

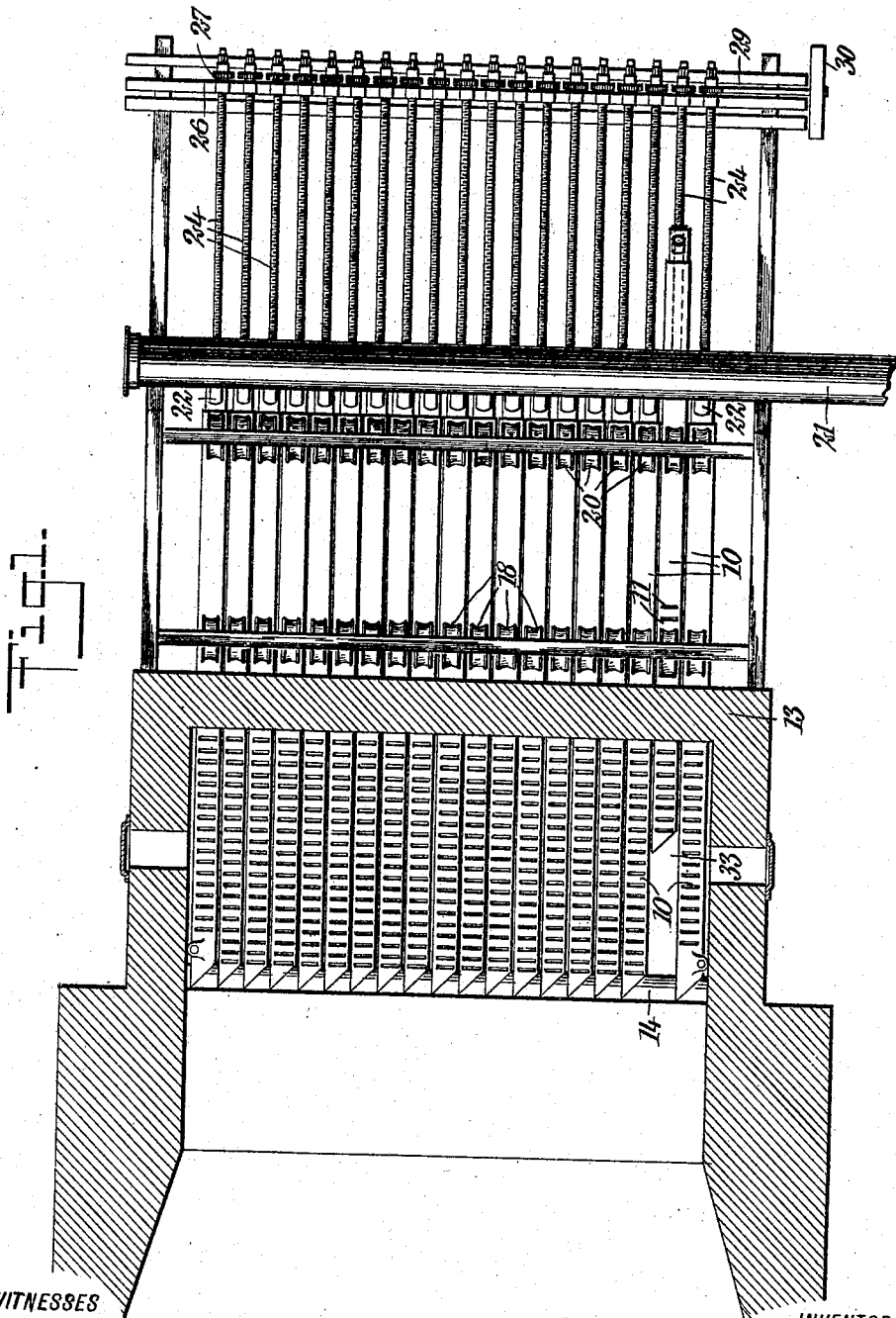
W. J. THOMAS.
FURNACE GRATE.

APPLICATION FILED DEC. 28, 1908.

937,487.

Patented Oct. 19, 1909.

3 SHEETS—SHEET 1.



WITNESSES

Ben. Jaffe

C. M. Fairbank

INVENTOR

William J. Thomas

BY Munn & Co

ATTORNEYS

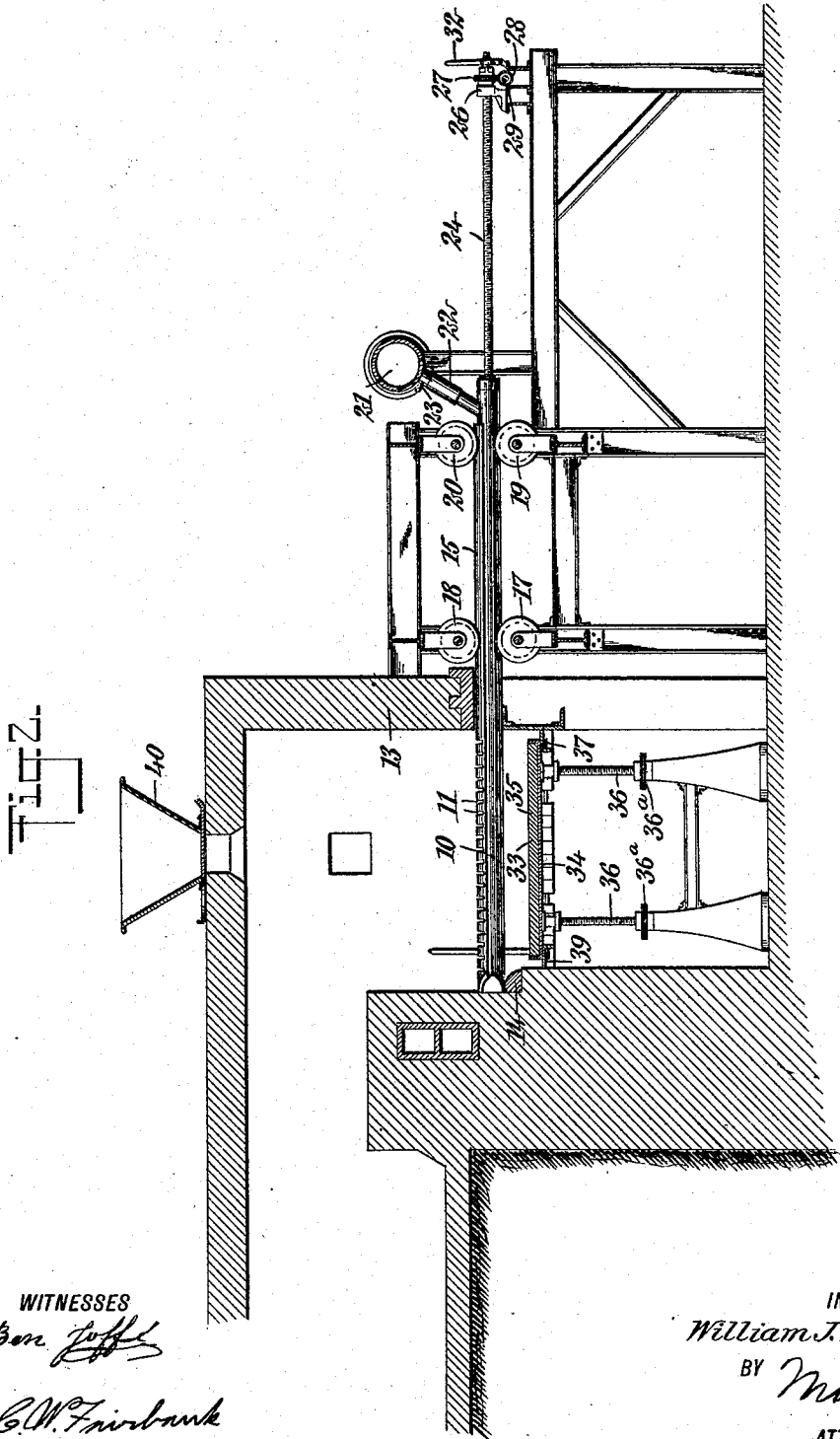
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 7-

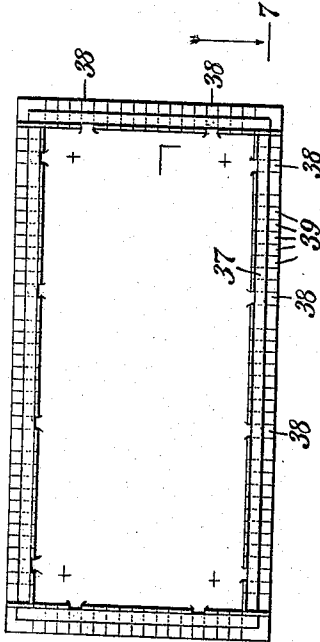
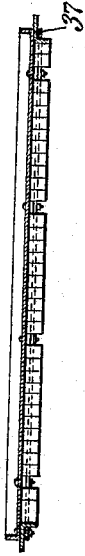


Fig. 6-

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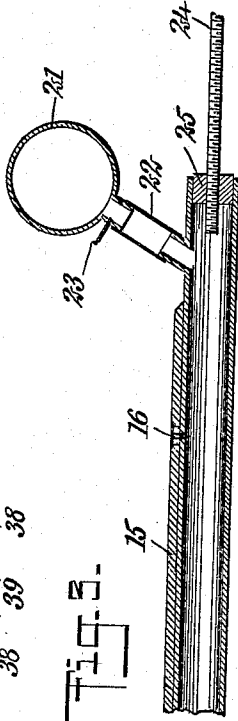


Fig. 5-

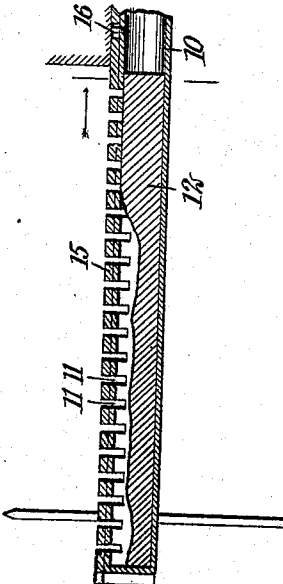


Fig. 4-

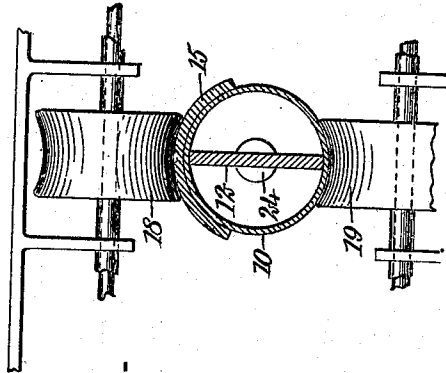
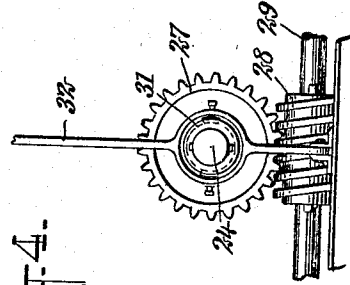


Fig. 5-



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UNITED STATES PATENT OFFICE.

WILLIAM J. THOMAS, OF SALT LAKE CITY, UTAH.

FURNACE-GRATE.

937,487.

Specification of Letters Patent.

Patented Oct. 19, 1909.

Application filed December 28, 1908. Serial No. 469,615.

To all whom it may concern:

Be it known that I, WILLIAM J. THOMAS, a citizen of the United States, and a resident of Waterloo, Salt Lake City, in the county of Salt Lake and State of Utah, have invented a new and Improved Furnace-Grate, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in furnace grates, and more particularly to that type of grate in which the grate bars are utilized as conduits for the delivery of air under pressure to the burning material.

One object of the invention is to so construct the parts that any one of the grate bars may be removed independently of the other bars and without interrupting the delivery of air through the latter.

A further important object is to permit of the removal of clinkers by the separate and successive removal and return of the grate bars, so that the clinkers and ashes will be supported on a tray or platform directly below the grate and from which they may be removed after all of the grate bars have been returned to place.

The controlling of the extent to which the clinkers, ashes and the entire body of burning material is dropped by the removal of the grate bars is another important feature of my invention, such control being accomplished by varying the elevation of the tray or platform prior to the removal of the grate bars.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a top plan view of an apparatus constructed in accordance with my invention, the furnace walls being shown in section; Fig. 2 is a side elevation of the apparatus shown in Fig. 1; Fig. 3 is a vertical section through one of the air delivery tubes and its operating mechanism; Fig. 4 is an end view of the operating mechanism shown in Fig. 3; Fig. 5 is an enlarged view of the tube-supporting means; Fig. 6 is an inverted plan view of the tray or platform which supports the clinkers and ashes during the removal of the grate bars; and Fig. 7 is a vertical section on line 7—7 of Fig. 6.

In my improved furnace I utilize the grate bars as conduits for the delivering of

air under pressure to the burning material; I provide for the separate removal of each of the grate bars independently of the others, and I provide means below the grate bars for supporting the ashes, clinkers and burning material, during the removal of the grate bars. Each of these features involves important structural details constituting parts of my invention. In the specific form illustrated I employ a plurality of grate bars, of any suitable form in cross section and each constituting a pipe or conduit and all arranged parallel and closely adjacent each other, to form a support for the burning material. Each bar or conduit is longitudinally movable out of the furnace, and means are provided for delivering air through each bar or conduit and to permit the escape of said air into the fire at a large number of separate points. The upper side of each conduit, along the portion thereof within the furnace, is provided with a series of transverse slots for the escape of the air, and this portion of the bar having said slots is reinforced and strengthened by a vertical partition or plate extending longitudinally of the bar. The several bars extend through apertures in the front wall of the furnace, and at their inner ends are supported by a transverse bar, having a curved outer surface. Each of the grate bars is pointed or wedge-shaped at its inner end and the curvature of the supporting bar is such that when the bar is forced inward longitudinally, it will strike the curved bar and rise to its proper position in case it has been depressed by the weight of the burning material above. The upper surface of each grate bar is provided with a protecting shield or cover, which is also provided with slots corresponding to the slots in the conduit. The cover or shield is movable longitudinally in respect to the conduit or bar, so that the effective size of the slots may be varied at will. Preferably, the bar along the portion outside of the furnace proper, is provided with radially-disposed bolts or rivets, operating in short slots in the casing or covering, so as to hold the two parts together but permit of a limited relative movement. Just outside of the furnace wall, I provide a supporting roller, having its periphery curved to fit the under surface of the grate bar, and directly above this roller is a second roller having its periphery curved to engage

with the upper surface of the grate bar or the cover or shield 15 thereof. The grate bar is longitudinally movable between these two rollers and is supported thereby. Preferably, a second pair of rollers 19 and 20 is employed for engaging with the bar at its outermost end, to counteract the weight of the burning material within the furnace, and upon the inner end of said bar.

The grate bars are arranged closely adjacent each other and substantially parallel as above indicated, and connected to all of the grate bars is a bustle pipe or main supply pipe 21. This pipe extends transversely of the several bars above the same and is connected to each of them by a branch pipe 22, including a detachable coupling. Preferably, the branch pipe 22 is formed of canvas or other flexible material, and encircles collars on the bustle pipe and the grate bar. This permits of a limited movement of the grate bar in respect to the bustle pipe without necessitating the shutting off of the air through the grate bar or the detaching of the two. The collar on the bustle pipe to which the canvas branch is secured, is preferably provided with a slide or other suitable form of valve 23, whereby the supply of air to any particular grate bar may be shut off before the branch pipe is removed and the grate bar drawn out of the furnace.

For withdrawing each grate bar, I provide a mechanism including a threaded rod 24 extending through a threaded aperture in the end 25 of the bar and having its opposite end held against longitudinal movement in a stationary bearing 26. The rotation of the threaded rod or screw 24 causes a longitudinal movement of the corresponding grate bar in a direction dependent upon the direction of rotation of the screw. For rotating the screw, the latter is provided with a worm-wheel 27 engaging with a worm 28 on a transverse shaft 29, which latter may be rotated by the connection of any suitable power to a pulley 30 on the end of the shaft. The shaft extends beneath all of the screws 24, and is provided with a separate worm-wheel for each, so that all of the screws 24 may be rotated simultaneously and all of the grate bars withdrawn at the same time. Each worm wheel 27 is connected to the screw through a clutch collar 31, movable longitudinally of the screw by means of a lever or handle 32. With the handle in one position, the rotation of the shaft 29 and the worm-wheel 27 will have no effect whatever upon the screw 24, while when the lever or handle is in the opposite direction, the screw will be rotated and the grate bar moved into or out of the furnace depending upon the direction of rotation of the shaft. As each clutch collar has its own handle or lever, it is evident that any one of the grate bars or any combination of them may be

moved independently of the remaining grate bars.

Directly below the grate bars is a platform, tray or table 33, which serves to support the clinkers, ashes and burning material upon the removal of the grate bars. This platform is preferably formed with a metal base 34 lined on its upper surface with fire brick 35, and provided with means for raising and lowering the platform to vary the distance between it and the grate bars. The means for varying the elevation is illustrated as including four screw jacks 36, which engage with the platform adjacent the four corners thereof and which may be operated simultaneously by the engagement of a chain, not shown, with four sprocket wheels 36^a. The platform is provided with separate slides around the edges thereof, which may be moved to permit a rod or bar to be extended upwardly into the fire to break loose any clinkers which may adhere to the furnace wall. A narrow bar 37 is supported adjacent to but spaced from the under surface of the body of the platform, and this bar is secured to said body at intervals by rivets extending through spacing pieces 38. Intermediate adjacent pieces are small slides 39, each of which has an inner downturned end and an outer end movable into engagement with the furnace wall. With all of the slides in their outermost position, as indicated in Figs. 2, 6 and 7, the platform closes the space below the grate bars substantially air-tight, so that all of the air which is delivered through the grate bars must pass upwardly through the fire to support combustion. Any one of the slides may be pulled back to leave a small opening, up through which a bar may be forced, but the slides are normally in their outermost position.

In the operation of my improved furnace, the fuel is supported directly on the grate bars and air is delivered under pressure to the slides in each of said bars. When it is desired to remove the accumulated ashes and clinkers on the grate bars, the platform is moved upwardly to a position at a distance from the under side of the grate bars equal to the depth of the accumulated ashes and clinkers. The grate bars are then removed one at a time and immediately returned, so that successive portions of the material above the grate is permitted to drop down onto the platform. The grate bars being pointed at their inner ends are easily forced back into position, and when all of them have been removed and returned, they in their new position, will subdivide the completely burned material, that is, the ashes and clinkers, from the unburned and burning material above. After the grate bars have been returned to position, the platform 33 is lowered and the material carried

thereby is removed in any suitable manner. The shutting-off of the supply of air through one grate bar is not sufficient to materially interfere with the process of combustion, and there is no necessity for shutting off the air through more than one grate bar at a time. Any grate bar may be moved outwardly a short distance, and the slide or slides 39 beneath the end may be moved inwardly to permit a bar to be projected up into the fire, or either one of the two side grate bars may be moved outwardly to the limiting extent to permit the upward movement of a dislodging bar at any point along the side.

The details of the furnace other than as far as they involve the grate bars and platform, do not involve any material feature of my invention. The furnace shown is a simple type of a reverberatory furnace, in which the fuel is inserted through a slide-controlled hopper 40 in the top, but it is evident that my improved form of grate construction may be employed in various other types of furnaces.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A furnace having a plurality of hollow grate bars, each having a series of openings therein, means detachably connected to each of said bars for delivering air therethrough, and means for removing any one of said bars without shutting off the supply of air to the remaining bars.

2. A furnace having a plurality of hollow grate bars, each having a pointed inner end, means for engagement with the outer end of each of said bars for withdrawing it longitudinally, guides outside of said furnace for supporting said bars, and means detachably connected to each bar for delivering air therethrough.

3. A furnace having a furnace wall, a plurality of grate bars extending therethrough, a pair of supporting rollers in engagement with the upper and the lower side of each grate bar outside of said furnace, and at a distance from said wall, and means for engagement with each of said grate bars for removing the same longitudinally between its corresponding rollers.

4. A furnace having, in combination, a plurality of grate bars, a platform beneath said grate bars for supporting the fire independently of the grate bars, and a plurality of slides carried by said platform and movable into engagement with the furnace walls.

5. A furnace having in combination, a grate, a platform beneath the grate and serving to support the fire independently of the grate upon the removal of the latter, means for varying the elevation of said platform, and a plurality of slides carried by said platform for sealing the space between the edges of the platform and the furnace walls.

6. A furnace having in combination, a series of grate bars, each constituting a hollow conduit, a vertical partition extending longitudinally through each conduit, and a curved shield or shell in engagement with the upper surface of each bar, said bar and said shield having registering outlet openings and said shield and bar being relatively movable to control the outflow of air through said openings.

7. A furnace having in combination, a plurality of grate bars, a plurality of screws held against longitudinal movement and having threaded engagement with said bars, a plurality of worm-wheels carried by said screws, a shaft having a plurality of worms in engagement with said worm wheels, whereby all of said grate bars may be moved longitudinally by the rotation of said shaft, and means for independently controlling the movement of said screws with respect to said shaft.

8. A furnace having in combination, a plurality of grate bars, each constituting a hollow conduit having a plurality of outlet openings in its upper side, means for removing each of said grate bars longitudinally out of the furnace, a bustle pipe extending transversely of said grate bars outside of the furnace, and a series of branch pipes connecting said bustle pipe with each of said grate bars.

9. A furnace having in combination, a plurality of grate bars, each constituting a hollow conduit having a plurality of outlet openings in its upper side, means for removing each of said grate bars longitudinally out of said furnace, a bustle pipe extending transversely of said grate bars outside of the furnace, and a series of branch pipes connecting said bustle pipe with each of said grate bars, each of said branch pipes including a cut-off and a detachable connection.

10. A furnace having, in combination, a plurality of removable grate bars, each constituting a hollow conduit having an outlet or opening within the furnace, a pipe extending transversely of said bars outside of the furnace and connected to each of them for delivering air thereto, a shaft extending transversely of said pipes outside of the furnace, and connections between said shaft and said bars, whereby the latter may be withdrawn from the furnace upon the rotation of the shaft.

11. A furnace having, in combination, a plurality of grate bars extending to the exterior thereof, supports for said bars outside of said furnace, a shaft extending transversely of said bars, and connections between said shaft and each of said bars whereby all of said bars or any desired number of them may be moved longitudinally upon the rotation of the shaft.

12. A furnace having, in combination, a plurality of grate bars, each having a pointed inner end, a plurality of supporting and guiding rollers for each of said grate bars
5 outside of the furnace and serving to retain the grate bars in a single plane, and mechanism for moving all of said grate bars or any desired number of them longitudinally.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM J. THOMAS.

Witnesses:

N. LLOYD STEWART,
HENRY F. GOSS.