

UNITED STATES PATENT OFFICE.

ROBERT ZEILLER, OF MUNICH, GERMANY.

SMOKE-CONSUMING FURNACE.

No. 824,327.

Specification of Letters Patent.

Patented June 26, 1906.

Application filed May 8, 1905. Serial No. 259,263.

To all whom it may concern:

Be it known that I, ROBERT ZEILLER, a subject of the King of Bavaria, residing at Munich, Kingdom of Bavaria, Empire of Germany, and temporarily residing in the city, county, and State of New York, have invented a certain new and useful Improvement in Smoke-Consuming Furnaces, of which the following is a specification.

The present invention relates to smoke-consuming furnaces; and it consists of the construction hereinafter set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a section of my improved furnace, the section being drawn through the longitudinal axis of the boiler, certain parts being shown in elevation. Fig. 2 is a vertical section on the line 2 2 of Fig. 1. Fig. 3 is a vertical section on the line 3 3 of Fig. 1. Fig. 4 is a transverse section on the line 4 4 of Fig. 2; and Fig. 5 is a detailed view of the auxiliary draft-pipes, showing a plug for closing the pipe.

A is a cylindrical steam-boiler of the usual construction.

B is a step-grate; C, the fire-bridge, which may be provided with a number of transverse openings D, the purpose of which will hereinafter be explained.

E is a transversely-arranged baffler constructed of fireproof material, containing a series of channels *l* and also a channel *m*, having openings *n* communicating with the fire-box. This body of fireproof material may be supported from the side walls of the furnace; but I prefer to support the same by means of hollow tubes *z*, arranged as shown, the tubes communicating with the interior of the boiler at different levels, so as to insure a circulation of water through them. By supporting the baffler in this manner I secure the same against collapse in case of a cracking of the individual bricks or blocks of which the same is built. The water circulating through the tubes prevents the melting of the metal support and also assists in raising the temperature of the water in the boiler.

An opening F in one of the side walls of the furnace communicates directly with the channel *m*, so that air, liquid fuel, or other combustible substances or substances furthering combustion may be introduced under pressure or otherwise. These substances, which are generally introduced at the ordinary temperature, are thus preheated, and thus do not reduce the temperature in the fire-box. On

the other hand, heat is removed from the baffler, thus reducing the temperature of the individual bricks and prolonging their life. The downward passages *n*, communicating with the channel *m*, are preferably narrowed at the bottom, so as to form nozzles.

The transverse channels *l* may be closed by plugs, preferably of fireproof material, which plugs may during the operation of the furnace be crushed by being pushed inwardly by means of an iron rod, thus opening the channels.

In addition to the baffler I provide at the upper part of the fire-box a series of arches H, so arranged as to prevent the passage of smoke below the boiler and above the baffler. When the furnace is a broad one, it is preferable to strengthen these arches H by inserting therein iron supports. I prefer to construct these in the form of tubes I, provided at intervals with apertures on the lower portions thereof, so that air or other substances furthering combustion or combustible material may be introduced therethrough into the fire-box. The bricks composing the arches may be open at one side, as shown in Fig. 1, so as to permit the building of the arch when the tube is already in place and also to permit the air or other material escaping from the apertures in the tube to escape downwardly. The bricks may be laid with the openings extending alternately downwardly and sidewise, as shown in Fig. 1. These tubes are connected with the exterior of the furnace by a channel passing through the wall of the furnace. (Not shown in the drawings.)

The operation of my device is as follows: After the fire has been started in the fire-box the draft is most intense just below the baffler, as all or the majority of the products of combustion have to pass between the baffler and the coal resting on the grate. The zone of most intense combustion, therefore, is just below the baffler, and the temperature in this zone is sufficient absolutely to oxidize all the combustible residues of imperfect combustion. All the gas, smoke, particles of coal, and other residues of imperfect combustion usually thrown out of the chimney are therefore completely burned, thus obtaining a maximum amount of heat from the coal and permitting no noxious gases, smoke, or coal-dust to ascend the chimney. In order to assist or increase the combustion at what I term the "zone of most intense combustion," air, liquid fuel, or other oxidizing or combus-

5 tible material is introduced under pressure
 or otherwise from the outside through the
 channel F into the channel *m*, and thence
 through the nozzles *n* into the fire-box.
 10 Liquid fuel or other combustible substances
 may be introduced through the pipes I in
 order to increase the combustion in the fire-
 box. When it is desired to obtain a sudden
 15 increase of heat—as, for instance, at times
 during the run of a locomotive—liquid fuel is
 introduced through the pipes I and the chan-
 nel F. Under ordinary conditions, however,
 air or other oxidizing material is introduced
 20 into the fire-box through the pipes I and chan-
 nel F. Should at any time the gases in the
 top of the fire-box become stagnant, one or
 more of the small channels *l* may be opened
 by removing or crushing the plugs G, as de-
 25 scribed, thus permitting the escape of the
 gases through the channels *l*. The walls of
 these channels are at a red heat, the tempera-
 ture being above that necessary for the com-
 plete combustion of the gases, coal-dust, and
 30 smoke, and therefore all of these substances
 before leaving the channel *l* are completely
 burned. In a very large furnace I provide
 an opening or series of openings D in the fire-
 bridge C to draw off a portion of the gases
 35 from the lower part of the mass of burning
 coal. At the point at which such channels
 D withdraw gases from the fire, the tempera-
 ture is so high that all particles of smoke and
 combustible gases will have been consumed
 40 before passing such channels.
 It is to be understood that any form of
 boiler may be used and that any kind of fuel
 may be burned in a furnace built in accord-
 45 ance with my invention. By the construc-
 tion devised by me all the smoke and com-
 bustible gases are forced through a zone of
 heat in which the temperature is sufficiently
 high completely to burn everything that can

be burned. The products passing up the chimney are therefore completely oxidized.

I claim as my invention—

1. In a smoke-consuming furnace, a de-
 pending baffle provided with channels run-
 ning through the same from front to rear,
 each channel being provided with separate
 removable closing means.

2. In a smoke-consuming furnace, a de-
 pending baffle provided with channels run-
 ning through the same from front to rear,
 and plugs of fire-resisting material for closing
 each of said channels.

3. In a smoke-consuming furnace, a de-
 pending baffle provided with channels run-
 ning through the same from front to rear,
 and frangible plugs of fire-resisting material
 for closing each of said channels.

4. In a smoke-consuming furnace, a de-
 pending baffle so arranged as to force the
 products of combustion to pass below the
 same, and a fire-bridge arranged in the rear
 of said baffle and provided with channels D
 65 for drawing products of combustion from the
 lower part of the fire-box.

5. In a smoke-consuming furnace, the com-
 bination with a baffle depending into the
 fire-box and provided with channels running
 70 from front to rear, of a tube or tubes arranged
 in front of the baffle provided with down-
 ward-extending openings, said tubes being
 connected with the outside of the furnace to
 permit the introduction of oxidizing or com-
 75 bustible material.

In testimony whereof I have hereunto set
 my hand in the presence of two subscribing
 witnesses.

ROBERT ZEILLER.

Witnesses:

JOHN LOTKA,

JOHN A. KEHLENBECK.