

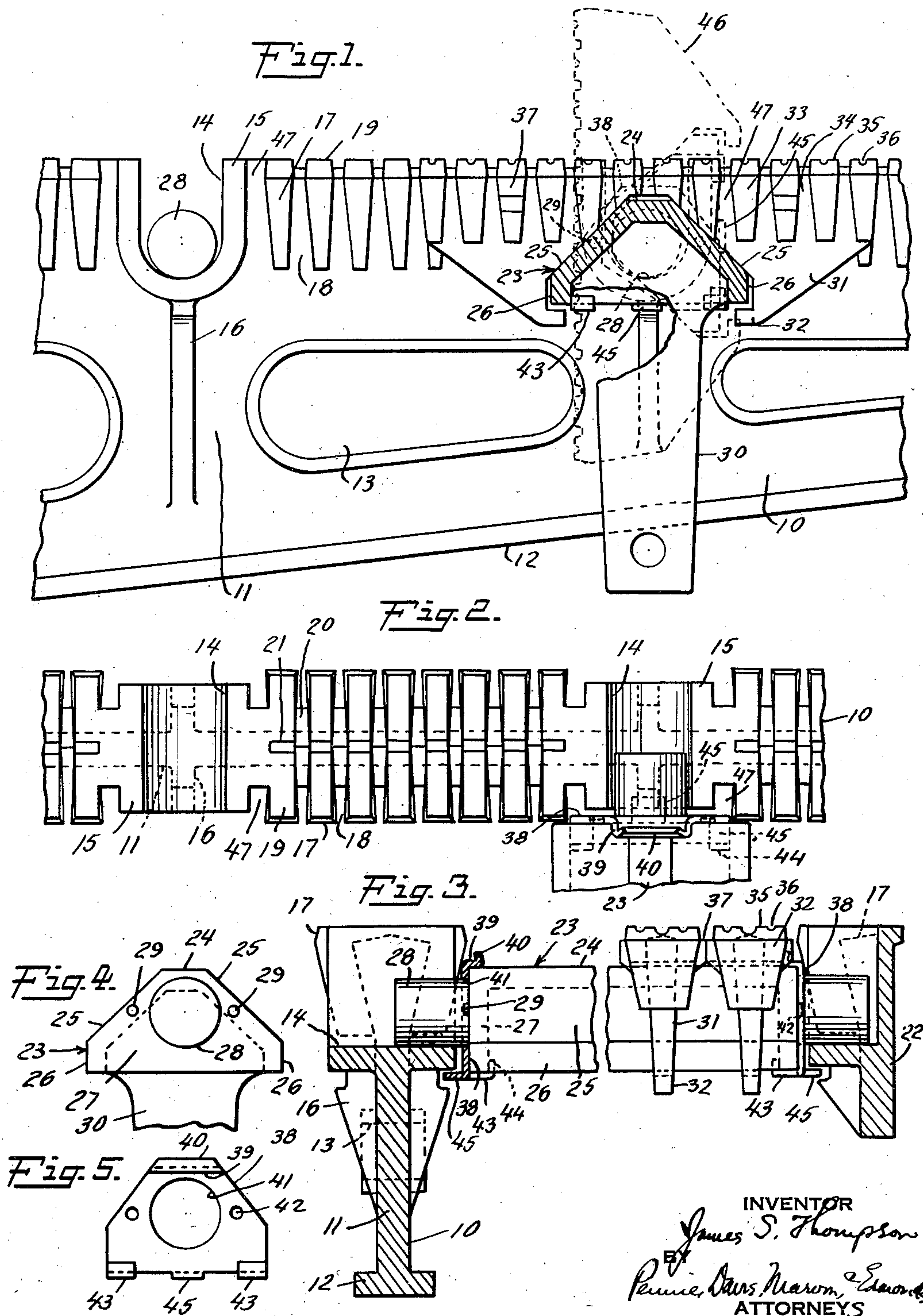
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GRATE BAR

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## GRATE BAR

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This invention relates to grates, especially those of the heavy duty type employed in locomotives, boiler furnaces, and the like, and including frame members and grate bars supported therein for rocking movement. More particularly, the invention is concerned with a grate bar of novel construction which comprises a carrier member and a plurality of fuel-supporting units thereon, the units being held in place on the carrier by means which are also employed to prevent accidental dislodgment of the grate bar from the frame.

The frame of the new grate is made up of side frame members, and in the larger sizes, also includes a center frame member, these members extending lengthwise of the fire box and having recesses aligned across the box for receiving the trunnions of grate bars. The new grate bar includes a carrier of simple construction having trunnions at its ends and a plurality of fuel-supporting units each of which has an opening through it of such size and shape that the unit may be mounted on the carrier by being slipped over the ends of the latter. In order to secure the units in place on the carrier, locking plates are provided which are placed over the trunnions and then secured to the carrier and each of these locking plates is provided with means which cooperates with a portion of the adjacent frame member to prevent the grate bar from being dislodged from the frame when in service.

For a better understanding of the invention, reference may be had to the accompanying drawing, in which

Fig. 1 is a fragmentary side elevation showing a portion of a center frame member with a grate bar in place thereon, the grate bar being shown in section;

Fig. 2 is a fragmentary plan view showing the center frame member and a portion of the grate bar mounted therein;

Fig. 3 is a sectional view through the frame member showing a portion of a grate bar mounted therein;

Fig. 4 is an end view of the carrier member; and

Fig. 5 is a face view of a locking plate.

Referring now to the drawing, the new grate is illustrated as comprising a frame member 10 which is ordinarily a single casting and comprises a web 11 with a bottom flange 12, the web being lightened by the formation of openings 13 therethrough. The frame member is provided at its top with spaced trunnion sockets 14 defined by ribs 15, these sockets being open at

the top. The frame member is strengthened beneath the sockets by stiffening ribs 16. Between the sockets, the face of the frame member is provided with spaced lugs 17 between which are air passages 18 for upward flow of air to fuel which may rest on top of the frame member. The lugs terminate at their tops in projections 19 separated by air channels 20 and 21 so that air flowing up through the passages may flow along all sides of each projection so as to keep the projection cool and effect a wide distribution of air to the fuel.

The frame member illustrated in Fig. 1 is a center member and it is provided with the usual means at its ends on which it is supported. The trunnion sockets 14 extend completely across the member so that each socket receives trunnions of two grate bars aligned across the grate. Also, both faces of the frame member are provided with the lugs 17. The side frame members, such as that illustrated at 22, are of a construction similar to the center members except that one face only of the member is provided with lugs and the trunnion socket extends only to the center line of the frame member.

The new grate bar includes a carrier member 23 which may be made of cast iron, steel, or the like. This carrier has a flat top 24 and downwardly and outwardly sloping sides 25 terminating in vertical edge flanges 26. The carrier thus has the shape of an inverted trough and the ends of the trough are closed by plate portions 27 from which extend the trunnions 28, these trunnions lying slightly below the top 24. Extending outwardly from the end of the carrier on opposite sides of the trunnion are small lugs 29. A shaker arm 30 extends down from the carrier at a suitable point and the shaker arm is connected to a shaker rod connecting a number of the carrier bars together so that they can be rocked in unison.

The particular shape of the carrier above described is preferred, since this provides a strong light construction and assists in centering the fuel-supporting units mounted thereon. However, carriers of various other shapes may be used to accomplish the same general purpose. Also, in the new carrier, the trunnions lie below the top of the carrier and that arrangement is preferred, since it simplifies the mounting and demounting of the fuel-supporting units, but the trunnions may be provided having their top surfaces level with the top of the carrier or projecting slightly above the latter, if desired.

The fuel-supporting units mounted on the carrier



rier may be of hollow sheet metal construction or may be single castings, the sheet metal construction described in my application, Serial No. 546,778, filed June 25, 1931, now Patent No. 1,899,539, issued February 28, 1933, being preferred since those units are lighter and cheaper than cast units. Each unit comprises a body portion 31 having an opening through it of the same general shape as the cross section of the carrier, except that the dimensions of this opening are slightly greater than those of the carrier so that the unit rests on the sloping sides 25 of the carrier and does not engage the top or edge flanges of the latter. Also, each unit is formed with lugs 32 which extend beneath the edges of the flanges 26 of the carrier when the unit rests thereon in normal upright position, these lugs preventing the units from being thrown free of the carrier. By making the dimensions of the opening in the unit slightly greater than those of the carrier, the unit rests only on the sloping surfaces of the carrier and is free to have angular movement relative to the carrier. A grate bar of this construction when used in a locomotive and subjected to shocks and jars incident to travel has a self-cleaning action by reason of the relative movement of the units on their carriers.

Each face of each unit is provided with spaced lugs 33 which in part define upward air passages 34 between them and each lug terminates in a plurality of small fuel-supporting projections 35 separated by air channels 36. Air flowing up through the passages and through the channels keeps the projections cool and is also widely distributed to the fuel on the unit.

Certain of the lugs 33 may be provided with spacing projections 37 so that when the units are placed on the carrier, the spacing projections of one unit contact with those of the adjacent units and keep the units spaced apart the proper distance.

The units are mounted on the carrier by being slipped over the ends of the latter and this operation involves no difficulties whatever since the opening through each unit is slightly larger than the cross-sectional shape of the carrier and the trunnions lie within the outlines of the carrier. After the units are in position, the carrier may be placed in the grate frame, but since the units are free to move lengthwise of the carrier, it is desirable to provide means to lock the units in place against such movement, and thus prevent the units from contacting with the frame during the rocking of the grate bars.

The locking means which I provide for the purpose consists of a pair of plates 38, one for each end of the carrier. These plates have a shape somewhat similar to the cross-sectional shape of the carrier but have an upwardly projecting portion 39 which fits over the top of the carrier and terminates in a flange 40 which sticks up above the top of the carrier to a substantial extent. Each locking plate has an opening 41 for the trunnion and other smaller openings 42 which receive the projections 29 from the ends of the carrier. The several openings in the plate fit the trunnion and projections fairly snugly so that the latter help to keep the plate in place. The plate is preferably made of mild steel and it has portions 43 which are sufficiently long to project downwardly beyond the bottom of the end of the carrier when the plate is in place on the trunnion. These projecting portions of the plate lie along the outer edges thereof and, after the plate is in position, the projections are bent back

along the bottom of the carrier and then turned up against the rear face of the end of the carrier as at 44. In this way the plate is held firmly in position on the end of the carrier and the end fuel-supporting units in the group on the carrier lie in contact with the upstanding part 40 of the plate and are thus kept properly spaced from the frame members. These upstanding portions on the plate also prevent the units from slipping off the carrier while the grate bar is being put in position.

The plate is also provided with a projection 45 extending outwardly from its bottom edge and aligned with the trunnion opening 14. This projection cooperates with a portion of the frame member to prevent the grate bar from upward movement which would throw the trunnion free of the trunnion socket. In grates in which the trunnion sockets are open at the top, ashes sometimes become wedged in the sockets beneath the trunnions and tend to lift the trunnions. When the accumulation of ashes has built up to a considerable extent, violent shaking of the grate bars might result in the trunnions being thrown free of the sockets. The projection 45 on the locking plate prevents this action from taking place. It extends outwardly from the face of the plate 38 a substantial distance and when the grate bar is in position in the frame, the projection underlies the rib 15 defining the trunnion socket in which a trunnion of the bar is mounted. In order to place the grate bar in position in the aligned sockets, the bar is turned through 90° to the position illustrated in Fig. 1 at 46. In this position, the projection 45 from each plate lies in alignment with a space 47 between the rib 15 and the next adjacent lug 17 on the frame. The grate bar is then lowered into position until its trunnions rest in their sockets, after which the bar is turned to its normal position. In this turning movement, the projections 45 swing down to lie beneath the bottom of the ribs 15.

The projection and rib cooperate at all ordinary times to prevent the trunnion from being lifted clear of its socket. When the bar is rocked for dumping purposes, the rocking movement does not go beyond 45° to either side of the normal position of the bar and consequently the projection 45 always lies beneath a portion of the rib, except when the bar is intentionally tilted so that its top lies vertical instead of horizontal.

The construction of the carrier and units described is simple and inexpensive and the carrier may be of light weight and yet sufficiently strong to serve its purpose. The units are also of simple construction and may be mounted on the carrier simply by being slipped over the ends of the latter. After the units are in position, the locking plates are put in place and the complete bar is then placed in the frame in the manner described and its shaker arm connected to the shaker rod. When the bar is to be removed, its shaker arm must be first disconnected from the shaker rod and then the bar swung through 90° as illustrated in Fig. 1. The bar can then be lifted free of the frame. To remove units from the bar, the projections 43 on the locking plate are then bent so as to clear the end of the carrier. Since the plate is of light stock, this is a simple operation.

While I have described the grate frame members in a preferred form which includes the side lugs and top projections, it will be apparent that frame members of various other types can be



employed so long as these members are provided with openings for trunnions and are provided with parts with which a portion of the locking plate on the grate bar can cooperate to hold the bar in place. The new bar, however, may be employed in a grate frame in which the trunnions are received in openings in the frame which are not open at the top. In that event, the locking plates serve only to keep the fuel supporting units on the bar and the projection 45 may be left in the plane of the plate or entirely dispensed with.

What I claim:

1. A grate which comprises the combination of a frame, and grate bars mounted therein, each bar comprising a carrier having trunnions receivable in openings in the frame, the carrier being rockable on its trunnions, a plurality of fuel-supporting units on the carrier and removable off the ends thereof, and a locking plate detachably mounted at each end of the carrier for holding the units thereon, said plate having an opening through which the trunnion loosely projects and a part underlying and engageable with a portion of the frame to prevent removal of the bar from the frame by an upward movement of the bar when the latter is in normal operative position.

2. A grate which comprises the combination of a frame, and grate bars mounted therein, each bar comprising a carrier having trunnions receivable in openings in the frame, the carrier being rockable on its trunnions, a plurality of fuel-supporting units on the carrier and removable off the ends thereof, and a locking plate detachably mounted at each end of the carrier, said plate having a part limiting movement of said units along the carrier, and another part cooperating with part of said frame to prevent accidental dislodgment of the bar from the frame.

3. A grate which comprises the combination of a frame, and grate bars mounted therein, each bar comprising a carrier having trunnions receivable in openings in the frame, the carrier being rockable on its trunnions, a plurality of fuel-supporting units on the carrier and removable off the ends thereof, and a locking plate detachably mounted at each end of the carrier, said plate having a part limiting movement of said units along the carrier, and a second part underlying a part of said frame beneath the opening in which a trunnion on said carrier is received, said second part permitting rocking movement of said carrier but preventing accidental dislodgment thereof from the frame.

4. A grate bar comprising a carrier having trunnions at its ends, a plurality of fuel supporting units mounted loosely on the carrier for rocking movement relative to said carrier, said units being removable off the ends of the carrier, and a plate at one end of said carrier for holding said units in place on the carrier, said plate having an opening through which the trunnion projects and lying adjacent the point of connection of the trunnion and the remainder of the carrier.

5. A grate bar comprising a carrier having trunnions at its ends, a plurality of fuel supporting units mounted on the carrier and removable off the ends of the carrier, and a plate at each end of the carrier, detachably secured to the carrier, and having a part limiting movement of the units along the latter, said plate having an opening through which the trunnion projects and lying adjacent the point of connection be-

tween the trunnion and the remainder of the carrier.

6. A grate bar comprising a carrier having trunnions at its ends lying within the outlines of the ends of the carrier, fuel supporting units on the carrier, each unit having an opening through it through which the carrier extends, said units being removable only off the ends of the carrier, and a plate at the end of the carrier for holding said units thereon, said plate having a projection extending parallel to the axis of the trunnion and beneath it in spaced relation to said trunnion.

7. A grate bar comprising a carrier having trunnions at its ends, a plurality of fuel supporting units mounted on the carrier and removable off the ends of the carrier, and a plate mounted at each end of the carrier and having an opening through which a trunnion projects, said plate having a part lying on the top of the carrier and limiting the movement of said units along the latter, another part engaging the under surface of the carrier for securing the plate in place thereon, and a projection beneath the trunnion and extending parallel to the axis thereof in spaced relation to said trunnion.

8. A grate which comprises the combination of a frame and grate bars mounted removably therein, each grate bar comprising a carrier having integral trunnions at its ends receivable in openings in said frame, said frame having an outwardly projecting part adjacent each opening, a plurality of fuel-supporting units mounted on the carrier and removable off the ends thereof, and a member at each end of the carrier for preventing movement of said units off the ends of the carrier, each member having a part underlying one of said outwardly projecting parts of the frame and engageable therewith to prevent accidental dislodgment of the bar from the frame by upward movement of the bar when in normal operative position.

9. A grate which comprises the combination of a frame, and grate bars mounted on the frame, each bar comprising a carrier having trunnions receivable in openings in the frame, said frame having an outwardly projecting part adjacent each opening, a plurality of fuel-supporting units mounted on the carrier, and members mounted at the ends of the carrier and removable off the ends of said trunnions, said members holding said units in place on the carrier and each having a part underlying one of said outwardly projecting parts of the frame to prevent accidental removal of the bar from the frame by upward movement of the bar when in normal operative position.

10. A grate which comprises the combination of a frame, and grate bars mounted on the frame, each bar comprising a carrier having a pair of supporting surfaces downwardly divergent, fuel-supporting units mounted on the carrier, each unit resting on said surface and having a limited freedom of angular movement relative to the carrier, said units being removable off the ends of the carrier, trunnions at the ends of the carrier and integral therewith and receivable in openings in said frame, said frame having an outwardly projecting part adjacent each opening, and means at each end of the carrier and preventing movement of said units off the ends of the carrier, said means having a part underlying and engageable with one of said projecting parts of the frame to prevent accidental removal of the bar from the frame by upward movement of the bar when in normal operative position.

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