Nov. 25, 1947. D. J. MOSSHART 2,431,415

RECIPROCATING STOKER GRATE BAR

Original Filed Dec. 31, 1940 2 Sheets-Sheet 1

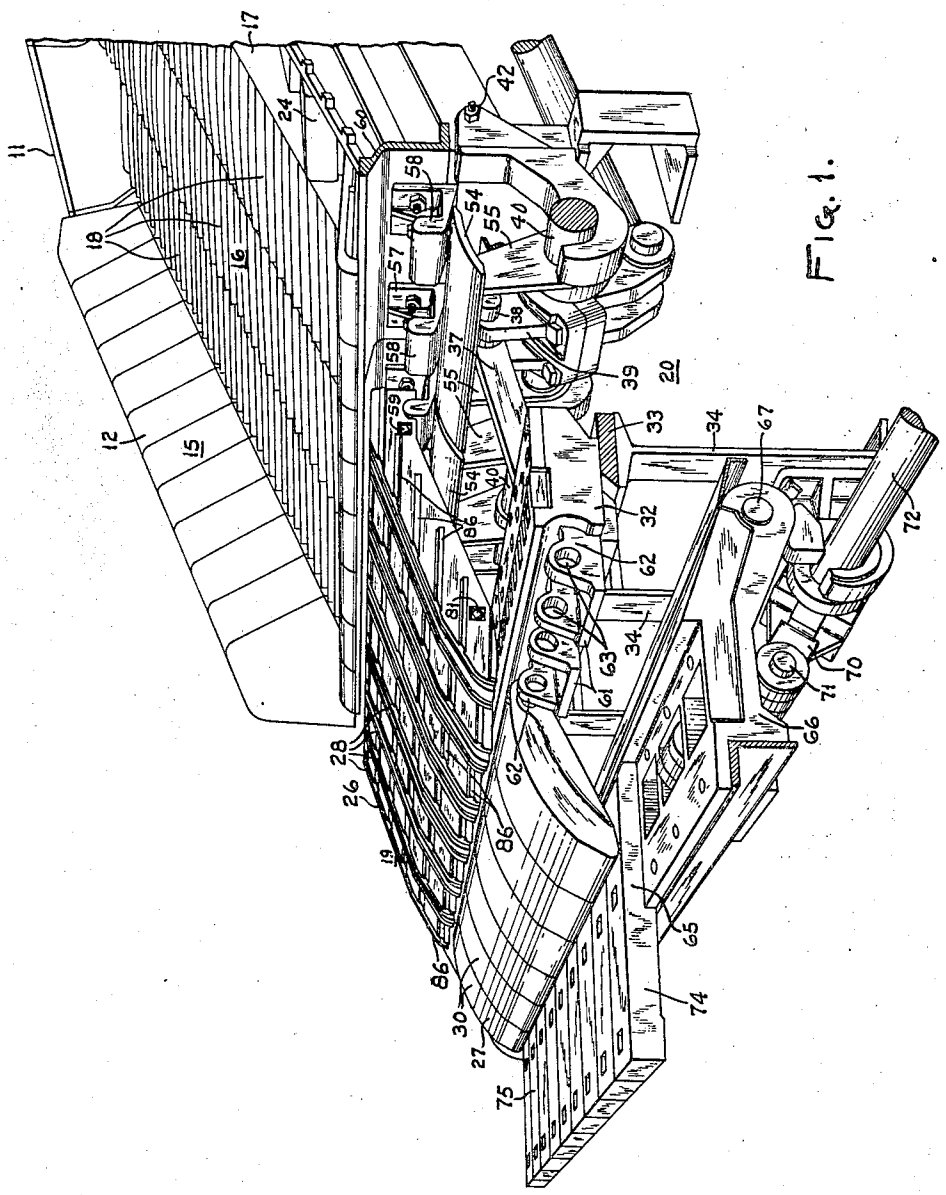


Fig. 1.

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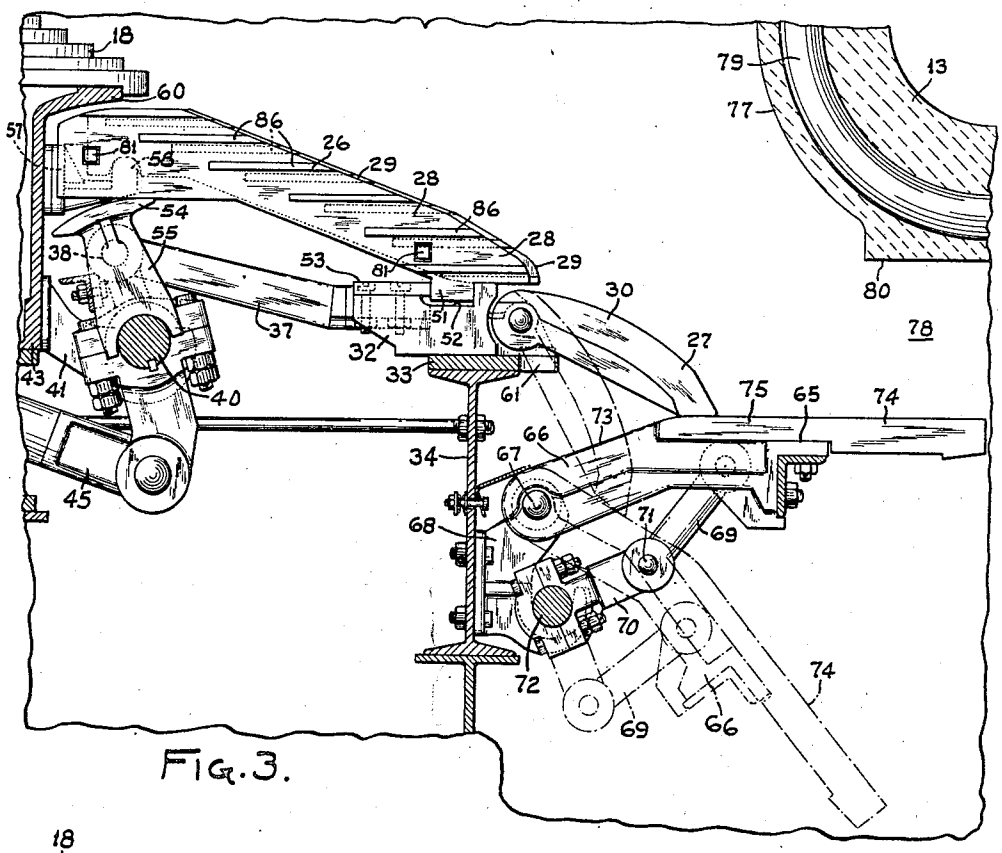
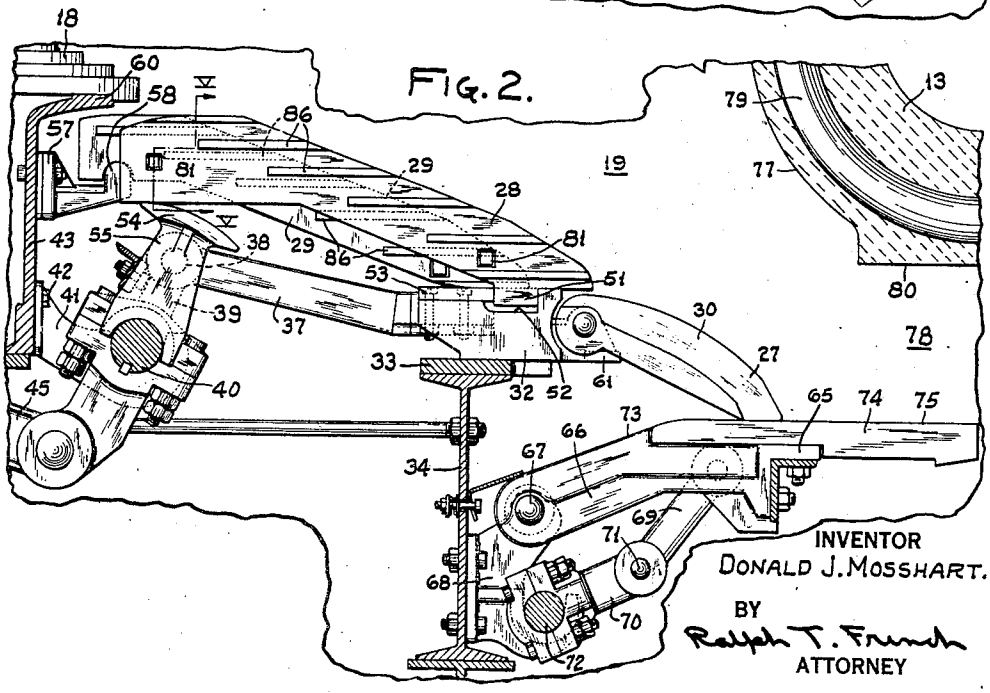


FIG. 3.

FIG. 2.



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RECIPROCATING STOKER GRATE BAR

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1 Claim. (Cl. 110—38)

1

This application is a division of copending application Serial No. 372,640, filed December 31, 1940, by R. A. Foresman, D. J. Mosshart and A. F. Schultz for Stoker apparatus, now Patent No. 2,369,957, granted February 20, 1945.

This invention relates to stokers, more particularly to progressive feed stokers and means for disposing of the ash from the discharge ends of such stokers, and it has for an object to improve the efficiency of this type of apparatus.

Another object of the invention is the provision of an extension grate construction for use with progressive feed stokers, which construction has improved agitating and pushing action.

A further object of the invention is to provide a novel grate bar construction.

These and other objects are effected by the invention as will be apparent from the following description and claim taken in connection with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a perspective view of a progressive feed stoker embodying the improved extension grate construction;

Fig. 2 is a transverse sectional view taken through the extension grate structure; and

Fig. 3 is a view similar to Fig. 2, but with the moving bars in a different position.

An extension grate construction for use with a progressive feed stoker has two main functions; the first being to break up and agitate the bed of burning fuel passing thereover to permit uniform flow of air through the same for promoting combustion, and the second being to positively eject the ash and noncombustible refuse as it reaches the discharge end of the extension grate.

In view of these functions, the extension grate may be considered to comprise first and second zones of action, considered in the direction of fuel feed. In the first zone, which extends from the discharge end of the underfeed section to a point near the discharge end of the extension grate, the fuel fed thereto should be completely consumed, hence the grate action in this zone should be primarily that of agitation to break up any clinker formations and to provide for ample penetration of air to the fuel bed to insure complete combustion of the fuel prior to its leaving this zone.

If the extension grate properly performs the above functions in its first zone, the second zone, which extends from the discharge end of the first zone to the ash pit, will receive only ash and noncombustible refuse. This being the case, the

2

grate action in the second zone should be primarily that of pushing to eject the ash and refuse.

Therefore, the present invention provides, for use at the discharge end of a progressive feed stoker, an extension grate construction comprising a first transversely-extending row of grate bars, a number of said bars being adapted to reciprocate and being interspersed among the remaining bars, which are stationary. This first row of bars provides a first zone in which the main action applied to the fuel bed is that of agitation, although, of course, definite feeding action is also present. Following this first row of grate bars is a second transverse row of bars, all of which are adapted to reciprocate and are provided with rearwardly-facing fuel-contacting and pushing surfaces, which surfaces are inclined sufficiently to insure positive ejectment of the ash and refuse fed thereto from the first row of grate bars constituting the first zone.

The construction includes a single reciprocatory member for imparting reciprocation to all of the reciprocatory grate bars, and an angularly adjustable support for the rearward ends of the grate bars of the last row, whereby the pushing effect of these bars may be varied in accordance with the angular adjustment of the supporting member therefor.

Referring now to the drawings more in detail, and with particular reference to Fig. 1, the reference numeral 15 indicates, in its entirety, a stoker comprising an underfeed section 16 of alternately arranged retorts 17 and tuyère rows 18, the stoker having an overfeed section 19. An air chamber 20 is provided beneath the stoker and serves to supply air for supporting combustion.

In operation, fuel is fed into the upper ends of the retorts 17 and is advanced along the retorts and forced upwardly over and onto the tuyère rows 18 by means of secondary rams 24 reciprocating within the retorts. As the fuel moves over the discharge end of the underfeed section, it is received by the overfeed section and, due to the action of the latter, is thoroughly agitated and positively pushed thereover toward the final point of discharge.

The overfeed or extension grate construction comprises a plurality of transversely-extending rows of grate bars, two rows, 26 and 27, being herein illustrated. The row 26 comprises a number of reciprocatory grate bars 28 interspersed among a number of stationary bars 29, these bars 28 and 29 comprising the subject matter of the present invention. The second row comprises a plurality of reciprocatory bars 30.

A cross-head 32, adapted to reciprocate in a direction longitudinally of the stoker, extends transversely of the extension grate construction and is supported for sliding movement upon a bearing plate 33, carried by the frame structure 34, 35, and 36. Means for imparting reciprocatory motion to the cross-head 32 is provided and comprises a plurality of rods 37 connected at one end to the cross-head and at the other end, at 38, to double crankarms 39 fixedly secured on the transversely-extending shaft 40, which is mounted for limited oscillatory movement in the bearing member 41. This bearing member may be bolted, as at 42, or otherwise secured, to the stoker frame 43.

Suitable means are provided for imparting limited oscillatory movement to the shaft 40, which means comprises the lower portion of the double crank arm 39 and the rod 45, the latter having an adjustable connection with the stoker engine (not shown).

In order that reciprocation of the cross-head 32 may impart corresponding motion to the reciprocatory first grate bars 28, the latter are provided on the under faces of their rearward ends with depending lugs 51, adapted to be received in mating recesses 52, in the upper surface of the cross-head. For manufacturing reasons, it may be desirable to form these recesses 52 as slots open at the forward edge of the cross-head and to close the same by a transversely-extending plate 53 bolted, or otherwise secured, to the cross-head (Fig. 1). The forward ends of the reciprocatory first bars 28 rest upon rockers 54, which are supported through arms 55 upon the transversely-extending shaft 40 carrying the double crankarms 39. The bearing surfaces of the rockers 54 and the length of the arms 55 are so designed and proportioned that there is substantially pure rolling action between the rockers 54 and the forward ends of the reciprocatory bars 28 resting thereon, whereby substantially all sliding friction between the upper ends of said bars and their supports is eliminated.

The stationary bars 29 of the first row 26 are individually supported by laterally-spaced brackets 57, bolted or otherwise secured to the stoker frame structure. Each bracket has an upwardly-extending lug 58, adapted to be received in a downwardly-opening recess in the lower face of the forward end of each of the stationary bars 29.

The brackets 57 and their lugs 58 are spaced apart laterally a distance equal to or greater than the width of the forward ends of the reciprocatory bars 28, normally disposed therebetween. It will be apparent that, in order to remove any reciprocatory bar 28, it is only necessary to lift the rearward end thereof a sufficient distance to remove the lugs 51 from their recesses 52, whereupon the bar may be moved rearwardly to withdraw the forward end thereof from between the adjacent brackets 57.

It will be noted that the discharge end of the underfeed section has a rearwardly-projecting lip structure 60 overhanging the forward ends of all of the grate bars 28 and 29 of the first row 26. This overhanging structure 60 is disposed so close to the forward ends of the grate bars which it overlies that there is not sufficient space to raise the upper ends of the stationary bars enough to separate the upwardly-projecting lugs 58 from their mating recesses 59. However, any selected stationary grate bar may be removed, simply by removing a reciprocatory bar adjacent thereto

and then sliding the stationary bar laterally into the space previously occupied by the reciprocatory bar, whereupon the stationary bar may be slid rearwardly until its forward end is clear of the overhanging structure 60. The rearward ends of the stationary bars 29 merely rest upon the cross-head 32, which slides or reciprocates therebeneath.

In the second or last row 27, the grate members 30 are pivotally supported at their forward ends by brackets 61 formed integral with, or permanently attached to, the cross-head 32. Each bracket 61 has a pair of upwardly-extending lugs or flanges 62 having aligned transversely-extending openings 63 therethrough, adapted to receive suitable means, such as pivot pins (not shown), for pivotally supporting and securing the forward ends of the bars 30 thereto.

The rearward ends of the bars 30 are supported by, and adapted to slide upon, an ash-supporting structure 65. This ash-supporting structure comprises a base plate 66 pivotally mounted, as at 67, on a bracket 68, secured to the frame member 34. A link 69 is pivotally connected to an arm 70 by pin or bar means 71, the arm 70 being clamped or fixedly secured to a shaft 72 extending transversely of the furnace and preferably having one end thereof extending through the furnace side wall, whereby it may be given a limited rotary movement, from without the furnace, by an operator. It will be apparent that the ash-supporting structures 65 may be angularly adjusted about the axis, at 67, by limited partial rotation of the operating shaft 72. The ash-supporting structure has two bearing surfaces for the grate bars 30, one surface being at 73 on the base plate 66, and the other being provided by a sectional ash-supporting member 74, having an upper surface 75. Reference to Figs. 2 and 3 will indicate that when the ash-supporting member 74 is in a substantially horizontal position adjacent the upper limit of its adjustment, the last grate members 30 will bear upon the surface 75, while when the ash-supporting structure is lowered, as illustrated in dotted lines in Fig. 3, the bars 30 will bear upon the surface 73. Obviously, there is an intermediate position of the ash-supporting structure at which the bars 30 will bear in part upon the surface 73 and in part upon the surface 74, depending upon which portion of their reciprocatory stroke or length of travel they are going through.

Referring to Figs. 2 and 3, it will be seen that the furnace rear or bridge wall 13 has a curved portion 77 disposed in overlying relation to the ash-supporting member 74. The curved portion 77 and the ash-supporting member 74 define therebetween a transversely-extending, longitudinally-converging ash discharge outlet 78. As indicated by the dot and dash line shown in Fig. 3, this converging passage 78 may be adjusted so that it is converging or converging-diverging, depending upon the angular adjustment of the ash-supporting member. Preferably, the portion 77 of the rear wall 13 which overlies or is in close proximity to the ash discharge outlet 78, is water cooled, as by means of tubes 79. In some cases it may be desirable to provide the curved portion 77 of the furnace rear wall with a depending lip or nose block 80 to catch, or retard the discharge of, unconsumed fuel which would otherwise pass through the discharge opening 78 to the ash pit.

Preferably, the grate bars 28 and 29 are each

made up of a plurality of thin sections, these sections being held together by a plurality of bolts **81** extending through aligned openings in each group of cooperating sections. The bars **28** and **29** are provided on their outer sides with horizontally-disposed ribs **86**, and these ribs on adjacent reciprocatory and stationary bars overlap, the ribs on the stationary bars being at different heights than those on the adjacent reciprocatory bars. In order that the reciprocatory bars may be removed in the manner previously explained, that is, by lifting the rearward ends sufficiently to remove the depending lugs **51** from their mating recesses **52** and then moving the bars rearwardly, the ribs **86** are so arranged that there will be no interference of overlapping ribs during lifting of the rearward ends of the bars. To this end, the vertical spacing of the ribs increases from the forward end or upper part of the bars to the rearward end or lower part thereof, corresponding to the greater vertical lifting movement of the rearward end relative to the forward end (Figs. 2 and 3).

While the construction herein illustrated shows the first row **26** of the extension grate construction made up of alternate reciprocatory and stationary grate bars, it is obvious that the invention is not limited to this particular arrangement, but will cover any other arrangement wherein a number of reciprocatory bars are interspersed among a number of stationary bars.

It will be apparent from consideration of Fig. 4 that when the reciprocatory bars **28** are in their forwardmost or retracted position, the upper surfaces thereof are disposed below or forward of the corresponding surfaces of the stationary bars **29**. Of course, when the reciprocatory bars are in their rearwardmost or projected position, their upper surfaces lie above

and rearwardly of the corresponding surfaces of the stationary bars. This construction results in a positive agitating action by the bars upon the fuel bed passing thereover and assures that no clinker formations will form upon the bars.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claim.

What is claimed is:

An elongated grate bar, a series of ribs extending laterally from each side of the grate bar, the ribs of each series being vertically spaced and said spacing increasing progressively from the top rib to the bottom rib, and a lug depending from the rear end of the bar, the vertical dimension of the lowermost space between ribs being greater than the heighth of said depending lug plus the thickness of one of said ribs.

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