to utilize the heat of the bridge wall to raise the temperature of the partially burned products after they have imparted a part of their initial heat to the boiler and to ignite the combustible matters mingled with said products; and it consists in the construction hereinafter described and particularly pointed out.

In the accompanying drawings: Figure 1 is a partial vertical section of a steam boiler furnace. Fig. 2 is a section on line 2—2 of Fig. 1. Fig. 3 is a perspective of the return flue. Fig. 4 is a section on line 4—4 of Fig. 1; and Fig. 5 is a modified detail.

Numeral 1 denotes a fire place; 2, a bridge wall; 3, a boiler, and 4 a smoke stack. 5 indicates boiler fire tubes. All these parts may be of any approved construction. The bridge wall however should be a good conductor of heat and is preferably made of graphite or like material.

In furnaces of this general type much fuel is wasted by incomplete combustion and the heat actually produced by defective combustion is also frequently not utilized to the best advantage on account of the rapidity with which the partially burned products are rushed under the boiler, through the boiler tubes and out of the stack. To overcome these objections I provide under the boiler and abutting against the fire bridge a return flue 6 whereby the products of combustion mixed with unburned gases and carbon passing over the bridge wall may be conducted back against the rear side of the bridge wall after the initial heat of combustion has been largely transferred to the boiler. This flue 6 is preferably formed by molding graphite to produce a suitable tubular structure 7 having its top preferably made of a shape to conform to the bottom of a boiler of cylindrical or like form. The space 8 between this top and the boiler communicates with the fire place over the bridge wall and constitutes that part of the exit flue which first receives the products of combustion which are drawn along the bottom of the boiler to a diving passage 9 which admits the products cooled by their contact with the boiler into flue 6 through which flue they pass back against the rear of the bridge.

10 indicates a wall fitting the boiler and closing the rear end of the exit flue or space 8. The wall or partition 10 is heated by the impact of gases that receive heat from the rear of the bridge wall and flow back through said flue 7 and up on the rear side of said partition by which means the cooling effect of the contiguous part of the boiler is in part overcome, it being a purpose of the construction to maintain the heat of the products by said partition and by the heated wall of flue 8 as far as practicably consistent with heating the boiler and then to reheat the same by circulating them against the rear of a bridge wall composed of refractory and highly heat-conducting substance such as graphite. The heat of the products is thus maintained that it may not fall too low for complete combustion which cannot take place until the gases, partially burned products, and air from the combustion chamber, have had sufficient time for intimate mixture at a proper temperature, which conditions do not exist in a single flue such as 8 situated next the boiler. The products after they are arrested by the wall 10 and turned down through opening 9 return to the rear of the fire bridge and are there turned in contact with said bridge and passed forward through flue 11 on their way to the boiler flues and stack. These products ordinarily contain considerable unburned carbon, carbon monoxide, hydrogen and air which only need to be properly blended, heated and the inflammable portions ignited to burn and undergo complete combustion. Such suitable mingling is effected while these products are passing through the flues 8 and 6 and turning about the ends of the partition 13 and the combustible gases and smoke are made to impinge against the fire bridge wall

whereby they are both heated and ignited, said wall being usually kept at or nearly at a white heat.

It is preferable to make the walls of the flues of graphite because of its indestructibility, its heat conducting capacity and its adaptation, when suitably treated, to be easily molded into suitable form.

The complete combustion produced by the means set forth develops all the heat of the fuel which is utilized in the flues below, through, or around, the boiler, and the escape of unburned gases and soot into the open air is thus prevented.

The partition 13 in tube 7 may be vertically disposed as shown in Fig. 2 or horizontally as indicated in Fig. 5.

It is not essential that tube 7 be molded in one piece. Its concave cover or other part or parts may be separately fashioned.

It is preferable that the bridge wall be molded or otherwise formed as an integral part of the flue walls in which case the concave top of the device may be separately formed if found convenient.

I am aware that in boiler furnaces circuitous conduits for products of combustion have been situated around or between the combustion chamber and the boiler and I do not broadly claim such devices. It is characteristic of my improvement that return flues, a bridge, and preferably a partition such as 10 fitting the boiler, are formed in one integral body of graphite and that the flues of conduits formed therein are so arranged that the products of combustion, after having been partially cooled by contact with the boiler, are returned and made to circulate against the rear of the bridge wall whereby they are re-heated and the temperature of said wall also kept below a destructive degree.

Having thus described my invention, what I claim is—

1. In a furnace, the combination of the combustion chamber with the bridge wall, the smoke stack or other exit flue and the intermediate flue 8 next the boiler, the partition wall 10 fitting the boiler and terminating the flue 8, the flue 6 communicating with said flue 8 adjacent the wall 10, and a flue 11 communicating with said flue 6 at the rear of the fire bridge and also with the exit, whereby products of combustion and air cooled by contact with the boiler may be thrown against the wall 10 and also against the rear of said fire bridge and be thereby re-heated to complete their combustion, substantially as set forth.

2. In a furnace, the combination of the combustion chamber with the bridge wall, the smoke stack or other exit flue and the intermediate flue 8 next the boiler, the partition wall 10 fitting the boiler and terminating the flue 8, the flue 6 communicating with said flue 8 adjacent the wall 10, and a wall 11 communicating with said flue 6 at the rear of the fire bridge and also with the exit, the bridge and flue walls being molded in an integral body of graphite or the like all substantially as set forth whereby partially burned products of combustion and air cooled by contact with the boiler may be thrown against the wall 10 and also against the rear of said fire bridge and be thereby re-heated to complete their combustion.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOSEPH SHIMA.

Witnesses:
MAX SONNENSCHEIN,
JAMES KOLAR.