

March 7, 1950

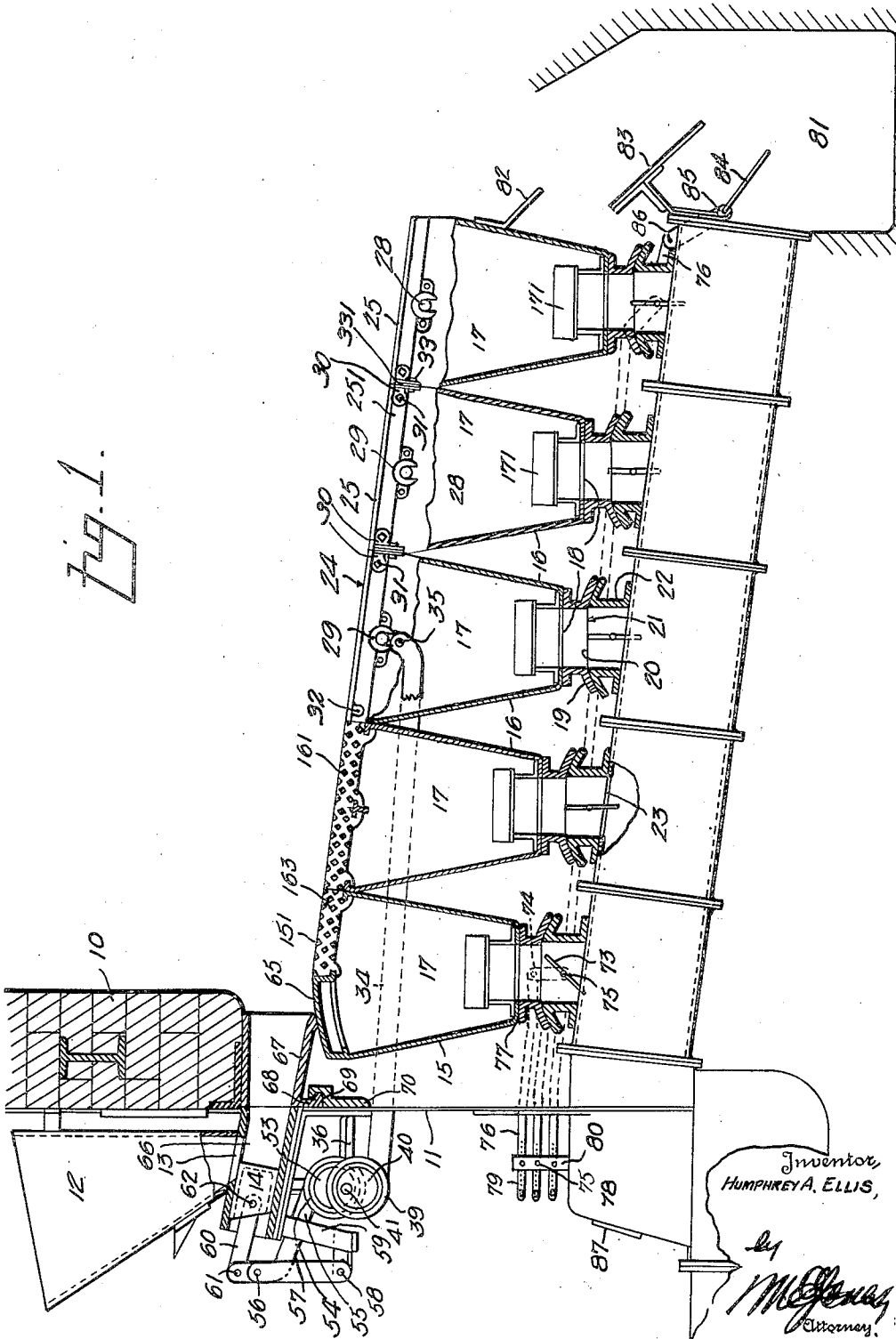
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2,499,735

AUTOMATIC CRADLE TYPE STOKER

Filed May 10, 1946

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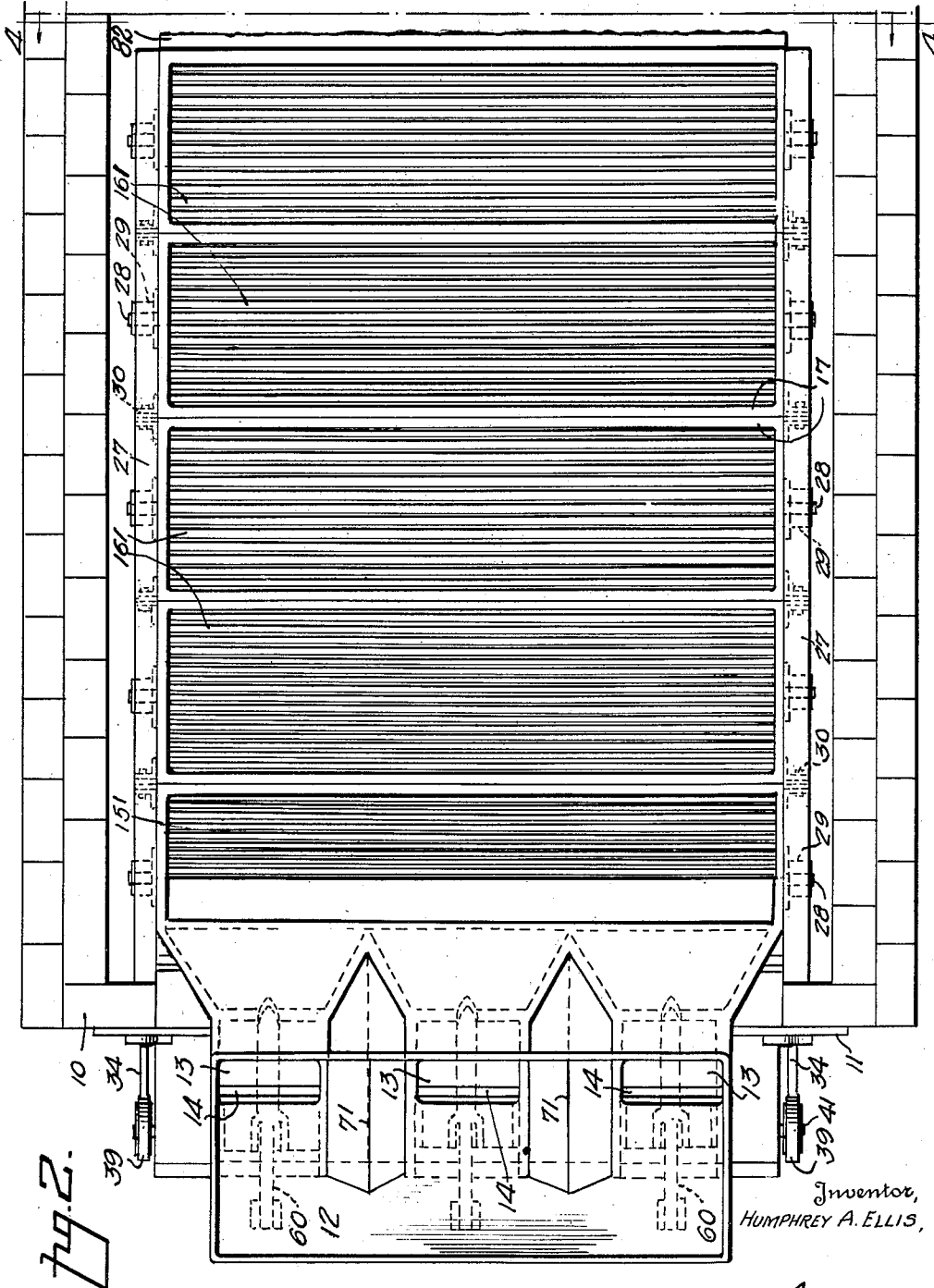
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AUTOMATIC CRADLE TYPE STOKER

Filed May 10, 1946

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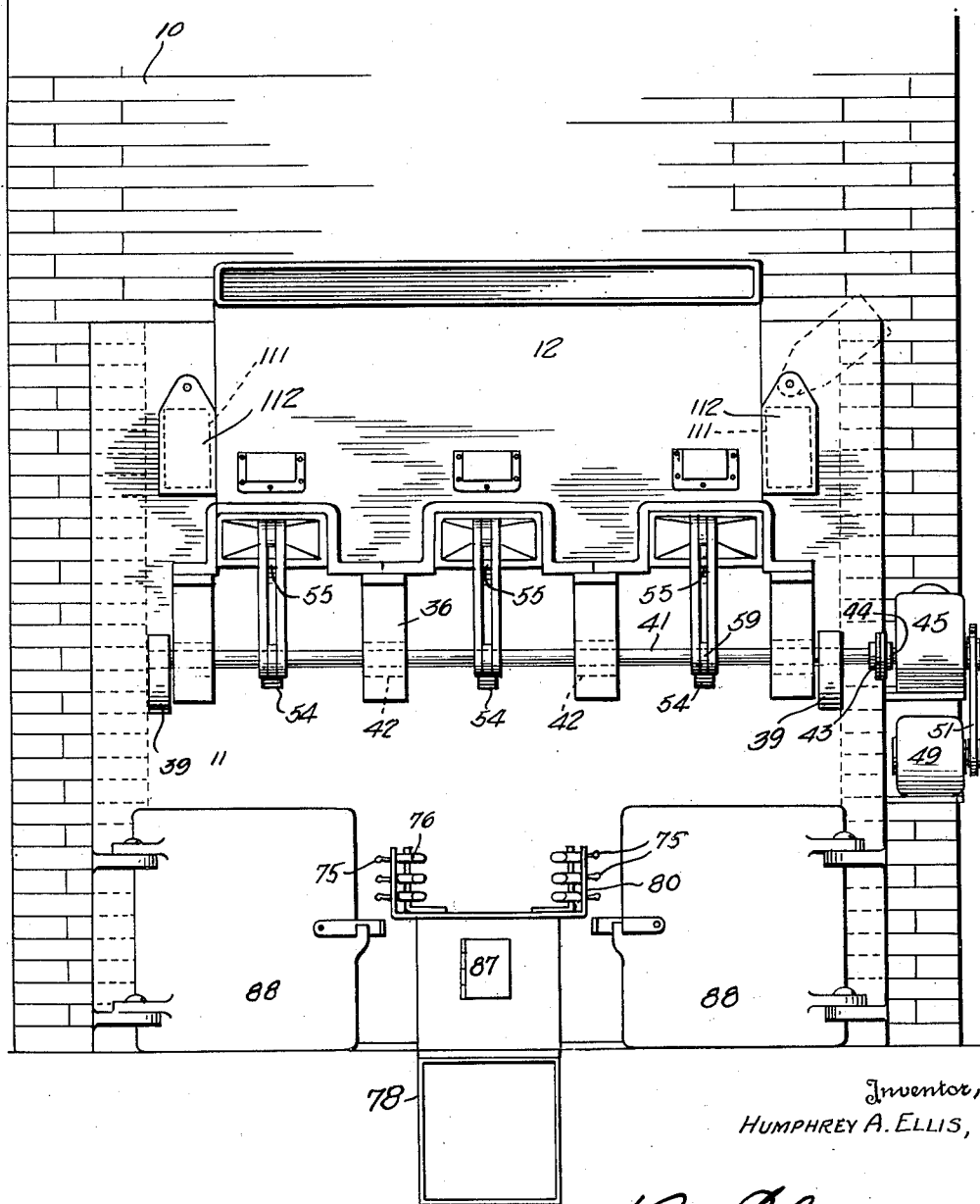
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AUTOMATIC CRADLE TYPE STOKER

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Fig. 3.



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AUTOMATIC CRADLE TYPE STOKER

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Fig. 4.

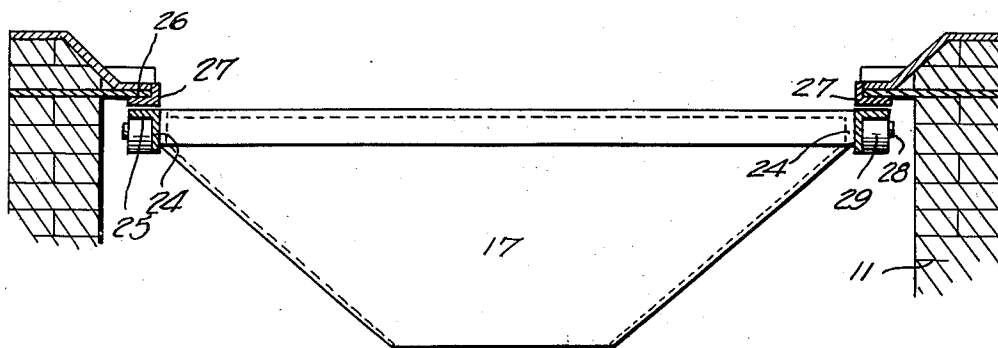


Fig. 5.

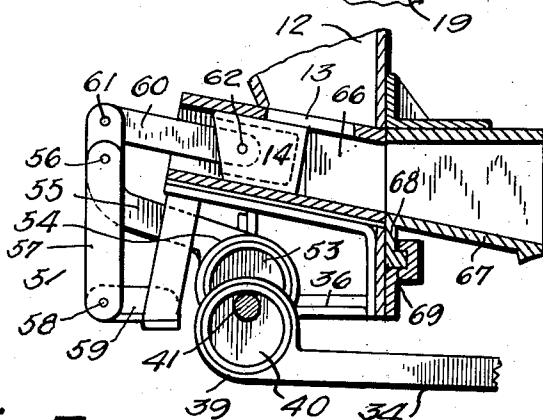


Fig. 6.

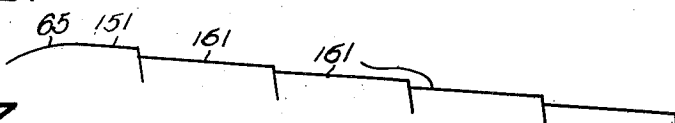
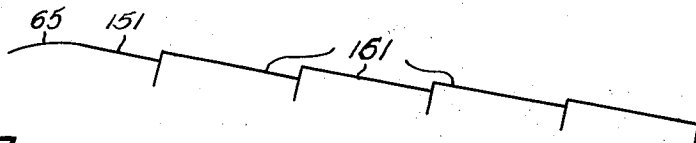
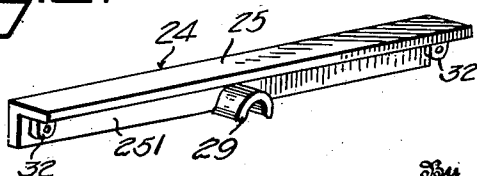


Fig. 7



79. 8.



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Filed May 10, 1946

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fig. 9.

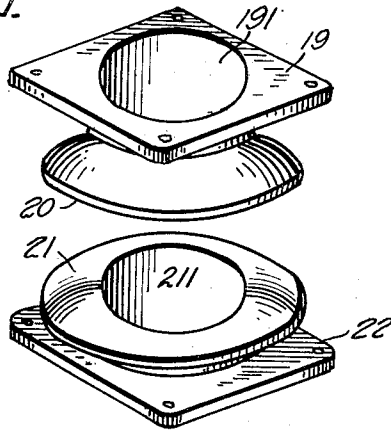


fig. 10.

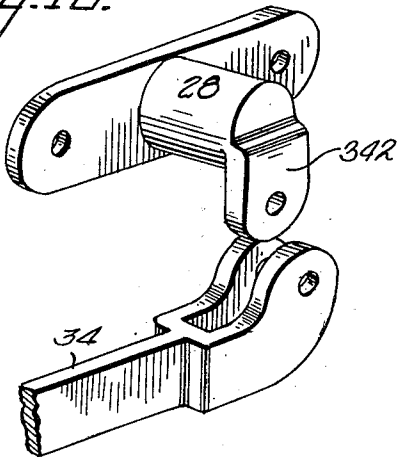


fig. 11.

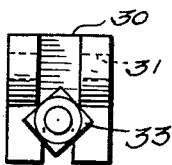
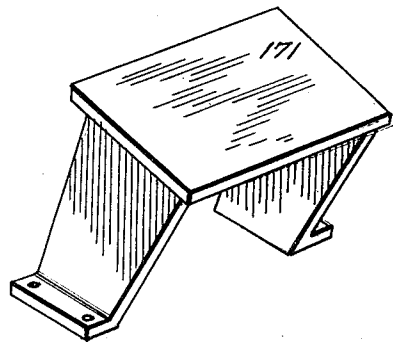


fig. 12.

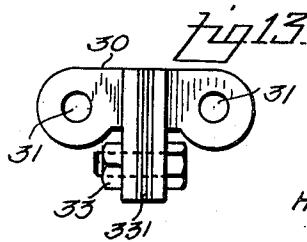


fig. 13.

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2,499,735

AUTOMATIC CRADLE TYPE STOKER

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Application May 10, 1946, Serial No. 668,917

11 Claims. (Cl. 110—39)

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This invention relates to an automatic cradle type stoker and it aims generally to provide a more efficient, practical and durable construction which will burn all grades of coal in minimum time, without manual intervention, and at reduced cost in manufacture, installation and operation.

A further desideratum is to provide an organization of parts which will maintain the fuel bed of uniform thickness and density, will have a novel motion to agitate the fuel bed to break up coking formations and to discharge ashes and which, more in detail, while fuel is being fed forward by ram means, will move the entire fuel mass in the opposite direction or toward the supply of fuel to meet or abut it to break up or crush the fuel bed. I prevent formation of a dense coking mat and maintain uniform porosity.

Further objects are to provide a construction having a plurality of movable grate sections, certain of which contain air distributing compartments beneath grates proper associated with forced air feeding means; such a construction wherein the forced air feeding means has duct means with connections between same and the associated sections engaging on curved wiping surfaces; a construction in which one of the sections at its top forms a hearth and coacts with a removable fuel feed plate means resting at one end thereon and interfitted with the furnace wall; a construction wherein the grate sections are unitarily movable and have bearing engagement with sealing bars pivotally connected by links; a construction wherein the grate sections are inclined forwardly and are unitarily movable in a direction in opposition to motion of a ram means to facilitate breaking up the caking or coking of bituminous coal to obtain better combustion within the fuel bed; a construction affording a novel mounting and drive for the ram means; a construction wherein all grate sections in the main are capable of manufacture by use of the same pattern; and a construction having novel valves, gates or equivalent means to control the admission of forced air into each of the aforesaid distributing compartments.

The present application is a continuation in part of my abandoned application Serial Number 344,824, filed July 10, 1940, and my abandoned application Serial Number 454,585, filed August 12, 1942, each for an automatic cradle type stoker.

Various objects and advantages additional to those mentioned will in part be pointed out and become evident from a consideration of the description following taken in connection with the

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accompanying drawings illustrating an operative embodiment.

In said drawings:

Figure 1 is a view primarily showing the stoker or grate in central longitudinal section and in connection with a feed hopper and brick setting, the latter being shown in longitudinal section and partly broken away;

Figure 2 is a view of the parts of Figure 1 showing the setting in horizontal section and the other parts in plan;

Figure 3 is a front elevation;

Figure 4 is a detail vertical section taken on the plane of line 4—4 of Figure 2;

Figure 5 is an enlarged longitudinal sectional detail of the ram actuating eccentric means;

Figure 6 is a diagram of the grate surfaces when at their front limit of movement;

Figure 7 is a diagram of the upper or grate surfaces of the grate sections when at their rearward limit of movement;

Figure 8 is a perspective view of one of the sealing bars for the grate sections;

Figure 9 is a perspective view showing the air duct connection between the main air duct and grate sections, the sections of the connection being separated to disclose their details;

Figure 10 is a fragmentary view in perspective showing the shaker bar connection to the stud bracket of one of the stoker sections;

Figure 11 is a perspective view of one of the air deflectors employed in the stoker sections;

Figures 12 and 13, respectively, are end and side views of one of the links used in articulately connecting the stoker sections to the bearing and sealing bars.

Referring specifically to the drawings, wherein like reference characters designate like or similar parts throughout the different views, the structure is installed or built into a brick, usually metal-reinforced, or other suitable setting as at 10 having a usual discharge chimney (not shown). A metallic front wall is provided at 11 onto which a coal hopper 12 is built or attached. At the bottom of the hopper, I provide one or more feed openings 13 through which the coal falls by gravity for feed into the stoker by reciprocatory or oscillatory motion of one or more rams 14.

The fuel which passes through the openings 13 forms a bed of approximately uniform depth on the upper surfaces of stoker sections 15 and 16, only one of the former being used and any desired number of the latter being employed.

Sections 15 and 16 primarily consist of metallic boxes or compartments 17 provided with

suitable grates across the top. The grate of section 15 is designated 151 and the grates of the sections 16 are designated 161. While the grates 151 and 161 specifically form no part of the invention, they may be built up in any suitable way and it is to be understood that they may be arranged most advantageously and usually above the boxes to minimize burring of the grates, and also that the grate bars may optionally be arranged at a right-angle to the position now shown. All of said grates are made up of spaced bars 163, such bars in the case of grates 151 and 161 being in staggered rows as shown so that tortuous passages are formed between them and if one row burns away the row beneath will continue to function.

The boxes or compartments 17 have suitable air deflectors 171 therein adjacent openings 18 in their bottom walls and attached to the boxes around such openings as by welding or bolting, are generally rectangular coupling or conduit sections 19 resting on or disposed in wiping contact at lower spherical surfaces 20 with the upper spherical surfaces 21 of coupling or conduit sections 22 as shown. Such sections 19 and 22 are detailed in Figure 9 and sections 22 are suitably mounted on a sectional air supply duct or conduit 78 as by welding or bolting them in place around outlet openings 23 therein. The openings or passages 191 and 211 through the coupling sections may be round or of any preferred shape.

Wall 11 may have inspection openings 111 therethrough normally covered by pivoted closures 112.

Loose bearing and sealing bars 24 (Figs. 1, 4 and 8) are located and balanced at the tops of the boxes 17, one on each side thereof, between the sides of the boxes and bars or beams 27 mounted on the side walls of the setting 10. Bars 24 are of approximately the same extent lengthwise of the stoker as the boxes 17 and they have rectilinear flanges or walls 25 slidably engaged with overhanging flanges 26 of said beams 27. Aligned studs or pins 28 are provided on opposite sides of each box 17 and they are engaged in downwardly open arcuate bearings 29 integral with bars 24 at vertical flanges 251 thereof. Sufficient clearance is provided between sections 15 and 16 at the top and between the studs 28 and bars 24 and associated parts to enable sliding of the bars 24 along flanges 25 incidental to oscillation or rocking of the sections 16 and 17 from the normal position of Figure 1 to a rearward limit and forward limit as diagrammatically suggested in Figures 6 and 7, respectively. Bars 24 although slidable, at all times remain practically parallel to and in substantial contact with flanges 26 to prevent leakage or loss of fuel by falling from the sides of the grates, especially in the spaces which otherwise would result when the grates or boxes are rocked or tilted.

The aforesaid sections 15 and 16 are adapted to be simultaneously reciprocated or oscillated on the axes from which the arcs of surfaces 20 and 21 are struck and to this end the bars 24 are in articulate linkage by reason of the loose pivotal connection of links 30 at 31 to lugs 32 on adjacent bars. Links 30 may be in sections connected by bolts 33 with one or more shims 331 interposed for adjustment as to length. One or more links or pitmen 34 are pivoted to adjacent boxes 17 as at 35 to lugs 342 of the brackets thereof carrying studs 28, and pass to the exterior through openings in the front wall 11. Pitmen

34 are preferably two in number and arranged on opposite sides of the boxes 17 and each has a yoke or strap 39 in which a crank or eccentric 40 is disposed. A horizontal rock shaft 41 on which said cranks 40 are fastened, is disposed across the exterior of wall 11 journaled at intervals in suitable bearings 42 carried by brackets 36 fastened to the wall. Said shaft 41 is coupled at 43 to the shaft 44 of a conventional reduction gearing unit 45 suitably supported at the front of the apparatus.

The shaft 41 may be mounted in any suitable manner and driven through the reduction unit 45 by any preferred means. As shown, it is driven from an electric motor 49, mounted adjacent unit 45, by a belt drive 51.

The motion of shaft 41 is utilized to reciprocate the rams 14 in a direction opposite to the direction of reciprocation of the stoker sections 15 and 16. Said shaft 41 has crank disks or eccentrics 53 thereon surrounded by straps 54 of links 55 which in turn are pivoted at 56 to and between pairs of levers 57 pivotally connected at their lower ends at 58 to brackets 59 conveniently fastened to the outer wall of hopper 12. Short links or connecting rods 60 are pivoted to the levers 57 at 61 and pivoted at 62 to the rams 14.

It will be noted that the front half of the upper surface of section 15 is an imperforate plate or hearth 65 having a convex upper surface, the arc of which is struck from the pivotal axis of such section. This section 15 is entirely within the furnace and is of such shape and size that the same patterns as are used in casting the parts of sections 16, for the most part, may be used in casting the parts thereof.

The rams 14 slide in slightly inclined chutes 66 which may be either separate or integral with the hopper 12 and wall 11, with which chutes the openings 13 communicate and which lead to the interior of the furnace. The bottom walls of chutes 66 may be of harder metal than the remainder to better withstand wear. One or more removable hearth plates 67 extend from wall 11 and their upper surfaces are flush with the upper surfaces of the bottom walls of chutes 66. Said hearth plates 67 having depending ribs or flanges 68 seated in grooves 69 formed by offset brackets 70 on wall 11. At the inner edges, hearth plates 67 overlap and rest on the plate 65. Said hearth plates 67 may be readily removed laterally to facilitate replacement, cleaning, inspection or repair of adjacent parts. At each side of the passages 13, diverging floor walls 71 are provided within the hopper 12.

The operation of motor 49 is not continuous but is under control of any desired automatic means, so that manual intervention is dispensed with, especially in the feeding of the coal, crushing the fuel beds and shaking of ashes from the grate.

The air supply duct 78 extends through the front wall 11 and forced air is supplied to the duct by a conventional blower or fan which may be suitably located exteriorly of the duct and driven in any suitable manner as by means of an electric motor.

The passage of air from the duct 78 to the grates is manually regulable. For instance, valves or plates 73 cover the outlet passages 23 of such duct. Valves 73 are independently operable and each has horizontal pins 75 by means of which it is pivoted to duct 78, and from one of which pins of each valve, a crank or lever 74 extends. A rod or link 76 is pivoted at 77 to each lever 74 and such rods extend through openings

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in the wall 11 to the exterior of the furnace for manual operation. Said rods 76 may be secured in open or closed positions or at different adjustments in any suitable way as by passing pegs 75 through adjacent openings 79 in the rods and guide brackets 80.

The upper surfaces of the boxes 17 incline downwardly and inwardly to correspondingly dispose the fuel bed so that ashes will fall from the innermost section 15 into an ashpit 81 aided by guides 82 and 83 on the innermost section 16 and duct 78, respectively.

Duct 78 inclines similarly to the grates and a closure 84 is pivoted at 85 to the duct 78 adjacent to ashpit 81 to facilitate cleaning of the duct. Closure 84 has a crank 85 to which one of the aforesaid operating rods 76 is pivoted. It will be noticed that of the total of six rods 76, they are arranged three on each side of the sections 15 and 16. A conventional door 87 is also provided at the front of duct 78.

Access to the interior of the structure may be had from the front through openings in the wall 11, normally covered by conventional doors 88.

Presuming operation, coal flows by gravity from chute or hopper 12 through openings 13 into the path of movement of rams 14 while the latter are retracted, and onto hearth plates 67, and from the latter is pushed by the rams 14, progressively moving toward the rear of the stoker onto the grates of boxes 17 forming the fuel bed. Through the reciprocation of pitmen 32, occurring periodically and automatically according to the control of motor 49, all of the sections 15 and 16 are moved as a unit toward the rear of the structure while all of the rams 14 slide in the opposite direction. This action advances the fuel bed as a whole, that is, it moves it away from the openings 13 and at the same time moves the rams away from the fuel bed providing spaces or gaps into which the coal from the hopper flows. This action is timed so that when the sections 15 and 16 are rocked in the opposite direction and the rams 14 moved toward the fuel bed, such fuel bed will move to some extent unitarily with sections 15 and 16, thereby compressing and crushing the fuel bed, after which the sections 15 and 16 will move relatively to and will slip under the fuel bed toward the rams 14. At the same time, because of the rocking of the sections 15 and 16, they will have up and down motions at their front and rear upper transverse edges, so that said edges, through rocking of the sections in opposite directions, will alternatively raise and recede as suggested by the full lines in the diagrams of Figures 6 and 7, the "steps" between raised and receded positions being, for instance, two inches in practice. As a result, the fuel bed will be further agitated and crushed or broken up so as to facilitate maximum combustion and coaction with air. The motion imparted to the pitmen 34, and, accordingly, to the connected parts, may be continuous or intermittent, as preferred.

While the "steps" provided at the fuel bed surface or tops of the grate sections when the latter are shaken, moves the fuel forward, the inclination of such surface and the resistance offered by the forward fuel charge to the returning or receding motion of the grate sections also aids to produce the general forward moving action of the fuel bed.

The action may be further explained by assuming that there is a five inch stroke with five retorts or boxes 17 where there will be four joints moving up and down at about two inches. With

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a five inch forward stroke and no resistance, the fuel should move or carry the same, whereas with a five inch return with resistance, the fuel carry is about four and one-half inches or a one-half inch slippage to create the forward fuel action. It is to be noted that with one-half inch slippage with each stroke, every half-inch of the fuel bed is broken up four times at the four joints. This maintains equal density or porosity.

I claim as my invention:

1. In a stoker structure, stoker sections having grates, means mounting the sections for rocking on axes below the grates, beams for mounting in a furnace wall, relatively loose sealing bars slidably engaging the under surfaces of said beams, and journal connections between the sections and bars above the said axes.

2. In a stoker structure, stoker sections having grates, means mounting the sections for rocking, beams for mounting in a furnace wall, relatively loose sealing bars slidably engaging the under surfaces of said beams and having bearings, and studs on the sections above their axes of movement journaled in said bearings.

3. In a stoker structure, a plurality of stoker sections, said sections having compartments to receive air and provided with grates at the top to receive coal to provide a fuel bed, said grates being relatively long and arranged side by side with their longitudinal axes parallel, a ram, operating means for the ram including linkage connecting the compartments, means operable to move said ram away from the fuel bed and to rock all sections simultaneously in the direction opposite to the direction of movement of the ram, means for the supply of fuel between the ram and fuel bed the said moving means being operable thereafter to move the ram and sections toward each other for the purpose specified, an air supply duct beneath the compartments, and connections communicating with the duct and said compartments consisting of relatively movable parts.

4. In a stoker, a plurality of stoker sections, relatively loose sealing bars at opposite sides thereof, means of bearing engagement between the sections and bars, said sections having compartments to receive air and provided with grates at the top to receive fuel to provide a fuel bed, said grates being relatively long and arranged side by side with their longitudinal axes parallel, linkage connecting the compartments in articulate relation, a ram movable above said compartments, means operable to rock all sections simultaneously in the same direction and move the ram in the opposite direction for reception of fuel between the ram and fuel bed and thereafter operable to move the ram and stoker sections toward each other for the purpose specified, a supporting element, and connections between and communicating with the element and said compartments yieldable to compensate for rocking of the sections.

5. A stoker structure according to claim 4, wherein said supporting element is an air supply duct.

6. A stoker structure according to claim 4, wherein the second-mentioned means is operable to rock the sections on axes eccentric to normal.

7. In a stoker structure, a plurality of stoker sections, said stoker sections comprising compartments mounted for rocking movement, linkage connecting the compartments above the pivotal axes of the sections, a ram to move fuel onto the stoker sections to provide a fuel bed, means

operable to move said ram, means correlated with said moving means operable to rock all sections in the direction opposite to the direction of movement of the ram to thereby move the ram and fuel bed away from each other, structure providing a passage to supply fuel between the ram and fuel bed, a support bridging the ram and stoker sections to receive said fuel, the said moving means functioning thereafter to move the ram and the sections toward each other for the purpose specified, and means to supply air to said compartments, the last-mentioned means and said compartments having surfaces in relatively slidable engagement to permit the aforesaid rocking movement of the compartments.

8. In a stoker structure, stoker sections having grates and compartments for supply of air beneath the grates, a ram to move fuel onto the stoker sections to provide a fuel bed, mechanism to move said ram, means correlated with said mechanism operable to rock said section simultaneously in the direction opposite to the direction of movement of the ram and to thereby move the ram and fuel bed away from each other, structure providing a passage to supply fuel between the ram and fuel bed, a support for fuel bridging the ram and stoker sections to receive said fuel, the said mechanism functioning thereafter to move the ram and sections toward each other for the purpose specified, an air supply duct, and means establishing communication between the compartments and duct having components in relatively slidable contact.

9. A stoker structure according to claim 8 having connections supporting the grates on the said air supply duct arranged in communication with the latter and in articulate relation thereto to compensate for rocking of the sections.

10. A stoker structure according to claim 8 having deflectors in the compartments in the path of incoming air.

11. In a stoker structure, a plurality of upright stoker sections having normally coplanar fuel-supporting portions constructed and arranged to collectively receive coal to provide a fuel bed, means at the bases of said sections mounting them for pivotal rocking movement each to and from opposite sides of the vertical plane in which the axis of its pivot is disposed, means above said bases including linkage articulately connecting said sections, a ram movable in a path at a right angle to said planes, said sections having edges parallel to said planes, and motor mechanism connected to the ram and to said linkage to move the ram in a direction away from said sections to rock all sections and thereby move the said edges alternately above and below the plane of said fuel-supporting portions to collectively advance the fuel bed.

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