





# UNITED STATES PATENT OFFICE.

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## SMOKELESS COMBUSTION-FURNACE.

No. 912,201.

Specification of Letters Patent.

Patented Feb. 9, 1909.

Application filed April 1, 1907. Serial No. 365,729.

*To all whom it may concern:*

Be it known that I, ROBERT STOKER, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Smokeless Combustion-Furnaces, of which the following is a specification.

This invention relates to smokeless combustion furnaces, and especially to the class of such furnaces having continuous circulation of super-heated air.

The invention embodies improvements in certain features of construction differing essentially from those found in other furnaces of this character, and in certain operations resulting from such construction and arrangement of parts, as will be hereinafter fully described and particularly pointed out in the claims.

The object of the invention is to provide in a smokeless combustion furnace having air conduits in or under the floor thereof and containing dampers which are operated to supply air partially to a super-heating air chamber adjacent the fuel chamber and partially to the ash pit of the furnace; and to provide a mixing chamber between the superheating chamber and the combustion chamber of the furnace.

A still further object of the invention is to provide in a smokeless combustion furnace, a series of dividing walls partially separating the furnace into four compartments, one of said walls having a super-heating air chamber therein in communication with the air supply conduits and with an air and gas mixing compartment which is in communication with the fuel chamber; and to provide novel and peculiar means for controlling said communications.

In the accompanying drawings forming part of this application: Figure 1 is a central longitudinal sectional view of a furnace embodying my invention. Fig. 2 is a sectional view taken on the plane indicated by the dotted line  $x-x$ , Fig. 1, with the boiler removed. Fig. 3 is a section taken on the plane indicated by the dotted line  $y-y$ , Fig. 1. Fig. 4 is a detail section on the line  $z-z$ , Fig. 1. Fig. 5 is a detail perspective view of the casing for the super-heating chamber.

The same reference numerals denote the same parts throughout the several views of the drawings.

The boiler 1 is of the ordinary construction and may be arranged in the furnace in any suitable manner, and the grate-bars 2, separate the fire-box into an ash pit and a fuel chamber. The grate-bars incline from the front of the chamber 3 to a hollow bridge-wall 4. To the rear of the wall 4, is a wall 5, projecting from the floor 6 of the furnace and having an anchored or concaved top, the deepest portion or center of which is on a horizontal plane with the top of the wall 4. The walls 4 and 5 are spaced apart so as to form an open-top mixing chamber 7, having a bottom or door, 8, operated by a hand lever 9<sup>a</sup>, to open and close the bottom of the chamber 7, for the removal of any deposits in the chamber 7, or on the said door. The wall 5 forms the front of a combustion chamber 9, and the rear wall 10 has a contracted passage or throat 11, leading from the combustion chamber 9 into the rear end 12 of the furnace. By this construction the furnace is divided into four sections which communicate with each other over their separating walls.

Under the floor 6 are a pair of air induction conduits 13, leading from the rear of the furnace to the ash pit 1<sup>a</sup>, and the air from such conduits to the ash pit is controlled by a damper 14, located in each conduit and operated by a suitable handle 15. The dampers 14 are hung in the conduits 13 under the bridge-wall and forward of the connection between the conduits 13 and the bridge-wall. These dampers may be manipulated to prevent air from flowing from the conduits 13 into the ash pit, and when the dampers are open to a greater or less degree, two branch outlets from the conduits 13 exist, but the effective area of the outlet to the super-heating chamber 16, is not changed, while the area of the outlet to the ash pit is changed according to the position of the damper 14.

A super-heating chamber 16 is formed in and by the bridge-wall 4, and a casing 17, secured to and forming the rear face and bottom of said wall, and provided with slots, perforations or other suitable passages 18 for the passage of super-heated air from the chamber 16 to the mixing chamber 7. Leading from the combustion chamber 9, in each wall of the furnace is a vertical return flue 19, each of which has common with it a longitudinal return flue 20, in the side walls of the furnace and common with a flue in the front wall of



the furnace which has openings 21 there-  
through from the front flue into the fuel  
chamber 3.

Having thus described my invention what  
5 I claim as new and desire to secure by Let-  
ters Patent is:

1. In a smokeless combustion furnace hav-  
ing the usual fire-box and grate-bars separat-  
ing it into a fuel-chamber and an ash-pit, a  
10 hollow bridge-wall adjacent the fire-box and  
having end-passages and rear openings, a  
combustion-chamber having an end spaced  
from the bridge-wall and forming therebe-  
tween a mixing-chamber, air induction con-  
15 duits extending from the rear end of the fur-  
nace under the combustion-chamber and  
the bridge-wall to the ash-pit and communi-  
cating with the mixing-chamber through the  
bridge-wall by means of the said end pas-  
20 sages, the side and front walls of the furnace  
having return flues formed therein and lead-  
ing from the combustion-chamber to the  
fuel-chamber, and means for varying the  
area of the outlet from said channels to the  
25 ash-pit without varying the area of the out-  
let from these channels to the interior of the  
bridge-wall.

2. In a smokeless combustion furnace hav-  
ing the usual fire-box and grate-bars separat-

ing it into a fuel-chamber and an ash-pit, a 30  
bridge-wall having air induction passages at  
the ends thereof and having a superheating  
chamber therein provided with eduction pas-  
sages, a combustion-chamber having an end  
wall spaced from the rear of the bridge-wall 35  
and thereby forming a mixing-chamber com-  
municating with the superheating chamber  
through the said eduction passages, air in-  
duction conduits extending from the rear of  
the furnace under all of said chambers to the 40  
ash-pit and communicating with the super-  
heating chamber through the said induction  
passages of the bridge-wall, the side and  
front walls of the furnace having return flues  
formed therein and leading from the com- 45  
bustion-chamber to the fuel-chamber, and  
dampers operated in said channels under the  
bridge-wall for varying the area of the outlet  
from the channels to the ash-pit without  
varying the area of the outlet from said 50  
channels to the superheating chamber.

In witness whereof I hereunto set my  
hand in the presence of two witnesses.

ROBERT STOKER.

Witnesses:

WINFIELD S. BOOKER,  
J. B. EDMONDS.