(No Model.) 2 Sheets—Sheet 1.

R. AFFELTRANGER.

SMOKE CONSUMING FURNACE.

No. 384,818. Patented June 19, 1888.

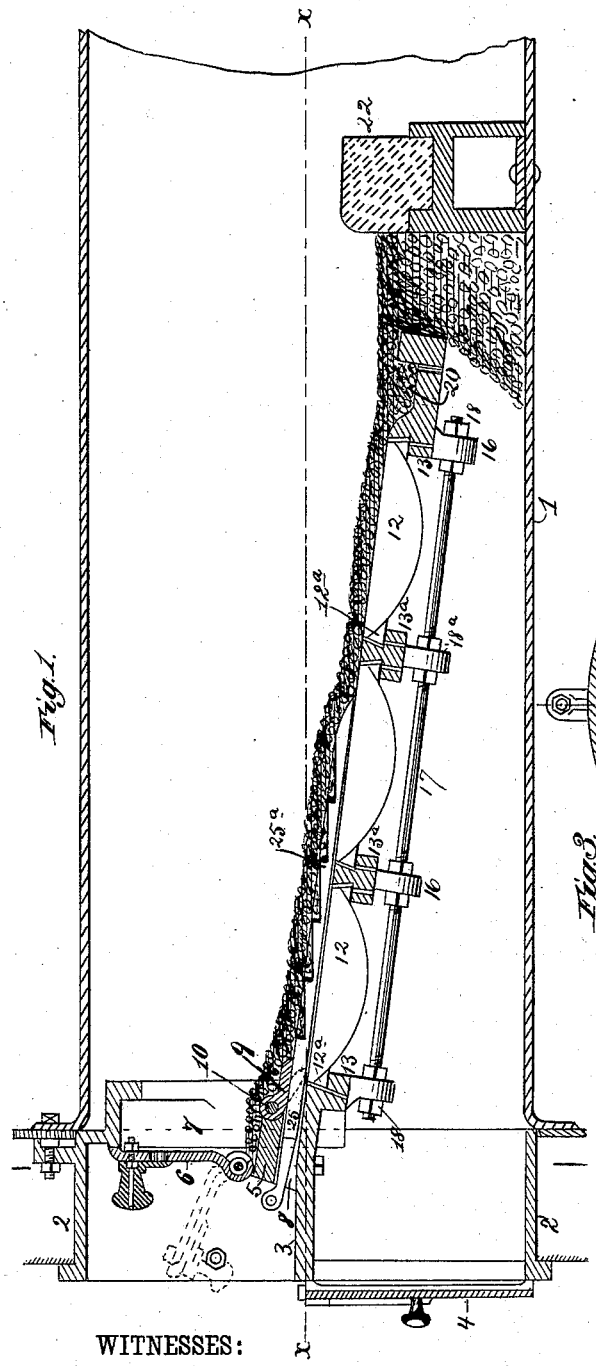

Fig. 1.

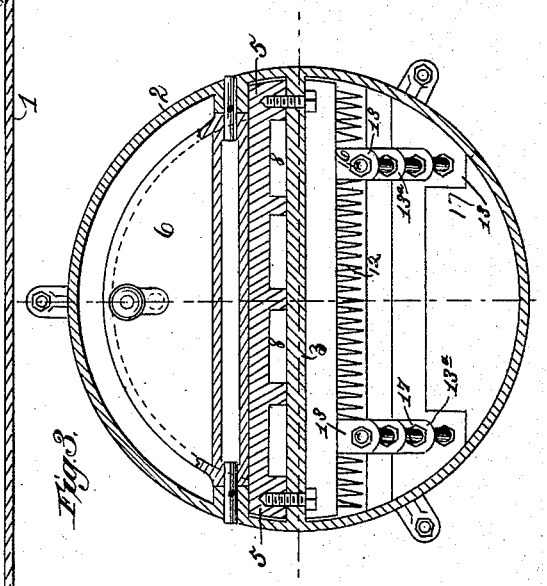

Fig. 3.

WITNESSES:

Percy B. Hillis

Robert Everett.

INVENTOR:

Rudolf Affeltranger

BY A. M. Tannes.

ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

R. AFFELTRANGER.

SMOKE CONSUMING FURNACE.

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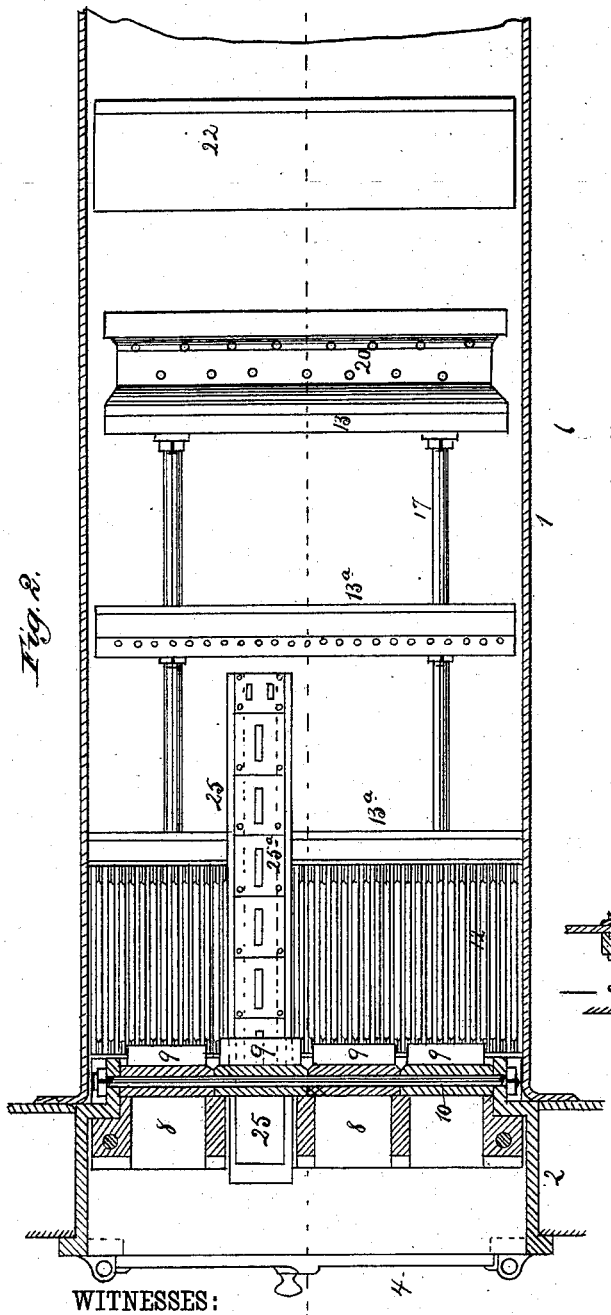

Fig. 2.

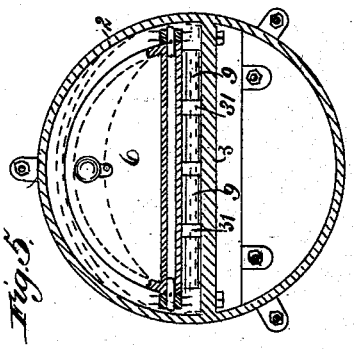

Fig. 3.

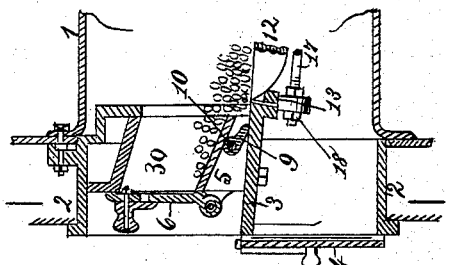

Fig. 4.

WITNESSES:

Lucy B. Hills.

Robert Everett.

INVENTOR:

Rudolf Affeltranger

BY A. M. Tanner

ATTORNEYS.

UNITED STATES PATENT OFFICE.

RUDOLF AFFELTRANGER, OF ZURICH, SWITZERLAND.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 384,818, dated June 19, 1888.

Application filed October 14, 1887. Serial No. 252,357. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF AFFELTRANGER, a citizen of Switzerland, residing at Zurich, in the canton of Zurich and Republic of Switzerland, have invented new and useful Improvements in Smoke-Consuming Furnaces, of which the following is a specification.

The present invention relates to that class of boiler and other furnaces in which provision is made for mechanically feeding the coal or fuel to the combustion-chamber and consuming the smoke and gases.

The object of the invention is to obtain a perfect combustion of the smoke and the formation of a uniform fuel-bed simultaneously with the cleaning of the grate, and the prevention of any injurious cooling or chilling of the burning coal. The formation of a uniform fuel-bed is to cause a rational combustion throughout the entire length of the grate—that is, from the feed-chamber to the rear end of the grate, where a slag-receiver is located for guarding against overheating.

The invention is applied to fixed inclined grates of boiler and other furnaces, and involves the employment of so-called "feeding-shovels" or "stoking-bars," which have peculiarly-shaped projections and are fitted in passages inside the feed-chamber, so as to operate between the grate and the fuel-bed for raising the latter and uniformly feeding the coal farther along the grate. After the retraction of the feed-shovels the passages through which they operate are automatically closed for preventing the admission of air above the fuel-bed.

The invention thus briefly outlined will be hereinafter more fully described, and then set forth in the claims.

In the accompanying drawings, Figure 1 is a longitudinal section of a furnace constructed according to my invention. Fig. 2 is a horizontal longitudinal section taken through the line *x x* of Fig. 1. Fig. 3 is a front view of the furnace partly in section. Figs. 4 and 5 are longitudinal and cross-sections of a modified form of feed-chamber for the fuel.

The reference-numeral 1 designates the shell or casing of the furnace, which is combined with a steam-boiler or other apparatus in any desired manner. At the front of the shell 1 is applied a frame, 2, which is securely bolted to said shell or otherwise attached thereto. A floor, 3, divides the frame 2 into two chambers, the upper one of which contains the fuel-supply devices, and the lower chamber is closed by doors 4, and leads into the ash-pit or space beneath the grate. A transverse plate or bridge-piece, 5, rests upon the floor 3, and is secured in place by vertical bolts or other fastening devices. To the top of the bridge-piece is pivoted an outwardly-swinging door, 6, which when in the vertical position serves to close the fuel supply chamber or space 7 of the frame 2. The bridge-piece has a series of longitudinal passages or grooves, 8, formed on its under side, which are opened at the front and closed at the rear by means of pivoted valves 9.

The passages 8 and valves 9 are in the present instance shown as being four in number, and all the valves have eyes which are fitted on a transverse bolt, 10, serving as a pintle upon which the valves can turn. The valves are capable of resting upon the floor 3, so as to shut off all communication with the outside of the furnace and prevent the entrance of air into the space above the fire-grate. This grate is stationary and inclined in a downward direction from the front to rear, as is seen in Fig. 1. It is composed of many small grate-bars 12. (Shown in the present instance as being arranged in three divisions.) The frame which supports these grate-bars is composed of the transverse bars 13 and 13ª, located, respectively, at the front and bottom and at intermediate points of the grate-surface. The bars 13 are undercut or wedge-shaped, so as to form ledges upon which rest correspondingly-shaped lugs 12ª on the ends of the grate-bars. Arms or brackets 16, depending from the bars 13, have eyes or apertures for the reception of longitudinal tie-rods 17. These rods are permanently bolted to the bars 13 at the top and bottom of the grate, and are secured by nuts 18. The intermediate bars, 13ª, are supported altogether by the tie-rods, and are secured by nuts 18ª, located on opposite sides of the brackets of said bars. The screw-threads on the rods 17 are sufficiently long to permit the nuts to be loosened or tightened. It will be seen that when the nuts are tight-

ened up the various grate-bars are firmly clamped in position and are prevented from moving in an upward direction by the peculiar form of the supporting-ledges of the bars 13 and the projections on the grate-bars themselves. By loosening the nuts of the tie-rods the grate-bars can easily be removed for the insertion of new ones, or for other purposes. At the bottom of the grate, and forming part of the lower bar, 13, is a slag receptacle or trough, 20, which is of the same width as the grate, or practically so. The slag or clinkers and ashes accumulating in this receptacle serve to prevent the overheating of the bottom or rear of the grate. In rear of the slag-receiver is an open space through which the slag, clinkers, and ashes drop into the ash-pit in front of the bridge-wall 22. As shown in Fig. 1, the refuse or ashes are banked up against said bridge-wall, so as to prevent air from passing up at this point.

The means employed for mechanically feeding the fuel or coal upon the grate and evenly distributing the same, so as to insure a perfect combustion of the fuel and cause any smoke to be consumed, may be described as follows, viz: Each one of the passages in the bridge-piece 5 receives a so-called "feed" or "transporting" shovel or stoking-bar, 25. In Fig. 1 only one of these passages is shown as being occupied, and the grate-bars also are, for the sake of clearness, only shown in the first division. The insertion of the bars 25 will cause the valves to be automatically raised, and when the bars are withdrawn the valves close in a like manner, so as to prevent the passage of air. The shovel or bar 25 forms a push-surface which is provided on its upper side with teeth, ribs, or other like projections 25^a. By the insertion of the bar or shovel through the passage in the bridge-piece 5 and the movement of the same between the grate and fuel-bed the latter is raised and uniformly shoved toward the rear of the grate. When the bar is moved forward, the coal is thrown off from the same and a uniform fuel-bed is obtained without any undue gathering of coal at any point. After the shovel has been completely withdrawn the valve closes automatically; consequently no air can enter to injuriously affect or chill the fuel-bed. It is evident that the coal fed into the furnace is successively fed, shoved, or conveyed to the rear, and as the smoke results chiefly from the coal near the feed-door or front of the grate the smoke will be passed over the rear of the fuel-bed, where the gases have already been consumed and the fuel is highly incandescent. By such means I attain a perfect burning of the smoke and gases evolved at the front of the fire chamber. It is apparent that the movement of the toothed shovels or stoking-bars will serve to clear the grate from ashes, and hence I attain a most economical combustion of the fuel, because the furnace and fire are so arranged that the fuel is completely consumed by the air entering through the grate into the fire. It is to be observed that the fine ashes drop through the grate while the slag is shoved to the rear, so as to fill the slag-receiver and the space in front of the bridge-wall. The refuse not necessary to exclude air at the rear of the grate is taken out through any suitable opening or door.

In the modification shown in Figs. 4 and 5 an inclined feed-hopper, 30, having a front door is formed in one piece with the bridge-piece 5, and the passages in the same are formed by bottom ribs, 31. The valves are shown as being arranged between said ribs or inside the passages, whereas in Fig. 1 they are at the front of the passages.

What I claim as my invention is—

1. In a boiler or other furnace, the combination, with a stationary inclined grate, of a front or feed chamber having longitudinal passages, pivoted valves for closing said passages, and sliding shovels or stoking-bars having elevations, ribs, or teeth and adapted to operate upon the grate through the valve-controlled passages, substantially as described.

2. In a boiler or other furnace, the combination, with the fire-chamber, of the front frame having a horizontal floor, the bridge-piece having longitudinal passages and valves, the feed-door, the inclined grate, and the sliding shovels or stoking-bars, substantially as described.

3. In a boiler or other furnace, the combination of a grate formed of the transverse bearer-bars carrying the grate-bars, and the longitudinal tie-rods passing through eyes formed on the bearer-bars and having nuts for firmly clamping all the parts together, substantially as described.

4. In a boiler or other furnace, the combination of the stationary inclined grate and the slag receiver or trough formed in the rear or bottom support thereof, with the fire and feed chambers, substantially as described.

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

RUDOLF AFFELTRANGER.

Witnesses:
WILLIAM SCHNEIDER,
PAUL GNÄDIG.