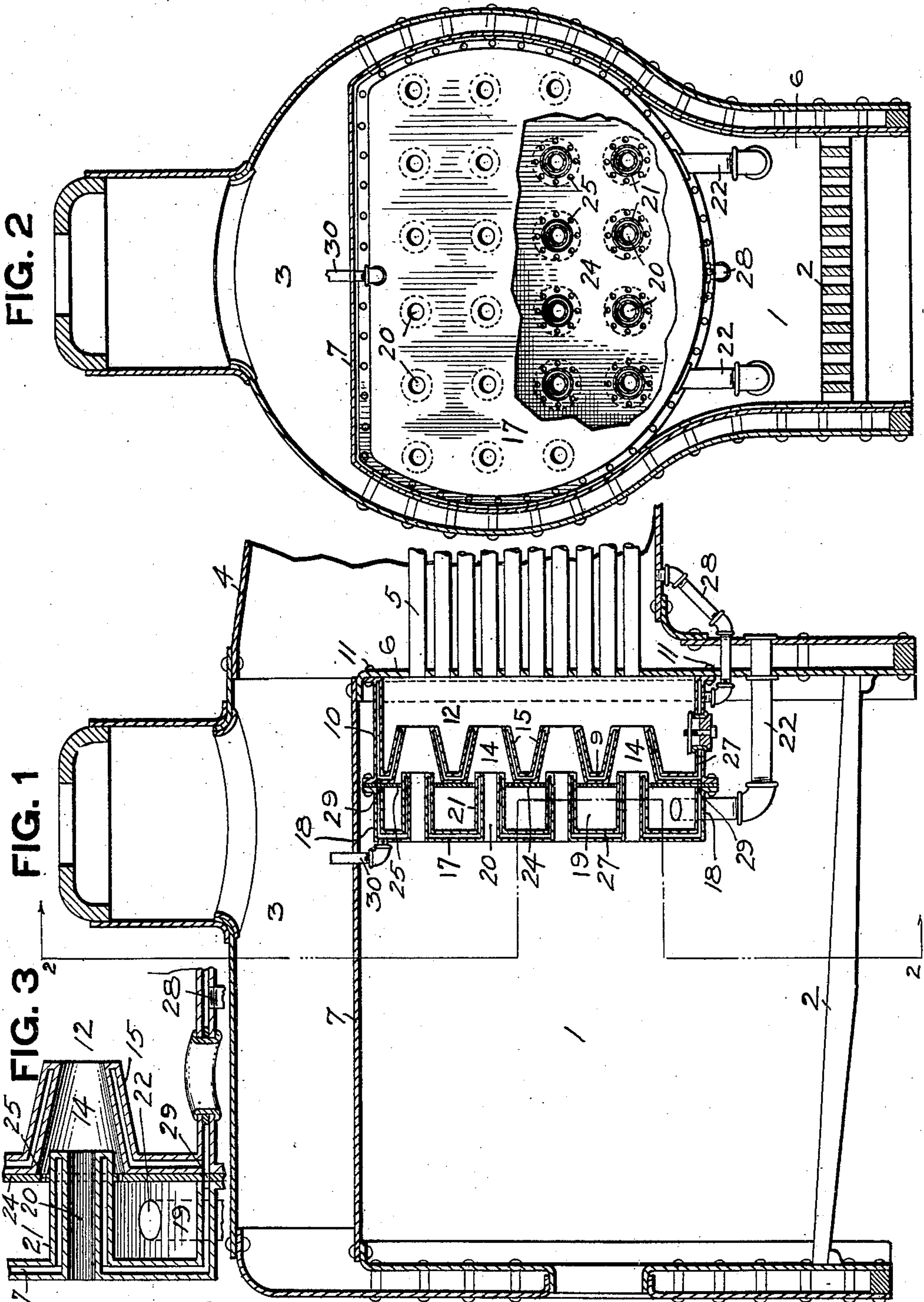


No. 863,597.

PATENTED AUG. 20, 1907.

H. H. FREEMAN.
SMOKE CONSUMING BOILER FURNACE.

APPLICATION FILED OCT. 11, 1906.



WITNESSES.

J. R. Keller
Robert C. Totten

INVENTOR.

Henry H. Freeman
Ray Totten & Winter
Attorneys

UNITED STATES PATENT OFFICE.

HENRY H. FREEMAN, OF WILKINSBURG, PENNSYLVANIA.

SMOKE-CONSUMING BOILER-FURNACE.

No. 863,597.

Specification of Letters Patent.

Patented Aug. 20, 1907.

Application filed October 11, 1906. Serial No. 338,493.

To all whom it may concern:

Be it known that I, HENRY H. FREEMAN, a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Smoke-Consuming Boiler-Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to furnaces and more especially to steam boiler furnaces.

10 The object of the invention is to improve furnaces by providing devices which secure a more perfect combustion of fuel, thus preventing, or at least reducing, the smoke and also increasing the efficiency of the furnace.

The invention consists of the appliances and their arrangement as hereinafter described and claimed.

In the accompanying drawing, Figure 1 is a vertical longitudinal section through a locomotive fire box and a portion of the boiler showing my invention applied thereto. Fig. 2 is a vertical transverse section on the 20 line 2—2, Fig. 1, and Fig. 3 is a portion of Fig. 1 on an enlarged scale.

In the drawing, the locomotive fire box is indicated at 1, having the usual grate bars 2 and having above the same the steam collecting space 3 of the boiler. The 25 boiler shell is indicated at 4 and the fire flues at 5, the latter being secured in the flue sheet 6, forming the end wall of the fire box. The top wall or hood of the fire box is shown at 7. The fire flues 5 constitute a heat absorbing element.

30 My invention comprises appliances for mixing air with the products of combustion before they pass into the fire flues of the boiler. The appliances shown comprise a wall, or partition 9, extending vertically and located in front of the fire flues and having the annular 35 horizontal portion 10 whose edge is secured to the flue sheet 6 by means of rivets 11, thus forming a supplemental chamber 12 in front of the fire flue. The wall 9 is provided with openings 14 and with conical nozzles 15 projecting into the supplemental combustion chamber 12. Outside of the wall 9 is another wall 17 also 40 having an annular horizontal portion 18 whose edge is joined to the edge of the wall 9, thus forming an air chamber 19 between said walls. The outer wall 17 is provided with openings 20 and has nozzles 21 leading 45 from said openings and projecting into the nozzles 15 of the inner wall. The air chamber 19 between these walls has communication with the outside atmosphere in any suitable way, such as pipes 22 leading from said chamber and extending out through the walls of the 50 fire box, preferably being directly forwardly as shown. Located between the chamber 19 and the wall 9 is a partition plate 24 which has openings to permit the nozzles 21 to project through the same. This partition plate is provided with perforations 25 surrounding the 55 nozzles 21, through which perforations the air passes from the chamber 19 into the nozzles 15.

In order to prevent the several walls or plates from burning out, they are preferably so constructed that they can be water cooled such as by making them double, with water chamber 27 between the same, and providing a suitable water connection. This is accomplished by providing a water connection 28 from the boiler to the bottom of the water chamber of the inner member and providing openings 29 between the water chambers of the inner and outer chambers, both at top 65 and bottom, and providing a steam outlet 30 leading from the top of the water chambers and projecting into the steam collecting space of the boiler. As a result there is a circulation through the chambers of these walls, said circulation receiving the cold water from the 70 bottom of the boiler.

In the use of my invention, the fuel, such as coal, is burned on the grate 2 in the usual way, the fire chamber 1 being the main or preliminary combustion chamber. The products of combustion pass through the nozzles 21 and into the nozzles 15, thereby drawing in a 75 certain amount of air from the chamber 19 which air is mixed with the products of combustion in the nozzles 15, said mixture then passing into the supplemental combustion chamber 12 where the oxygen in the air 80 consumes the unoxidized portions of the products of combustion and the completely oxidized products of combustion pass through the fire flues to the stack in the usual way.

The action of the device described will be readily understood from this description. These appliances are 85 simple and can be applied to any form of furnace, whether a steam boiler furnace, or the like. In case of furnaces other than steam boiler furnaces, the fire flues 5 will be represented by some other heat absorbing 90 element.

What I claim is:—

1. In a furnace, the combination of a heat absorbing element, a fuel combustion chamber in front of said heat absorbing element, a wall separating the heat absorbing 95 element and fuel combustion chamber and providing a supplemental combustion chamber and having a series of openings provided with conical nozzles projecting into the supplemental combustion chamber, a second wall in front of the first wall providing an air chamber between said 100 walls and having a series of straight nozzles open to the fuel combustion chamber and projecting into the conical nozzles of the first wall, and a connection from said air chamber to the atmosphere.

2. In a furnace, the combination of a heat absorbing 105 element, a fuel combustion chamber in front of said heat absorbing element, a wall providing a supplemental combustion chamber between the fuel combustion chamber and heat absorbing element, a series of conical nozzles in said wall and projecting into the supplemental combustion 110 chamber, a second wall providing an air chamber between the same and the first named wall, a series of straight nozzles in said wall open to the fuel combustion chamber and projecting into the conical nozzles of the first named wall, a plate between the air chamber and the first wall 115 and provided with openings through which the straight

nozzles project and also with perforations around said openings, and connections from the air chamber to the atmosphere.

3. In a steam boiler, the combination of the fuel combustion chamber, a boiler, a supplemental combustion chamber between the boiler and fuel combustion chamber, an air chamber between the supplemental combustion chamber and fuel combustion chamber, conical nozzles provided in the wall separating said supplemental combustion chamber and air chamber, straight nozzles communicating with the fuel combustion chamber and projecting through the air chamber and into the first named nozzles, means

for supplying air to the air chamber, the walls forming the supplemental combustion chamber and air chamber being hollow, a water connection from the boiler to said hollow walls, and a steam connection from the upper portion of said hollow walls to the steam collecting space of the boiler. 15

In testimony whereof, I the said HENRY H. FREEMAN have hereunto set my hand.

HENRY H. FREEMAN.

Witnesses:

ROBERT C. TOTTEN,
J. R. KELLER.