J. M. HOPWOOD.

GRATE BAR.

APPLICATION FILED AUG. 28, 1917.

1,302,368.

Patented Apr. 29, 1919.

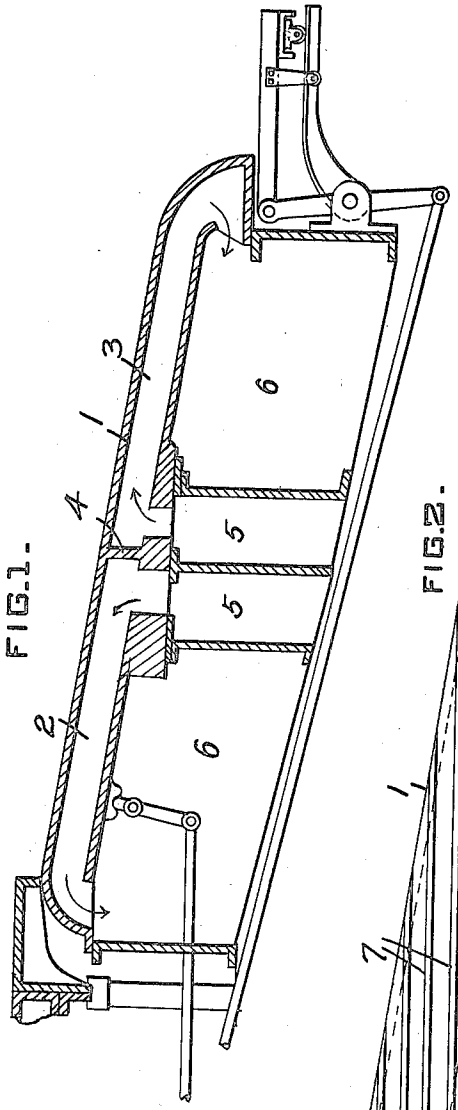


FIG. 1.

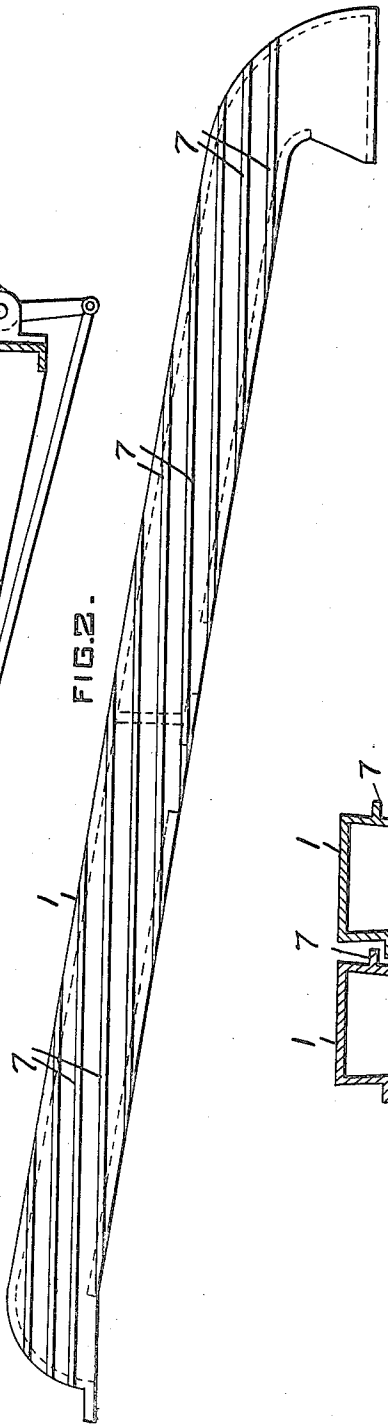


FIG. 2.

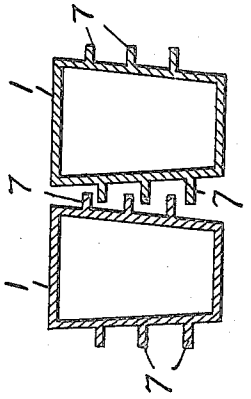


FIG. 3.

WITNESSES

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JOHN M. HOPWOOD, OF DORMONT, PENNSYLVANIA, ASSIGNOR TO DARWIN S. WOLCOTT, TRUSTEE, OF SEWICKLEY, PENNSYLVANIA.

GRATE-BARS.

1,302,368. Specification of Letters Patent. Patented Apr. 29, 1919.

Application filed August 28, 1917. Serial No. 188,645.

To all whom it may concern:

Be it known that I, JOHN M. HOPWOOD, residing at Dormont, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Grate-Bars, of which improvements the following is a specification.

The invention described herein relates to certain improvements in that type of grate bars having passages therein for the flow of air into a chamber or chambers below the fuel supporting elements and then up between the grate bars into the fuel. In order to prevent the sifting of ashes, fine coal, etc., down between the grate bars, it has been necessary to place the bars as close to one another as practicable without preventing the flow of air between them. Experience, however, has shown that when subjected to a high temperature for a considerable time, the bars will "grow," *i. e.*, increase in dimensions and that by reason of such "growth," the spaces between the bars will be practically or wholly closed, preventing a flow of air sufficient for efficient combustion except by greatly increasing the air pressure.

The invention described herein has for its object a construction of grate bar which will permit of the bars being spaced such a distance apart, that the "growth" of the bars will not materially reduce the flow of air between them, and will prevent the sifting of ashes, fine coal, etc., down through the spaces between adjacent bars. The invention is hereinafter more fully described and claimed.

In the accompanying drawing forming a part of this specification, Figure 1 is a sectional elevation of a portion of the fire box or furnace of a boiler having the improved grate bars arranged therein; Fig. 2 is a side elevation of the improved bar, and Fig. 3 is a transverse section showing two bars arranged in operative relation.

In the practice of the invention, the grate bars 1 are made hollow for the passage of air therethrough prior to the passage of air into the fuel, thus insuring the cooling of the grate bars and heating the air. It is preferred, when the bars are arranged in line with the general movement of the fuel through the furnace, to divide the passage in the bar into two sections, 2 and 3, by a transverse partition 4, each section being provided with ports adjacent to their ends for the admission and discharge of air. While the air may be caused to flow through the bars in either direction, in the construction shown it passes from the conduits 5 into the passages and flowing toward the ends of the bars, is discharged into the boxes 6 under the fuel supporting bars. From these boxes the air passes up between the spaced bars and enters the fuel thereon.

As shown, the end walls of the wind boxes 6 and the partitions separating the conduits from each other and from the boxes 6 form the supports for the bars 1 and are so constructed and proportioned as to relative heights that the bars will have a downward inclination from the front to their rear ends. The bearing surfaces between the undersides of the bars and their supports are horizontal or substantially so, so that the bars when reciprocated will move in a plane at an angle to the axis of the bars.

Any suitable means may be employed for reciprocating the bars, such for example as the levers 10 having their upper ends in engagement with the underside of the bars while their lower ends are connected to rods 9 which are adapted to be reciprocated by the fuel feeding means as fully shown and described in application Serial Number 184242, filed August 3rd, 1917.

As clearly shown in Figs. 2 and 3, the grate bars are provided on their side walls with means whereby the sifting of ashes, etc., between the bars into the boxes 6 is prevented and that without materially interfering with the flow of air from the boxes up between the bars.

In the construction shown herein, ribs 7 are so formed on the sides of the bar as to be in planes at an acute angle to the axes of the bars and preferably substantially parallel with the plane of reciprocation of the bars. The ribs on the bars are so spaced and so located that the ribs of one bar will project between or intercalate with those of the others. As shown in Fig. 3, the spacing of the ribs and the thickness of the latter are so proportional that when the bars are arranged in a furnace as indicated in Fig. 3,

passages will be formed between adjacent bars, open at one end to receive air from below the fuel supporting surfaces. This air after passing along the passages and being heated by contact with the surface of the bars and the ribs, will enter the fuel on the supporting surfaces. As these passages are substantially parallel with the direction of reciprocation of the bars and therefore approximately horizontal, any ashes which may sift down between adjacent bars can be easily displaced and forced back into the material resting on the fuel supporting surfaces.

The spacing of the ribs and their thickness should be such as not only to provide air passages as above stated, but also to avoid the liability of said passages being materially reduced or choked by the "growth" of the bars due to the high heat to which they are subjected.

It is characteristic of the improvement described herein that passages are provided between adjacent bars for the flow of air between the bars into the fuel and that the ribs forming such passages are so arranged as not to interfere with relative movements of adjacent bars, while preventing any substantial sifting of ashes down between the bars.

It is characteristic of the improved grate bar described and claimed herein that the ribs are arranged on the sides of the bar at such an acute angle to the longitudinal axis of the bar that when two bars are arranged in operative relation, relatively long passages are formed, such passages exceeding in length the thickness or transverse dimensions of the bar and as the bars and ribs become highly heated, the air flowing through these long passages will be highly heated, and in order that practically all of the air may be heated to an efficient degree the ribs are so located relative one to the other that the passages between the ribs will be comparatively small in cross-section. A desirable length and cross-sectional dimensions of these passages may be had by so arranging the ribs that at least two of them will be bisected at points intermediate their ends by a line drawn at right angles to the longitudinal axis of the bar.

It is preferred that the ribs should be inclined toward the rear or discharge end of the bar so that the air will enter the fuel in the direction of the movement of the fuel. By giving the ribs a rearward inclination there will not be any tendency to force ashes into the spaces between the ribs during the upward or return movement of the bars and on the downward or feed movement there will be small liability of ashes entering between the grooves as the whole mass of fuel will be moving in that direction and entrance at such time will be resisted by the inflowing air.

I claim herein as my invention:—

1. The combination in a fuel supporting means of two or more suitably spaced grate bars, means for reciprocating a number of said bars in planes approximately parallel with the longitudinal axes of the bars, means interposed between the walls of adjacent bars to form passages adapted to permit of an uninterrupted flow of air between the bars and a substantial range of longitudinal reciprocation and to prevent the downward passage of coal and ashes.

2. A grate bar provided on its side with ribs projecting laterally for a suitable distance from the side of the bar and arranged at such an angle to the longitudinal axes of the bars as will permit of a substantially longitudinal reciprocation of the bars in planes approximately parallel to the axes of the bars when arranged in a furnace and will also permit of the passage of air while preventing the free downward movement of coal and ashes.

3. A grate bar adapted to be reciprocated in a plane substantially parallel with the longitudinal axis of the bar when in use and provided on its side with ribs extending from the under to the upper side of the bar and approximately parallel with the direction of reciprocation of the bar whereby the free movement of air up between the bars is permitted and a downward movement of coal and ashes is prevented and a substantially large range of reciprocation of the bars can be had.

4. In a furnace the combination of a plurality of movable grate bars having passages provided with inlet and outlet ports, a chamber arranged below the grate bars and connected to the outlet port of the bars, means for moving a number of said bars, and means interposed between adjacent bars to permit the flow of air from the chamber between the bars into the fuel while preventing the passage of fine coal and ashes into the chamber.

5. In a furnace the combination of a plurality of spaced grate bars having passages provided with inlet and outlet ports, means for shifting a portion of said bars, a chamber arranged below the grate bars and connected to the outlet ports of the bars, spaced ribs so arranged on adjacent sides of the bars that the ribs on one bar will project into the spaces between the ribs on the other bar, thereby forming passages for the flow of air from the chamber into the fuel, the ribs being so arranged as to prevent the passage of ashes and fine coal into the chamber and to permit of the desired movement of the bars.

6. In a furnace the combination of a plurality of spaced grate bars having passages provided with inlet and outlet ports, means for reciprocating a portion of said bars longitudinally, a chamber below the grate bars

and connected to the outlet from the bars, spaced ribs so arranged on the sides of the bars that the ribs on one bar will project into the spaces between ribs on adjacent bars, thereby forming passages for the flow of air from the chamber into the fuel, said ribs being arranged at an acute angle to the longitudinal axes of the bars so as to prevent the passage of fine coal and ashes down between the bars while permitting of a substantially longitudinal movement of one bar relative to another.

7. A grate bar having a longitudinal passage provided with inlet and outlet openings on the underside of the bar and having on its sides a plurality of spaced ribs arranged at acute angles to the longitudinal axes of the bars and adapted when two or more bars are arranged in operative relation in a furnace to form passages for directing air from the underside of the bars into the fuel.

8. A grate bar having a longitudinal passage provided with inlet and outlet openings on the underside of the bar and having on its sides a plurality of substantially parallel air directing ribs inclined toward the discharge end of the bars.

In testimony whereof, I have hereunto set my hand.

JOHN M. HOPWOOD.