

J. B. LEONARD AND J. F. DIRZUWEIT.
STOKER FURNACE.

APPLICATION FILED JAN. 2, 1920.

1,403,609.

Patented Jan. 17, 1922.

4 SHEETS—SHEET 1.

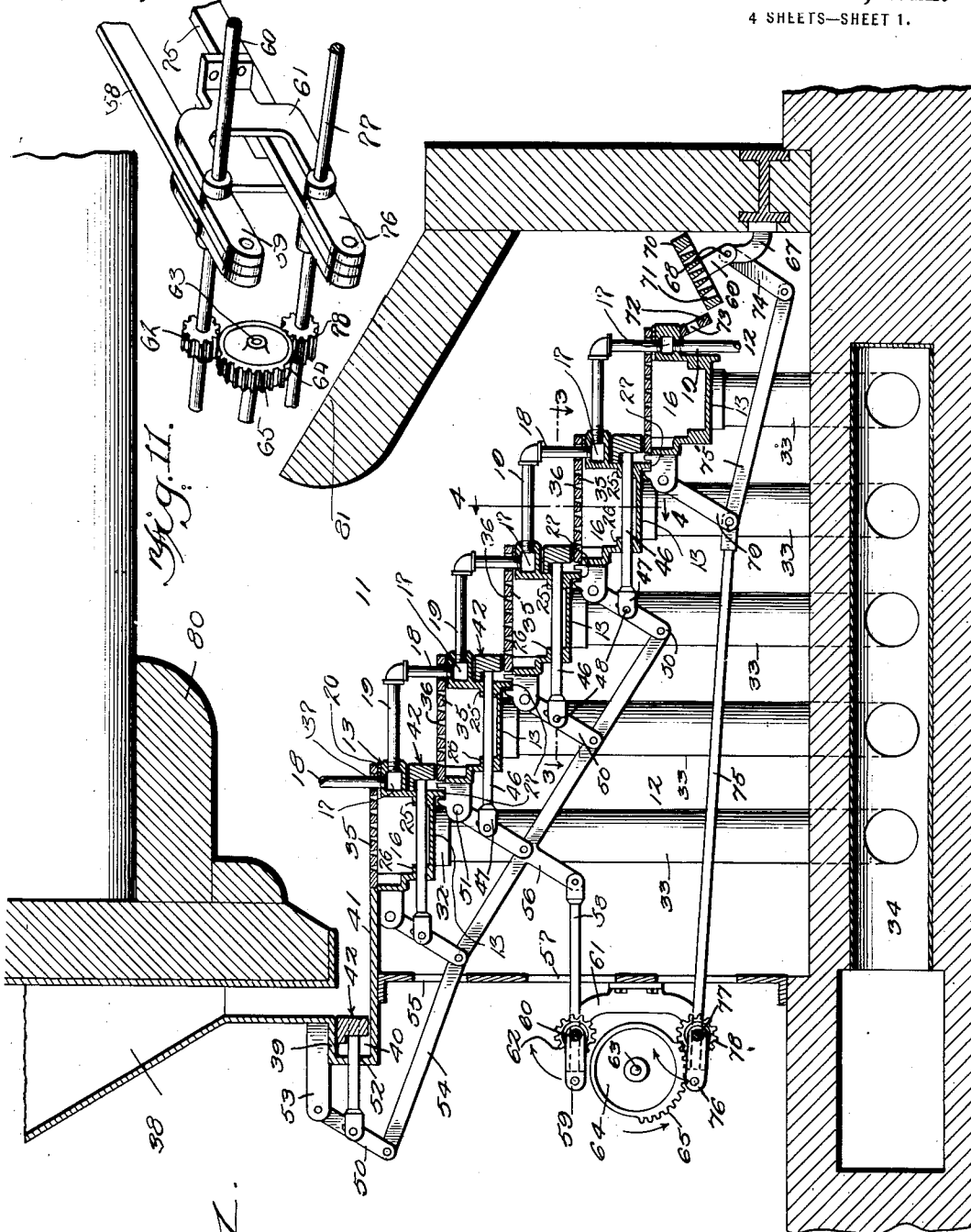


Fig. 1.

Fig. 11.

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STOKER FURNACE.

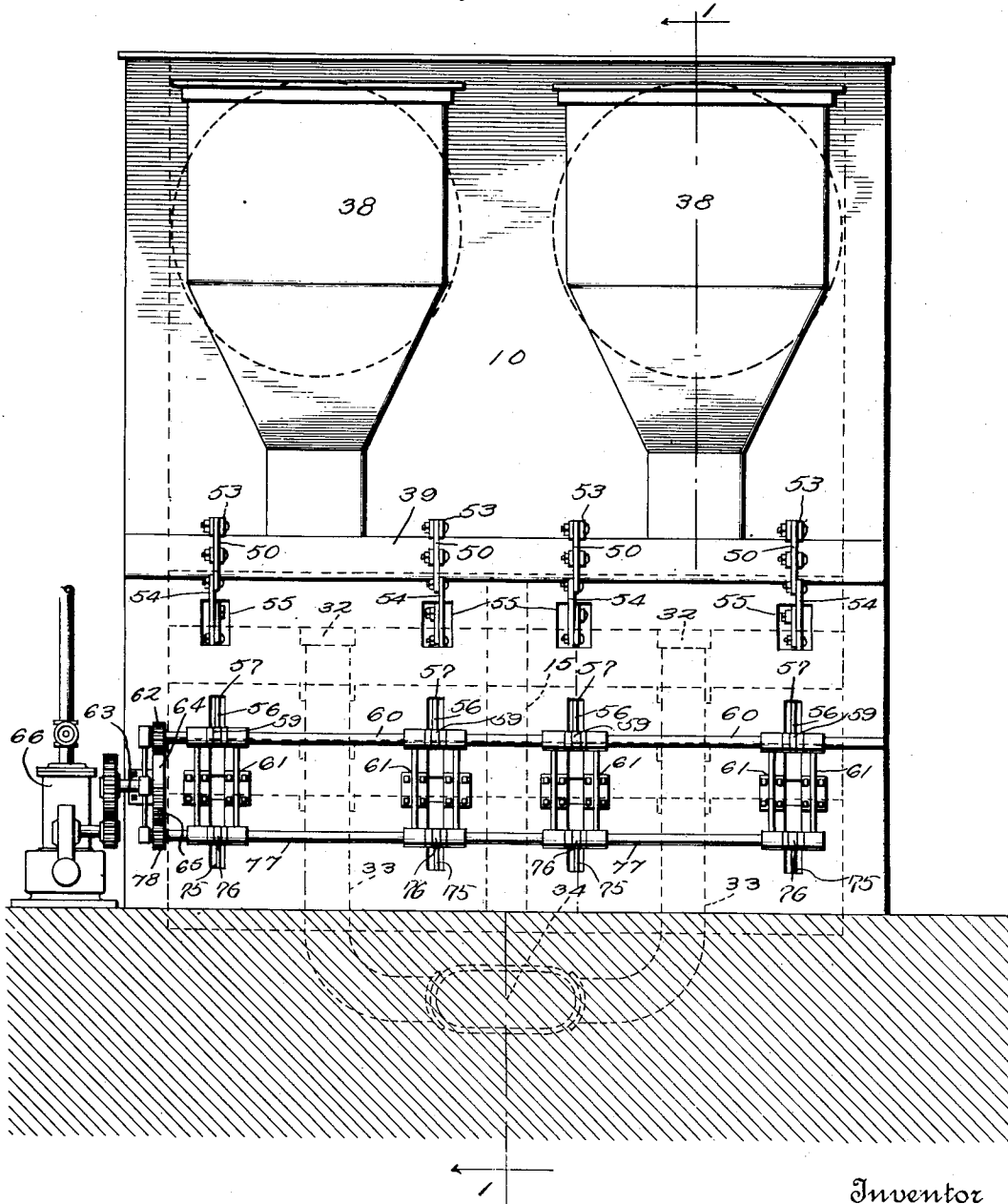
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4 SHEETS—SHEET 2.

Fig. 2.



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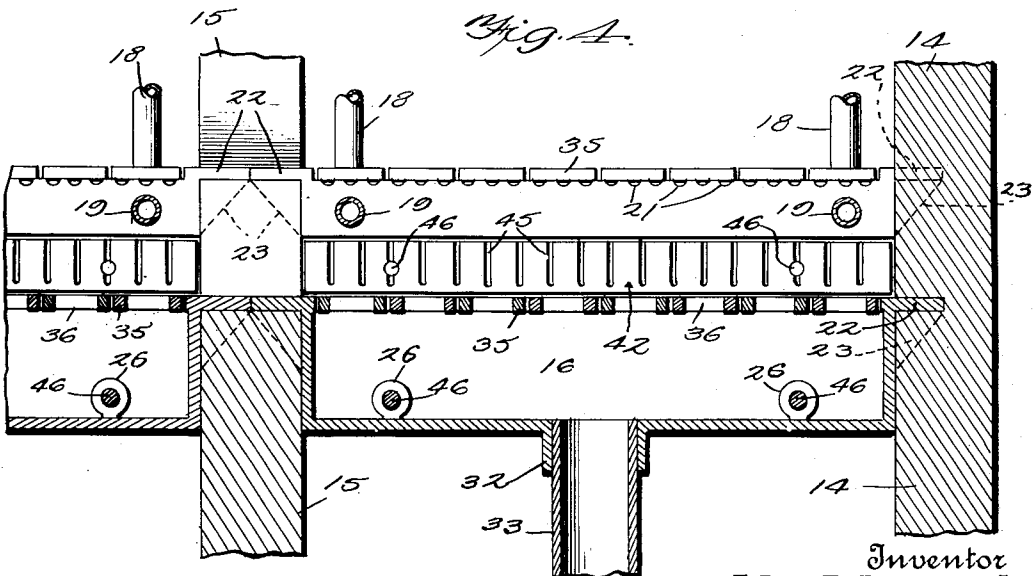
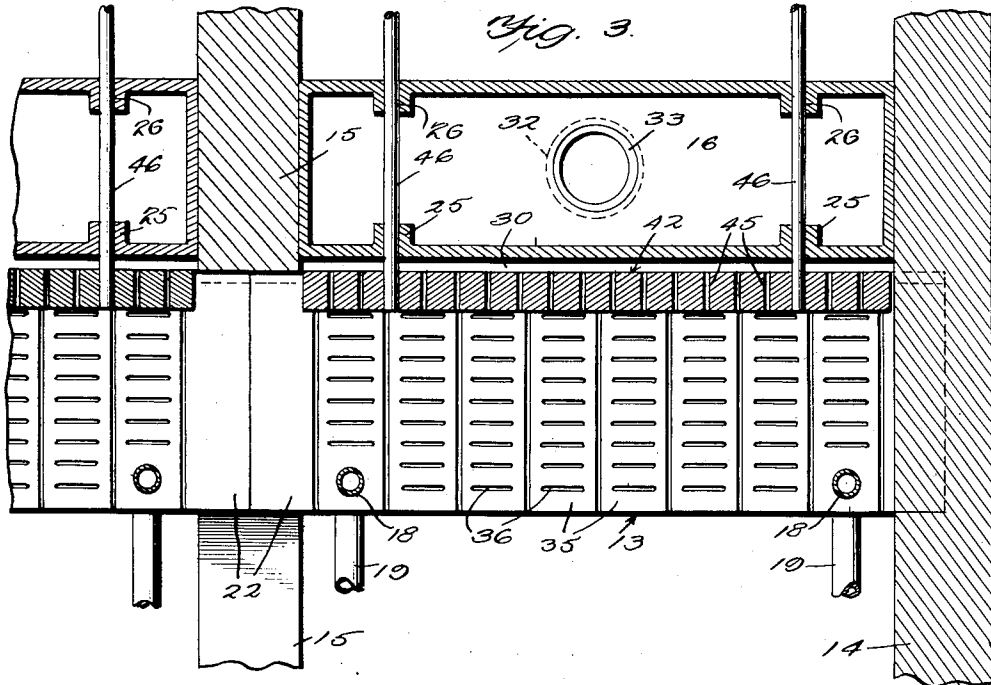
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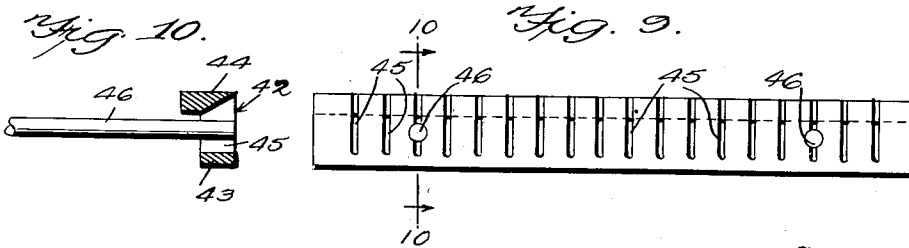
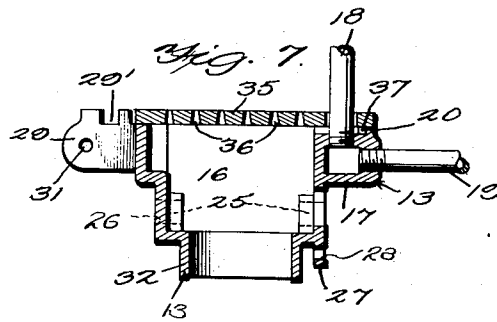
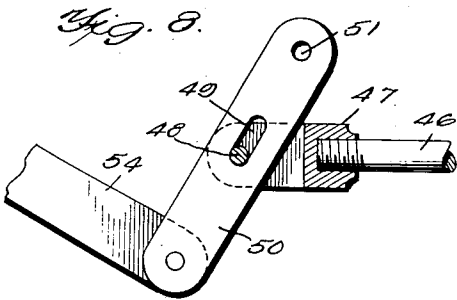
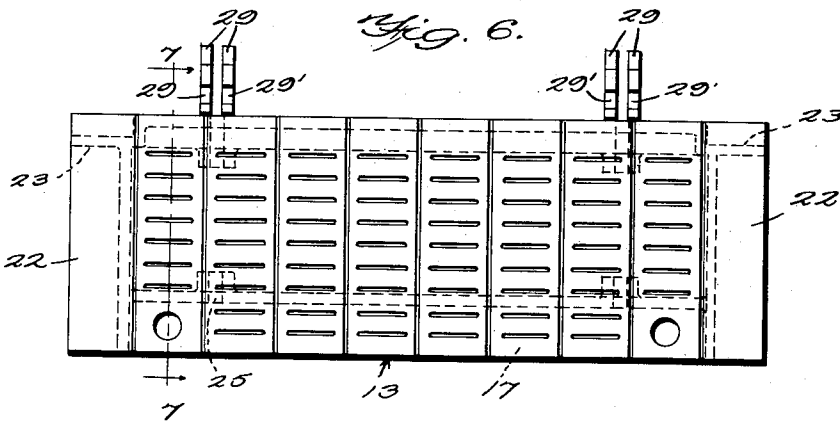
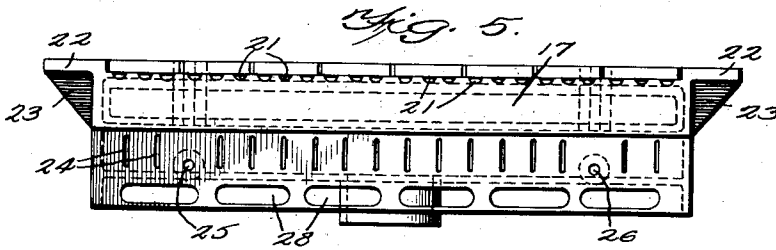
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UNITED STATES PATENT OFFICE.

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A CORPORATION OF MARYLAND.

STOKER-FURNACE.

1,403,609.

Specification of Letters Patent. Patented Jan. 17, 1922.

Application filed January 2, 1920. Serial No. 348,762.

To all whom it may concern:

Be it known that we, JOHN BIRCH LEONARD and JOHN F. DIRZUWEIT, citizens of the United States, residing in the city of Baltimore and State of Maryland, have invented certain new and useful Improvements in Stoker-Furnaces, of which the following is a specification.

This invention relates to improvements in stoker furnaces.

An important object of the invention is to provide an efficient furnace wherein comminuted fuel may be used.

A further object is to provide an automatic furnace which is simple in construction, cheap to manufacture and the parts of which are readily replaced when destroyed by prolonged use.

Other objects and advantages will be apparent throughout the course of the following description.

In the accompanying drawings wherein for the purpose of illustration is shown a preferred embodiment of our invention and wherein like reference characters designate like parts throughout,

Figure 1 is a sectional view taken through a furnace embodying our invention taken on line 1—1 of Figure 2,

Figure 2 is a front elevation thereof,

Figure 3 is a section taken on the line 3—3 of Figure 1,

Figure 4 is a section taken on the line 4—4 of Figure 1,

Figure 5 is a rear elevation of one of the twyer boxes,

Figure 6 is a plan view thereof;

Figure 7 is a section taken on the line 7—7 of Figure 6,

Figure 8 is an enlarged detail view showing the link connection,

Figure 9 is a rear elevation of a pusher bar,

Figure 10 is a section taken on the line 10—10 of Figure 9, and

Figure 11 is a perspective view of a portion of the operating shafts and associated elements.

Referring now more particularly to the drawings the numeral 10 indicates a furnace as a whole having therein the usual steam and water drums.

The lower portion of the furnace is divided into a fire box 11 and an ash pit 12 by

a step-like arrangement of twyer boxes 13. In the present illustration wherein the furnace is shown as embodying two series of twyer boxes the outer ends of the twyer boxes are embedded in the side walls 14 of the furnace and the inner ends rest upon a central supporting wall 15.

Each of the twyer boxes 13 comprises a rectangular box-like structure 16 provided upon its rear face, or that face which when the twyer box is in its proper position faces the rear of the furnace with a longitudinal water chamber 17. This water chamber 17 projects beyond the normal rear wall of the box like structure 16 and has a depth of approximately one-half of the depth of the twyer box proper. At each end the water chamber 17 is provided with a vertical opening which receives an inlet pipe 18 and a horizontal rearwardly extending opening which receives an outlet pipe 19. The inlet pipes 18 of the uppermost of the twyer box of each series are connected with any suitable source of water supply and the outlet pipes 19 of the lowermost twyer box of each series form the feed water supply pipes for the furnace. Each of the water chambers 17 is provided upon the rear of its upper surface with an upstanding ridge 20, the top of which lies in the same plane as the top of the twyer box proper. This ridge is provided with spaced air outlet openings 21.

The ends of the twyer boxes are provided with horizontal flanges 22 braced by vertical flanges 23. In placing the twyer boxes in position at the ends of the twyer boxes which enter the side wall of the furnace, the flanges 22 and 23 are embedded in the wall while at the ends which engage the supporting wall the flanges 22 rest upon the supporting wall and the flanges 23 are embedded therein. The rear faces of the twyer boxes below the water chambers 17 are provided with spaced air outlet openings 24.

In the front and rear walls of each of the twyer boxes are arranged alined pairs of bearings 25 and 26 for a purpose hereinafter to appear. The rear wall of the twyer box extends downwardly as at 27 below the bottom level of the twyer box proper and is provided with ash outlet openings 28, the purpose of which will presently appear. Upon its front face the twyer box is pro-

vided with spaced pairs of ears 29 having formed in their upper surface notches 29', spaced from the front wall of the twyer box, which are adapted to receive the depending portion 27 formed on the rear face of the twyer box next above. It will be obvious that between the rear wall of one twyer box and the front wall of the twyer box next below a space 30 is formed as clearly shown in Figure 3. The ears 29 have formed therein openings 31 for a purpose presently to appear.

The bottom of each twyer box is provided with a circular depending flange 32 adapted to receive the upper end of a branch pipe 33 which communicates with a conduit 34 through which is forced air under pressure. Mounted upon the upper faces of the twyer boxes are plates 35, having openings 36 formed therein to allow the passage of air. The two end plates of each twyer box are provided with openings for the reception of the inlet pipes 18 and are held in position by these pipes. The remaining plates may be held in position in any desired manner as for example by means of lugs 37 formed upon the bottoms of the plates 35 and abutting the shoulders 20 formed upon the water chambers 17. Mounted upon the front wall of the furnace are hoppers 38 having offsets 39, forming pockets 40. The bottom of each pocket 40 is formed by a dead plate 41 which is flush with the top of the uppermost twyer box 13. Slidably mounted in the pockets 40 and in the pockets formed by the overhanging water chambers 17 are pusher bars 42. Each pusher bar comprises a vertical portion 43 and a horizontal portion 44 integral with and of greater width than the vertical portion 43. Formed in the pusher bars are air outlet openings 45.

Secured to the pusher bars 42 are push rods 46. Each of the rear ends of the push rods 46 has secured thereto in any suitable manner a bifurcated member 47 which carries the pin 48. These pins operate in slots 49 formed in levers 50 which are pivotally connected to the ears 29 by means of pins 51 extending through the openings 31 thereof. The push rods of the pusher bars 42 which are mounted in the pockets 40 extend through openings 52 formed in the walls of the pockets. Secured to the hopper in any desirable manner are supporting arms 53 to which the levers 50 which connect with the push rods 46 of the pusher bars are pivoted. Bars 54 extend through slots 55 formed in the front wall of the ash pit 12 and are pivotally connected to the levers 50. The bars 54 are provided within the furnace with arms 56.

Connecting rods 58 extend through slots 57 formed in the wall of the furnace and are pivotally connected with the arms 56. These connecting rods have their opposite ends

pivotally connected with cranks 59 formed on a shaft 60 journaled in suitable brackets 61. This shaft bears a pinion 62. A power shaft 63 is provided having thereon a segmental gear 64 having a sufficient number of teeth as at 65 to cause the pinion 62 to perform a complete revolution at each engagement of the teeth 65 therewith. This power shaft 63 is driven at a low rate of speed by any suitable prime mover 66.

Secured to the bridge wall of the furnace below the lowermost twyer box are brackets 67 having rotatably mounted therein shafts 68. Supports 69 are secured to the shafts 68 and carry dumping grates 70 having air openings 71 formed therein. Secured to the rear face of each lowermost twyer box is a deflecting plate 72 having air openings 73 formed therein. Each deflecting plate has its lower edge arranged adjacent to the upper edge of the corresponding dumping grate 70. An arm 74 is secured to each shaft 68 and is pivotally connected with one end of a connecting rod 75'. The opposite end of each link 75' is pivotally connected with the inner end of a connecting rod 75. The outer end of each link 75 is pivotally connected with a crank 76 formed on a shaft 77, also mounted in bearings formed in the brackets 61. This shaft 77 is provided with a pinion 78 of the same size as the pinion 62 and adapted to engage the teeth 65 of the gear 64. The connecting rods 75 may be supported by links 79 pivoted to the ears 29 of the lowermost twyer boxes 13.

The operation of our furnace is as follows:

Fuel is fed from the hopper 38 and moved by the pusher bar 42 adjacent the bottom thereof outwardly upon the uppermost of the twyer boxes 13 where the fuel is supplied with air for combustion. As the movement of the fuel continues the fuel from the uppermost twyer box passes downwardly upon the second of the twyers and so on downwardly until it arrives upon the dumping grate 70. Here the fuel is almost if not entirely consumed, and supplied with sufficient air to prevent any loss of fuel. The operation of the ash support 70 dumps the ashes periodically into the ash pit 12.

In event of any ash passing back of the pusher bars 42, this ash is passed downwardly into the pit through the openings 30 and through the openings 28 formed in the rear face of the twyer boxes. Air for combustion is also supplied to the fuel through the openings 24 formed in the rear faces of the twyer boxes and the openings 45 formed in the pusher bars.

The fuel in its downward passage heats the water in the water chambers 17. These water chambers have therefore a double function, that of heating the water for supply to the boiler and that of cooling the

rear end of the twyer box to prevent burning out thereof by the flames. In order that the flame may be more fully directed against the steam and water drums of the furnace and that combustion may be complete we have provided a coking arch 80 to assist in the combustion and a deflecting arch 81 which tends to direct the flames upwardly against these drums.

10 It is to be understood that the form of our invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size, and arrangement of parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

What we claim is:

1. In a furnace, a fuel support comprising a plurality of twyer boxes arranged in stepped formation, each of said twyer boxes including a rear wall, said twyer boxes being provided with extensions projecting rearwardly of the rear walls of the twyer boxes to form recesses, means carried by each of said twyer boxes upon the front face thereof for supporting the rear end of the next upper twyer box, pusher bars normally disposed within said recesses, and means for actuating said pusher bars.

30 2. In a furnace, a fuel support comprising a plurality of twyer boxes arranged in stepped formation, each of said twyer boxes including a rear face, said twyer boxes being provided upon their rear faces adjacent the upper edges thereof with water chambers, comprising longitudinally extending portions projecting rearwardly of the rear walls of the twyer boxes, said water chambers overhanging the next lower twyer boxes and forming therewith recesses, pusher bars normally disposed within the recesses, and means for periodically actuating said pusher bars.

3. In a furnace, a fuel support comprising a plurality of twyer boxes arranged in stepped formation, each of said boxes being provided upon its rear face adjacent the upper edge thereof with a water chamber comprising a longitudinally extending portion overhanging the next lower twyer box and forming therewith a recess, said water chambers being connected in series, pusher bars normally disposed within the recesses for assisting in the rearward motion of the fuel bed, and means for actuating said pusher bars.

4. In a furnace, a fuel support comprising a plurality of twyer boxes arranged in stepped formation, a plurality of series of pusher rods slidably mounted in said twyer boxes, pusher bars secured to said rods, a plurality of series of levers pivotally connected with said twyer boxes, said pusher rods being pivotally connected to said levers intermediate the ends thereof, bars connecting the lower ends of the levers of each series, a crank-shaft, a pinion mounted on said crank-shaft, cranks carried by said crank-shaft, connecting rods pivotally connected with said cranks and said bars, a grate pivotally mounted rearwardly of the lowermost twyer box, rocker arms connected with said grate, a second crank-shaft, a pinion mounted on said last named shaft, cranks carried by said last named shaft, means pivotally connected with said last named cranks and said rocker arms for dumping said grate, a third shaft, a mutilated gear mounted upon said last named shaft and adapted to mesh with said pinions, and means for rotating said last named shaft.

In testimony whereof we affix our signatures.

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JOHN F. DIRZUWEIT.