Sept. 3, 1957 R. C. RIVERS 2,804,834

TRAVELING GRATE STOKER

Filed March 19, 1954 2 Sheets-Sheet 1

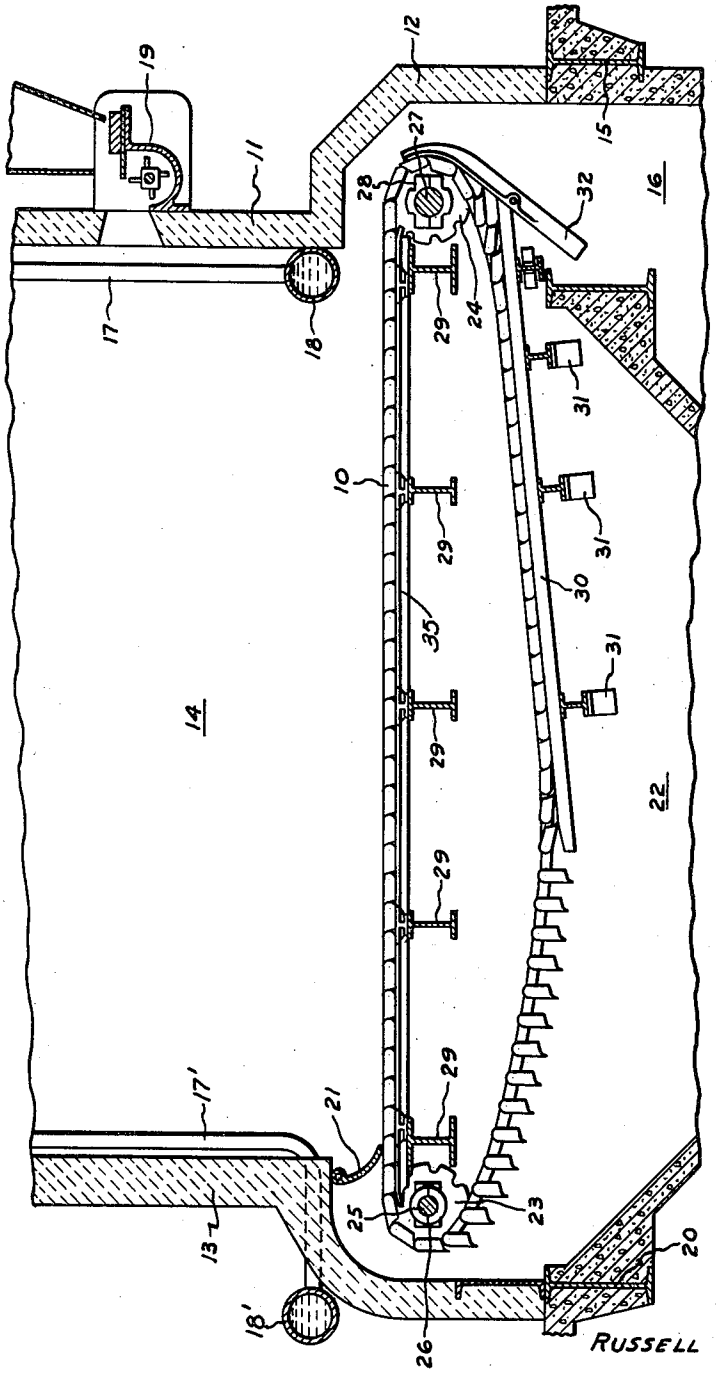


Fig. 1

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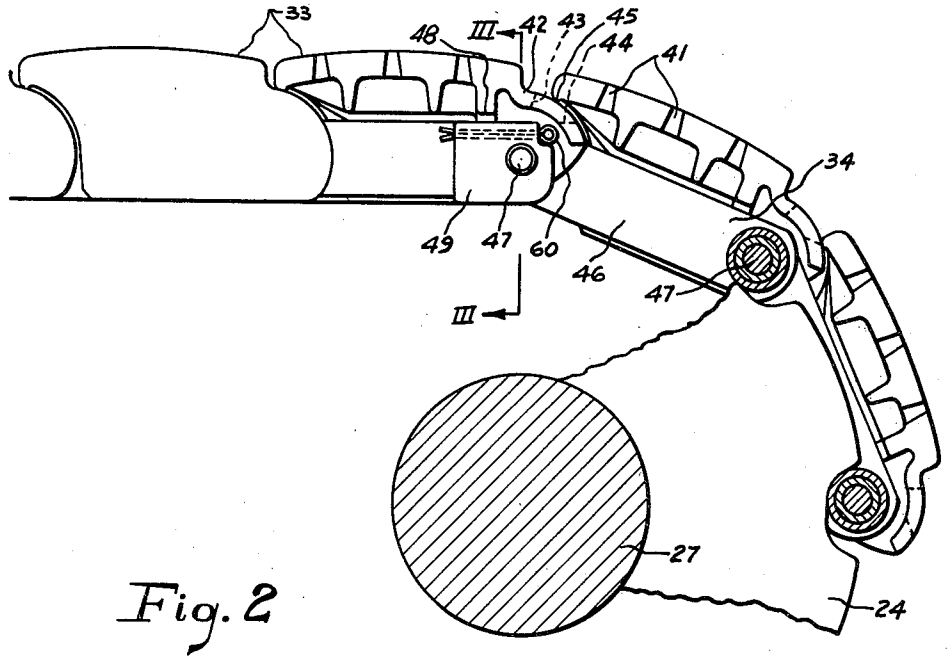


Fig. 2

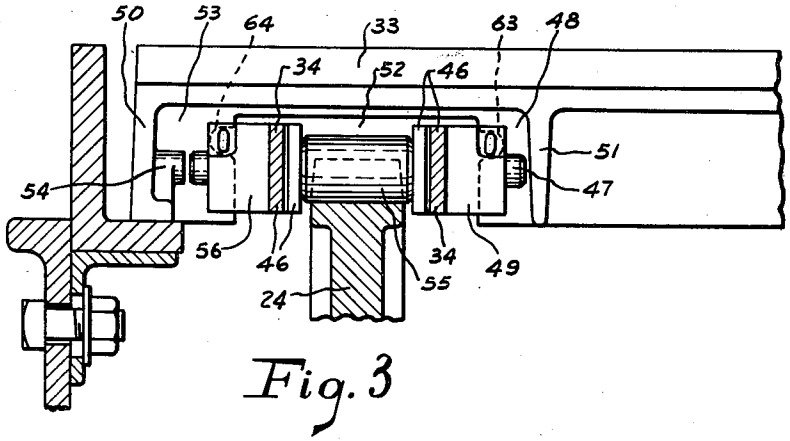


Fig. 3

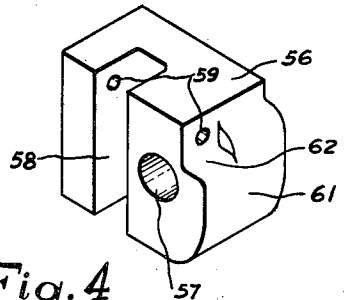


Fig. 4

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TRAVELING GRATE STOKER

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2 Claims. (Cl. 110—40)

This invention relates to traveling grate stokers and more particularly to a grate for use with a spreader stoker in a steam generating apparatus.

In the firing of coal in a steam generating apparatus, it is common practice to project the coal into the furnace by means of a spreader stoker so that the coal falls on the upper surface of an elongated traveling grate. The coal burns on the grate surface and the ash is carried by movement of the grate to one extremity of the grate where the ash falls over the end into an ashpit. Many difficulties have been experienced with traveling grates of this type in the past. In previously known constructions, the bars were easily burned and the bars suffered from the disability that ash sifts through very easily. Furthermore, the bearings which support the moving elements in these prior art grates are forced to carry extremely heavy loads under difficult conditions. The replacement of damaged or burned-out bars also has required the complete shut-down of the furnace and involved a time-consuming operation. These and other difficulties which have been experienced with previously-known grates are obviated by the present invention in a novel manner.

It is therefore an outstanding object of the present invention to provide a traveling grate construction in which the bars may be quickly removed from any position without disturbing the rest of the bars and without disturbing the fuel bed.

It is another object of the present invention to provide a traveling grate having bars in the construction of which no machining is required, so that the alloy used may be very hard.

It is a still further object of the present invention to provide a traveling grate construction in which there is no necessity for reversed bending of the chain so that it is possible to use a tight-fitting interlocking bar construction, thus offering less leakage and less burning of intricate exposed bar construction.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

Figure 1 is a vertical sectional view of a traveling grate constructed under the philosophy of the present invention,

Figure 2 is an enlarged view of a portion of the apparatus shown in Figure 1, with portions broken away for clarity of presentation.

Figure 3 is a vertical sectional view of the apparatus of the invention taken on the line III—III of Figure 2, and

Figure 4 is a perspective view of an element of the invention.

Like reference characters denote similar parts in the several figures of the drawings.

Referring first to Figure 1 wherein is best shown the general features of the invention, the grate designated generally by the reference numeral 10, is shown in use in the lower portion of a furnace 11. The furnace 11 comprises a front wall 12 and a rear wall 13 defining a combustion chamber 14. The front wall 12 is offset to overlie one end of the grate 10. It is supported on a beam 15 and serves as one wall of an ashpit 16 underlying the end of the grate. The wall 11 is provided with waterwall tubes 17 extending upwardly from a header 18 and a spreader stoker 19 is mounted on the wall 11 some distance above the grate 10 with a suitable aperture in the wall provided for the projection of fuel therethrough by the stocker. The rear wall 13 is mounted on a beam 20 and is provided with a seal 21 which contacts the grate. A header 18' provides for flow to water wall tubes 17'.

The grate 10 consists in general of a number of bars linked together to form an endless chain. This chain is mounted on and supported by a sprocket 23 underlying the rear wall 13 and a sprocket 24 underlying the front wall 11. The sprocket 23 is keyed to and mounted on a journal shaft 25 which is in turn mounted in suitable bearings 26 while the sprocket 24 is mounted on a shaft 27 which is carried by suitable bearings 28. The shaft 27 is suitably driven by conventional means, not shown. The upper run of the grate is held in a substantially level position by supporting means including beams 29 which extend from one side to another of the furnace. A rail 30 underlies the grate from its position under the wall 12 to a position substantially rearward of the central position of the furnace and this rail is supported by beams 31 extending transversely of the furnace. A shoe 32 is pivotally mounted to the forward end of the rail 30 and has a curved upper end which presses against the forward end of the grate.

In Figure 2, which is an enlarged view of the forward end of the grate, it can be seen that the grate is made up of a series of bars 33, which are pivotally attached at their forward ends to a linked chain 34 which is in turn driven by the sprocket 24. The upper run of the series of bars 33 rests on a horizontal rail 35 which in turn rests on the beams 29, as is evident in Figure 1. It is to be observed that the bars 33 interlock with one another particularly in their horizontal runs to form a substantially solid surface for the carrying and burning of fuel. The curved upper portion of the shoe 32 embraces these bars around the forward end of the grate and prevents them from opening up as they would otherwise do because of the fact that they are pivoted at one end only. The lower end of the shoe 32 is provided with a substantial weight which biases it toward a vertical position. The shoe is attached to the forward end of the rail 30 by means of a pin passing through a suitable bore in a block which is adjustably fastened to the forward end of the rail 30.

The details of construction of the bars 33 are particularly well shown in Figure 2. The upper surface of each of the bars is slightly curved longitudinally of the furnace and is provided with a number of air holes 41. The forward end is provided with a curved skirt 42 which is provided with slots 43 and 44 for a purpose to be explained more fully hereinafter. The rearward end of each of the bars 33 is provided with a downwardly directed curved nose 45 which rides along the surface of the skirt 42 of the immediate adjacent rearward bar. The link belt 34 is made up of individual links 46 joined together by transverse pins 47. Each bar 33 is provided with vertical transverse webs 48. A locking member 49 is associated with the pins 47 and the webs 48 to lock the bars 33 in place on the link chain 34.

In Figures 3 and 4 is shown the manner in which the locking member 49 cooperates with the other members,

To begin with it should be noted that each bar 33 is compartmentized by vertical longitudinal walls such as the end wall 50 and an intermediate wall 51 defining a compartment 52. The vertical web 48 mentioned hereinbefore extends into the compartment 52 from the wall 51 and a similar vertical web 53 extends toward it from the end wall 50. The pin 47 extends transversely of the compartment 52 and is limited in its endwise movement by the intermediate wall 51 and by a lug 54 extending into the compartment from the end wall 50.

A roller 55 is mounted on the central portion of the pin 47 and is engaged by the teeth of the sprocket 24. At each end of the roller 55 and joined by the pin 47 are links 46 of the link chain 34. Mounted on the outer end of the pin 47 is a similar locking member 56 which engages the web 53. The locking members 49 and 56 are very similar except that one is right hand and the other is left hand for engagement with right and left webs in the manner shown. Figure 6 shows a left hand locking member 56 which is representative of the rest of the locking members. The locking member 56 is of a generally block-like configuration provided with a transverse bore 57 through which passes the pin 47. It is also provided with a slot 58 in which the web 53 resides. In the upper portion of the block and extending longitudinally thereof is a small bore 59 through which may pass a cotter pin 60 as is evident in Figure 2. The locking member 56 is provided with a rounded portion 61 at the end adjacent the bore 57. This is done to provide a sufficient bulk of metal around the bore 57. A recess 62 is provided adjacent the bore 59 in order to provide for the head of the cotter pin 60. It should be noted that each slot 44 in the skirt 42 of each bar 33 is aligned with a cotter pin 60, while each slot 43 is aligned with a link chain 34. It also should be noted, as is evident in Figure 3, that a notch 63 is provided in the vertical edge of the web 48, while a similar notch 64 is provided in the vertical edge of the web 53.

The operation of the invention will now be evident in view of the above description. The shaft 27 is driven so that it rotates in its bearings 28 carrying with it the sprocket 24. The teeth of the sprocket 24 engage the rollers 55 thus carrying the pins 47. The movement of the pins 47 carries the link chains 34 and the bars 33, the latter being driven through the medium of the locking members 49 and 56. The rollers rest on the rail 35 supported by the beams 29 along the upper run of the belt. This provides for a smooth horizontal upper grate run. The spreader stoker 19 is, of course, operating and projecting fuel upon the upper run of the grate 10 in the usual manner. The fuel is moved forwardly in the furnace, that is to say, toward the front wall 12 and the ash is deposited in the ashpit 16. As the bars 33 pass over the forward end of the grate, they are free to rotate about their pins 47, the rearward end of each bar being free. However, the shoe 32 presses against the bars and holds them in a position generally tangential to the sprocket 24. The shoe is pressed against the bars under the lever action provided by the weight of its lower end. If, however, a piece of foreign matter comes in contact with the shoe or jams a bar into open position, the shoe is free to swing about its pivot pin and move out of the way. As each bar 33 proceeds further around the forward end of the grate, it leaves the shoe 32 and a time later comes in contact with the rail 30. For a short space, the bar is free to rotate outwardly before it is again forced into alignment with the other bars. The bars have now moved into the lower run of the grate and bars in this position are supported by the rail 30, in a position considerably above that which they would occupy if they were hanging freely. That is to say, the bars are not permitted to hang by their pins 47 in a downward, open position. However, after each bar leaves the rail 30 at the rearward end, it swings about its pin 47 into the open, pendent position shown in Figure 1. This permits any ash that may have

accumulated on the inner side of the lower run to be removed.

The manner in which the bars 33 are mounted on the grate and the manner in which they may be removed is best shown in Figures 2, 3, and 4. In order to remove a single bar 33, it is only necessary to swing the bar immediately preceding it about its pin 47 and away from the bar which is to be removed. This exposes the slot 44 and permits the operator to obtain access to the cotter pin 60. It is only necessary then to remove all cotter pins 60 and the bar may be removed from the locking members 49 and 56. In most cases it is not necessary to stop the grate. Access doors may be provided adjacent the lower run of the grate in order to permit the removal and replacement of a grate in such a manner. To place a new grate in position, it is only necessary to drop the new bar in position with the webs 48 and 53 sliding into the slots 58 in the locking members. Then cotter pins 60 are inserted through bores 59 so that the intermediate portion of the cotter pin resides in the notches 63 and 64. The bar is then locked in place. This same action serves to lock the pin 47 against lengthwise movement; that is to say, the pin 47 may only be removed from the locking members, the link chains, and the rollers after a bar has been removed.

The slots 43 in the skirts 42 of the bars 33 are provided to permit the bars to swing freely about their pins 47. In the pendent position shown in Figure 1, the link chains reside in these slots 43. Otherwise, the skirts 42 would strike the link chains 46 and prevent rotation of the bars.

Other modes of applying the principle of the invention may be employed, change being made as regards the details illustrated, provided the features stated in the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A traveling grate comprising a plurality of endless link chains in spaced parallel longitudinal relationship, a series of grate bars, each extending transversely between two chains, each grate bar pivotally connected at each end to one of its chains and having its opposite edge engaging the surface of the immediately-longitudinally-adjacent bar in closed slidable contact, short pivot pins joining adjacent links of each chain and extending transversely from each side for a short distance, two locking members mounted one at each end of said pins joining each pin with the end portion of a grate bar, each locking member mounting comprising a bore by which it is pivotally-mounted on its pin, the grate bar having two longitudinal flanges which extend across the ends of the pin and prevent it from leaving the chain and locking members, transverse flanges extending downwardly from the grate bar adjacent each longitudinal flange, a slot formed in each locking member in which a transverse flange resides, said grate bar being mounted over said pin with said latter flange mounted in said slot, and means selectively retaining each transverse flange in the slot of its locking member.

2. A traveling grate comprising a plurality of endless link chains in spaced parallel longitudinal relationship, a series of grate bars, each extending transversely between two chains, each grate bar pivotally connected at each end to one of its chains and having its opposite edge engaging the surface of the immediately-longitudinally-adjacent bar in closed slidable contact, short pivot pins joining adjacent links of each chain and extending transversely from each side for a short distance, two locking members mounted one at each end of said pins joining each pin with the end portion of a grate bar, each locking member mounting comprising a bore by which it is pivotally-mounted on its pin, the grate bar having two longitudinal flanges which extend across the ends of the pin and prevent it from leaving the chain and locking members, transverse flanges extending downwardly from the grate bar

adjacent each longitudinal flange, a slot formed in each locking member in which a transverse flange resides, said grate bar being mounted over said pin with said latter flange mounted in said slot, a notch in each transverse flange being aligned with a second bore in its respective locking member, and a cotter pin passing through the second bore and residing in the said notch.

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