

J. R. FORTUNE.
FURNACE.

APPLICATION FILED APR. 15, 1908.

939,997.

Patented Nov. 16, 1909

3 SHEETS-SHEET 1.

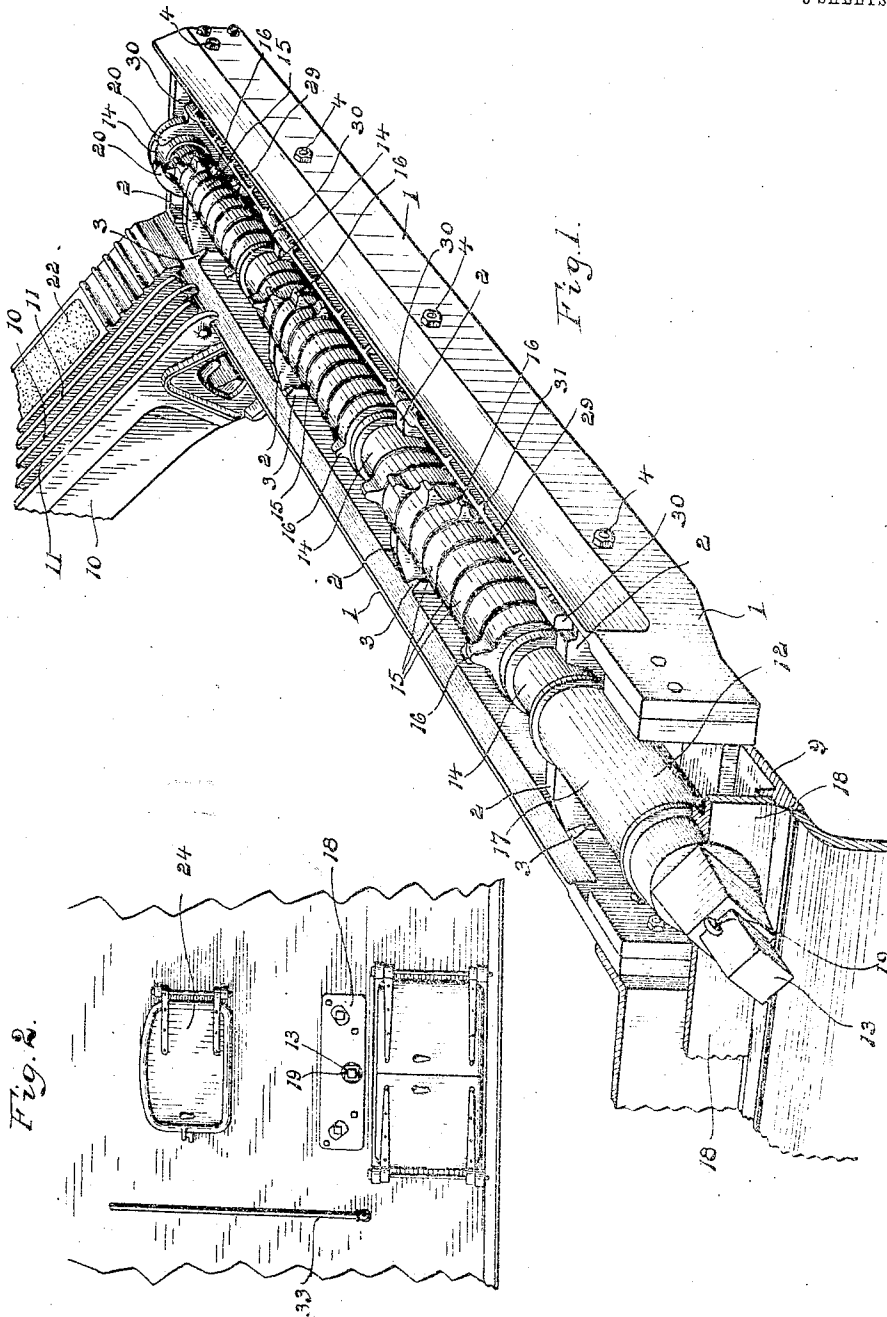


Fig. 2.

Fig. 1.

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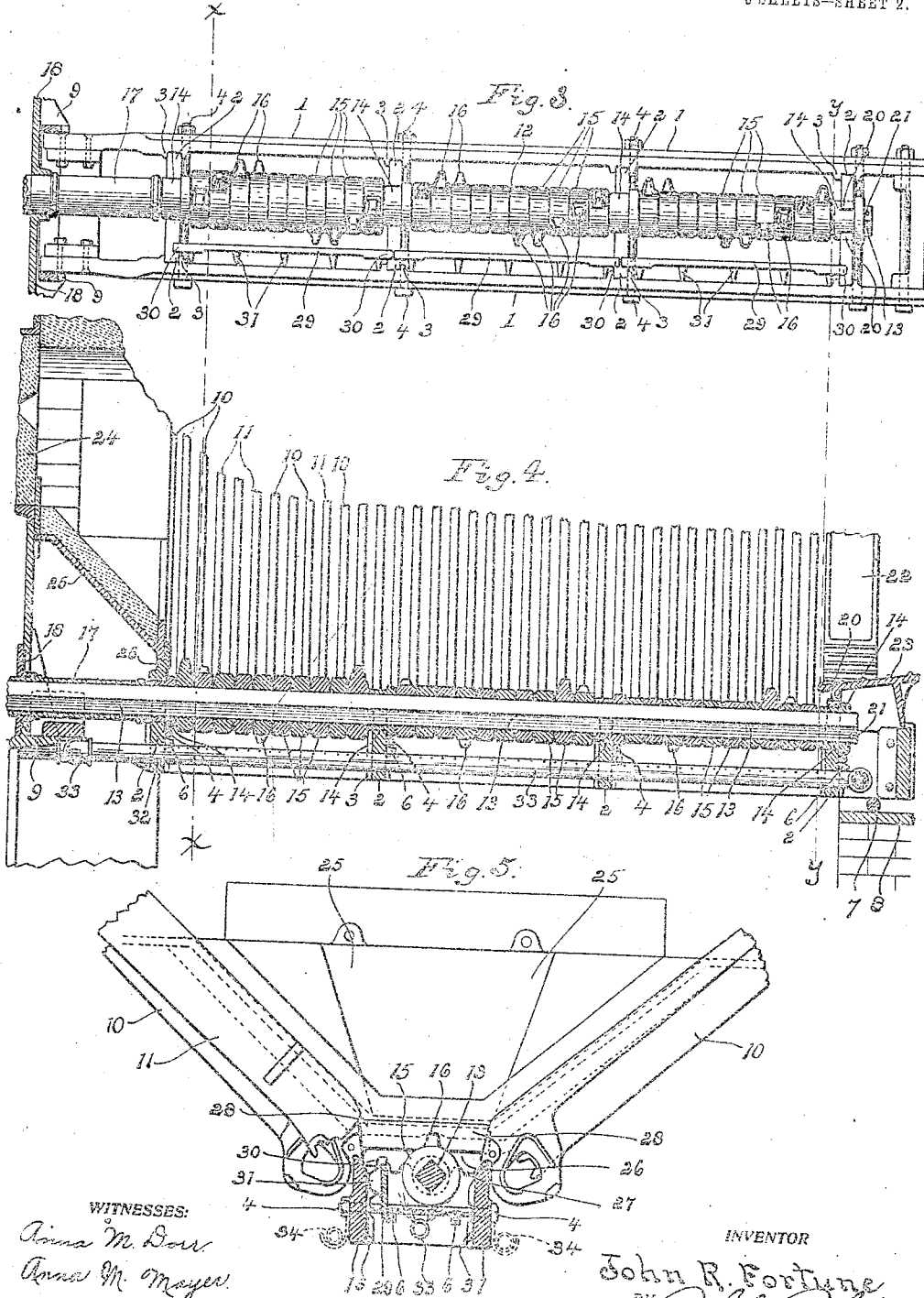
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3 SHEETS—SHEET 3.

Fig. 6.

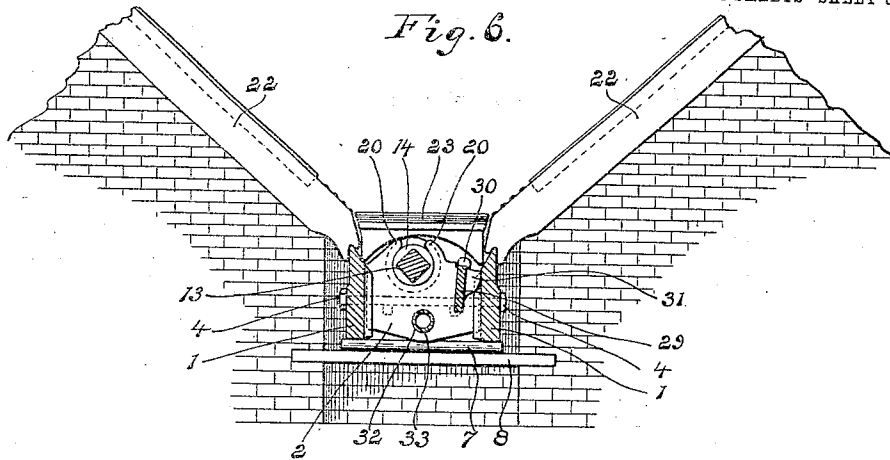
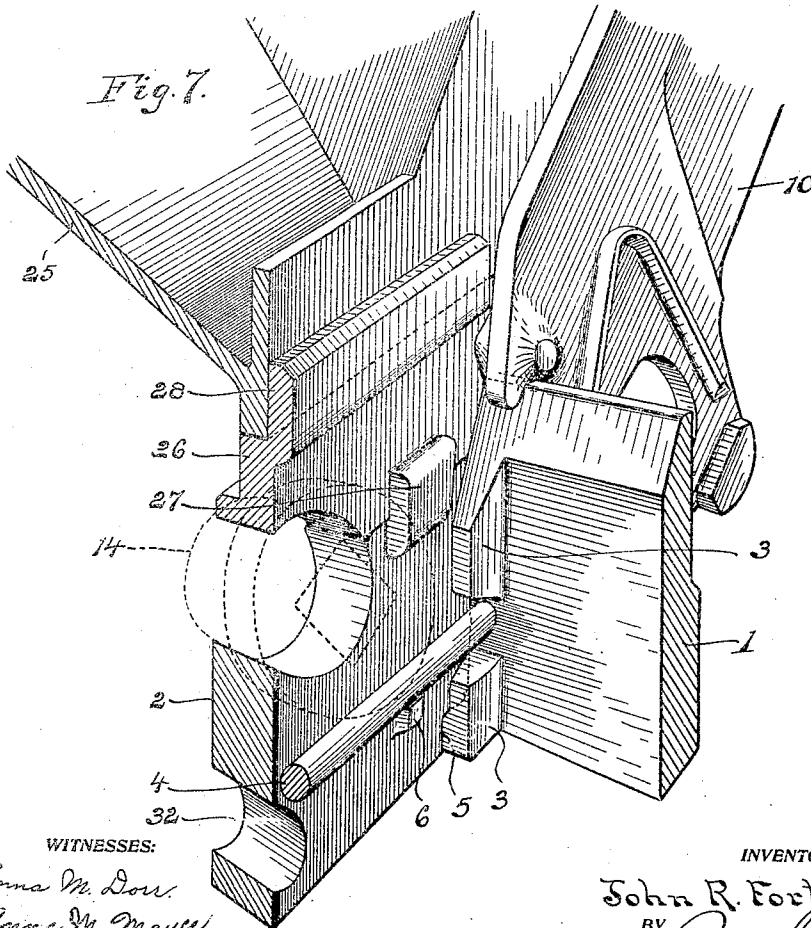


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOHN R. FORTUNE, OF DETROIT, MICHIGAN.

FURNACE.

939,997.

Specification of Letters Patent.

Patented Nov. 16, 1909.

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To all whom it may concern:

Be it known that I, JOHN R. FORTUNE, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in furnaces and more particularly to a clinker-bar or grinder and a grate bearer and mounting therefor, for automatic furnaces.

An object of the invention is to provide a cheap and efficient knock-down construction having its parts so arranged as to interlock when set up in position for use, and to provide a mounting for the clinker-bar, so constructed that said bar may be quickly and easily removed.

A further object is to increase the efficiency of the clinker-bar by arranging its teeth in a spiral row or rows and to increase its durability by making the same in sections which may be removed and replaced and which increase its radiating surface by affording air spaces between the sections.

It is also an object of the invention to provide means for restricting the opening between the clinker-bar and bearer, which means may be removed to permit the freer passage of clinkers and ash, and to provide certain other new and useful features in the construction, arrangement and combination of parts, all as hereinafter more fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of a bearer with its clinker-bar in place thereon, embodying the invention; Fig. 2 is a front elevation of a portion of a furnace front; Fig. 3, is a plan view of the bearer and clinker-bar; Fig. 4 is a longitudinal, vertical section on the axial line of the clinker-bar, through a furnace; Fig. 5 is a transverse vertical section of the same on the line $x-x$ of Figs. 3 and 4; Fig. 6, is a similar view, on the line $y-y$; and Fig. 7 is an enlarged perspective detail showing the forward clinker-bar bearing and adjacent parts in section.

As shown in the drawings 1—1 are parallel plates forming the sides of the grate bearer and these plates are spaced apart by a series of transverse bearing members or plates 2, the ends of which engage between vertical

ribs 3 on the inner sides of the plates 2, and bolts 4 passing through the bearer sides extend across adjacent to one side of each bearing member to tie the sides together and clamp the bearing members between. Each bearing member rests upon lugs 5 which fill the lower ends of the grooves between the ribs 3, and lugs 6 projecting from the face of each bearing member just beneath the adjacent tie bolt 4, prevent the bearings from lifting in the grooves. When in position within the furnace, the bearer rests at its rear end upon rolls 7 on a supporting plate 8 built into the bridge-wall of the furnace, and at its forward end is supported upon a bracket 9 on the furnace front. The upper edge of each side of the bearer is beveled for the engagement of a series of stationary grate-bars 10 which alternate with similar movable grate-bars 11 and all of these bars extend upwardly and outwardly from the bearer, forming a V-shaped grate.

To clear the grate of ash and grind the clinkers so that they will fall through and not clog the bearer, a rotary clinker-bar 12 is mounted in the bearings 2 longitudinally of the bearer. This clinker-bar or grinder consists of a bar or shaft 13 which is square in cross-section extending the length of the bearer with its forward end projecting through an opening in the furnace front, and slipped upon this bar are the bearing-thimbles 14 each having a square axial opening to fit the bar and a cylindrical outer surface to rest and turn in the seats in said bearings 2. Strung on said shaft between said thimbles is a series of short sections or rings 15 each formed with a square axial opening to fit the shaft and provided on its outer surface with a tooth 16. These sections are preferably set relative to the shaft so that the teeth extend outward in a spiral row, the row extending once around the shaft between the bearings. On the shaft forward of the front bearing is a sleeve 17 and the forward end of this sleeve engages a bearing provided therefor in a detachable plate 18 secured over an opening in the furnace front. The outwardly projecting end of the sleeve is squared for the engagement of a suitable lever for turning the clinker-bar and a pin 19 extends through the end of the shaft and engages the end of the sleeve to hold the shaft from longitudinal movement relative to the sleeve and its sections. The rearmost bearing is formed with upwardly

extending curved fingers 20 which nearly complete the circle of the bearing so that the thimble 14 is prevented from lifting out vertically and a pin 21 extending through the end of the shaft prevents said thimble from slipping endwise from the bearing in one direction and a flange on the thimble engaging the end of the bearing prevents such endwise movement in the opposite direction. A sufficient opening, however, is left between the ends of the fingers 20 to permit of the lifting out of the shaft when the pin 21 is removed and the thimble slipped longitudinally out of the bearing. Thus the clinker-bar may be quickly and easily lifted out for repair by removing the plate 18 and disengaging the thimble 14 from its bearing.

Upon the bridge-wall at the rear of the grate-bars and set at an inclination similar to said bars are the dead grate-bars 22 with their lower ends engaging the sides of the bearer in a manner similar to that of the stationary grate-bars. To cover the rear end of the bearer between the dead grate-bars, a cap-plate 23 is provided. This plate is formed with downwardly extending curved ribs forming legs to engage the bearer at each side and supporting the plate in the desired position thereon.

24 is a fire-door in the furnace front and extending inward and downward from said door to the front bearing 2 of the bearer is a hearth-plate 25. This hearth-plate is formed in the usual manner to conform to the V-shape of the grate and to receive a fire-brick covering. The space between the lower edge of the hearth-plate and the bearing 2 is filled by a filler or cap-plate 26. This cap-plate is formed at its lower edge to rest upon the upper edge of the bearing-plate 2 and upon the thimble and at each side of the thimble is provided with downwardly extending lugs 27 to engage the inner side of the bearing-plate. The upper edge of the filler-plate is provided with a flange 28 to engage the inner side of the flange on the hearth-plate and said filler-plate, engaging at its inner side the adjacent stationary grate-bars and also a rib on the end of the bearing-thimble, is prevented from slipping inward, the lugs 27 and flange 28 preventing the filler-plate from slipping forward. The filler-plate is thus interlocked with the other parts and securely held against accidental displacement while at the same time filling in the space between the hearth-plate and the bearing to prevent the escape of ashes and clinkers. It also forms a cap to hold the thimble in its bearing and is made detachable to facilitate the removal of the thimble and other parts.

The clinker-bar is preferably set in its bearings a little to one side of the center line of the bearer so that there is a greater space between it and the sides of the bearer

at one side than at the other. To partially fill this wider space at one side of the clinker-bar suitable filler-plates 29 are provided, one between each pair of bearings. These filling members are detachably supported in place by being provided with end lugs 30 at their upper edges to project over and engage the top of the bearings 2. At intervals upon the outer face of the filler-plates are spacing-ribs 31 to engage the side of the bearer and space the plate therefrom. These plates being simply hung by their lugs between the bearings, may be quickly and easily lifted out at any time should it be desirable, on account of large quantities of clinker and ash from the coal, to provide a greater space between the clinker-bar and the bearer.

In each of the bearing-plates 2 near its lower edge is a hole 32, in which holes is supported a steam-pipe 33 having a series of jet openings along its upper side to project jets of steam upward around the clinker-bar to assist in the disintegration of the clinkers. This steam-pipe extends outward through the furnace front and is connected with any desired supply. As shown in Fig. 5 in dotted lines, other or additional steam-pipes 34 may be supported in any suitable manner at each side of the bearer along its outer lower edges to direct the jets of steam upward between the grate-bars.

By making the grate-bar or ring-sections 15 each formed with one or more teeth, should one of the teeth become broken the section may be removed and a new section put in its place without the necessity for a whole new bar, and as these sections are formed with adjacent inclined faces 35 as shown in Fig. 4, the radiating surface of the grate-bar is materially increased and therefore cools much more readily, preventing warping and other troubles from overheating. As shown, the sections 15 between the forward bearing 2 of the bearer and the adjacent bearing are all made of the same diameter, but the sections between the second bearing and the next are preferably of a lesser diameter and those between the third and the last bearing are of a still lesser diameter. The clinker-bar, taken as a whole, is thus given a tapering form, being of larger diameter at its forward end than at its rear end. The space between the sides of the clinker-bar and the sides of the bearer thus increases toward the rear of the bearer, so that more of the ash and clinker will be removed at the rear of the furnace than at its forward end, and by setting the sections 15 so that their teeth form one or more spiral rows around the clinker-bar, the clinkers will be more readily broken up because of the rotary motion which will be given them by the spiral setting of the teeth.

The rings 15 between one bearing and the

next adjacent bearing are, however, preferably all made of the same diameter so that they will be interchangeable and but three sizes will be required for the whole bar, thus cheapening the construction and making it much easier to specify the ring required, should one become broken.

Having thus fully described my invention what I claim is:—

1. In a furnace, the combination with grate-bars, of a bearer consisting of independent sides adapted to support the ends of said bars, detachable bearing-members extending across between said sides and bolts extending across the bearer and through said bearer sides to draw the sides toward each other and clamp the bearing members between them, and a clinker bar supported by the bearing members.

2. In a furnace, the combination with grate-bars, of a bearer consisting of sides adapted to support the ends of said bars, and provided with vertical grooves closed at their lower ends, transverse bearing members detachably engaging at their ends said grooves, bolts extending across the bearer and through its sides to secure the sides together and the bearing-members in their grooves, and a clinker bar supported by said bearing-members.

3. In a furnace, the combination with grate-bars, of a bearer for supporting one end of said bars consisting of parallel sides having vertical grooves closed at their lower ends, bearing-members extending across between said sides with their ends engaging said grooves, bolts extending across the bearer and through its sides adjacent to each bearing-member to draw the sides together and clamp the members between them, lugs on each bearing-member projecting beneath said bolts, and a clinker bar supported by said bearing members.

4. In a furnace, the combination with a series of grate-bars and a bearer supporting the ends of said bars, of a rotatable clinker bar consisting of a shaft formed square in cross section, members having teeth sleeved upon said shaft, bearing-members on said bearer for said clinker bar each formed with a bearing of greater diameter than the diameter of the clinker bar shaft, and open at its upper side to permit the lifting out of said shaft, a bearing thimble within the bearing of one of said bearing-members having a square opening to fit the shaft and provided with a flange at one end to engage the end of the bearing, and means on the shaft near one end thereof to engage the thimble of the adjacent bearing and hold the shaft from longitudinal movement and the thimble within its bearing.

5. In a furnace, the combination with grate-bars, of a bearer having sides adapted to support one end of said bars, bearing-

members extending across between said sides, a clinker bar supported by said bearing members extending longitudinally between the bearer sides with a wider space between it and one of said sides than between it and the other side, and a filler adapted to engage the bearing-members at its ends and be detachably supported thereby within the widest space.

6. In a furnace, the combination with inclined grate-bars, of a bearer having sides adapted to be engaged by and support the lower ends of said bars, a series of bearing members between said bearer sides, a clinker bar rotatably mounted on said bearing members and extending longitudinally of the bearer closer to one side of the bearer than to the other, filler plates having spacing ribs to engage one of the bearer sides, and lugs on the end of said filler plates to engage the bearing members and detachably support said plates within the wider of the two spaces between the clinker bar and the bearer sides.

7. In a furnace, the combination with inclined grate-bars and a bearer having sides adapted to be engaged by and support the lower ends of said bars, of a bearing between said bearer sides near its forward end, a hearth plate extending inwardly from the furnace front with its inner and lower edge above said bearing, and a cap plate detachably supported by the bearing and filling the space between said bearing and said edge of the hearth plate.

8. In a furnace, the combination with inclined grate-bars and a bearer having sides adapted to be engaged by and support the lower ends of said bars, of a bearing in said bearer between its sides near its forward end, a clinker bar in said bearing, a hearth plate extending inwardly from the furnace front with its inner and lower edge above said bearing, a detachable cap plate seated upon the bearing, downwardly extending lugs on the cap plate engaging the bearing and a flange on the cap plate engaging the hearth plate.

9. In a furnace, the combination with inclined grate-bars, of a bearer having sides adapted to be engaged by and to support the lower ends of said grate-bars, detachable bearing members between the sides of said bearer having openings near their lower sides within the bearer, and a steam pipe extending through said openings in said bearing-members and provided with jet openings in its upper side.

10. In a furnace, the combination with inclined grate-bars and a bearer for supporting the lower ends of said bars, of a clinker bar supported by said bearer and consisting of a shaft formed square in cross section throughout its length, a series of crushing sections on said shaft having square

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axial openings to receive the shaft and provided with teeth, a sleeve on the forward end of the shaft having a square axial opening to receive the shaft, a detachable plate adapted to be secured to a furnace front and forming a bearing for said sleeve through which bearing the sleeve projects, means for engaging the projecting end of the sleeve to turn the clinker bar, and means for preventing the shaft from moving longitudinally through said sections and sleeve.

11. In a furnace having a front provided with an opening and a door opening, the combination with inclined grate-bars, of a bearer having sides adapted to be engaged by and to support the lower ends of said bars, a series of bearing-members extending across between said sides of the bearer, a clinker bar supported by said bearing-members and extending outward from the furnace front, a detachable plate adapted to be secured to the furnace front to close the opening therein and to form a bearing for the projecting end of the clinker bar, a bearing-member for the rear end of the clinker bar having a bearing of greater diameter than the diameter of the bar and provided with an opening in its upper side through which the bar may be lifted, a thimble upon the bar engaging said bearing, a hearth plate extending inward and down-

ward from the door in the furnace front to a point over and adjacent to the forward bearing-member, and a cap plate upon said forward bearing-member to fill the space between it and the lower edge of the hearth plate and detachably interlocked with said bearing-member and hearth plate.

12. In a furnace, the combination with inclined grate-bars and a bearer for supporting the lower ends of said bars, of a clinker-bar supported by said bearer and consisting of a shaft formed square in cross-section throughout its length and a series of sections on said shaft having square axial openings to receive the shaft and provided with teeth, a sleeve on the forward end of the shaft having a square axial opening to receive the shaft, a detachable plate adapted to be secured to the furnace-front and forming a bearing for the sleeve, said sleeve projecting through said plate and having an end adapted to be engaged by means for turning the clinker bar, and means for preventing the shaft from moving longitudinally through said sections and sleeve.

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

JOHN R. FORTUNE.

Witnesses:

OTTO F. BARTEHL,
ANNA M. DORR.