May 23, 1933. J. S. THOMPSON 1,911,005

GRATE

Filed March 8, 1930

Fig. 1.

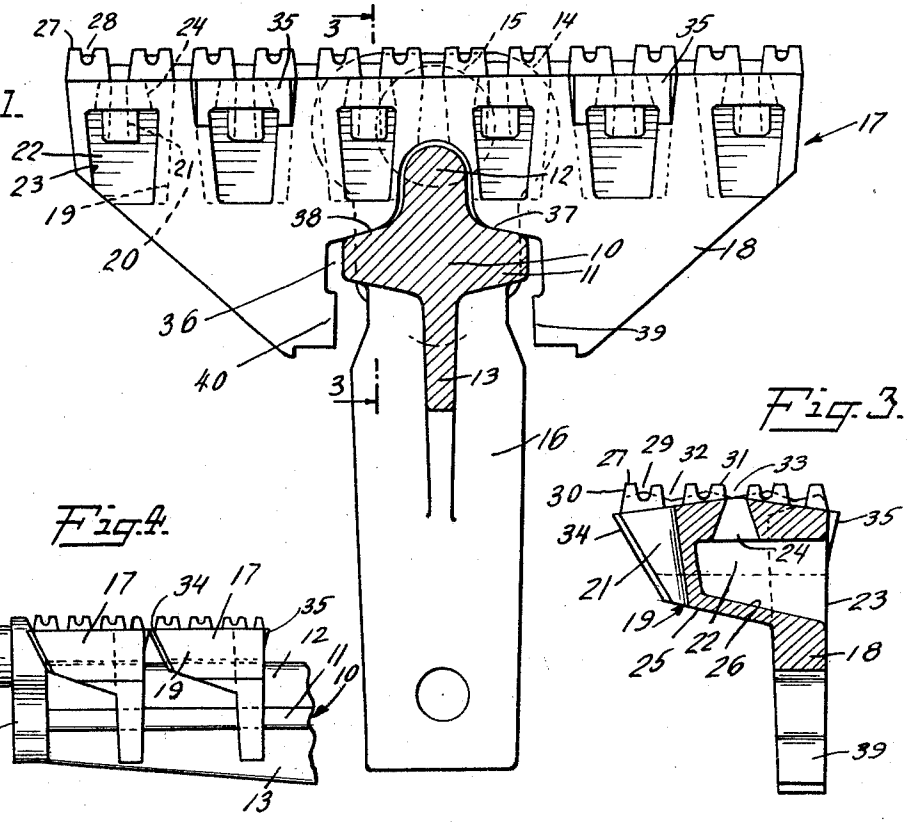
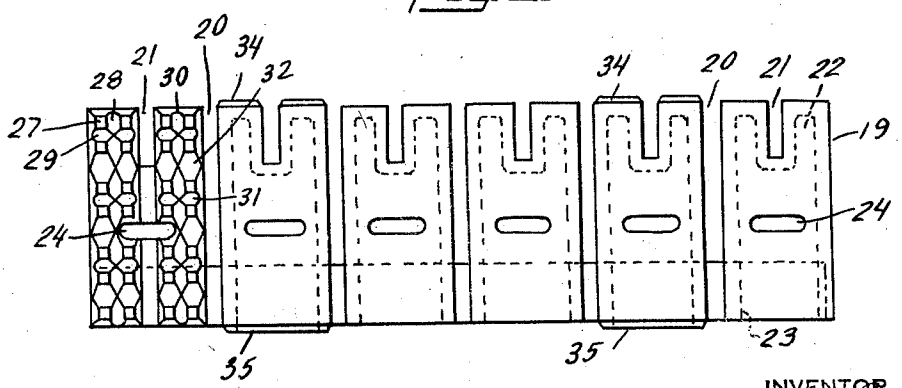


Fig. 3.

Fig. 4.

Fig. 2.



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Patented May 23, 1933 1,911,005

UNITED STATES PATENT OFFICE

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GRATE

Application filed March 8, 1930. Serial No. 434,255.

This invention relates to grates of the type used in locomotives, marine boiler furnaces and for other heavy duty purposes. More particularly, the invention is concerned with a grate bar which includes numerous features of novelty by virtue of which more efficient combustion is obtained, the fuel is burned to a fine ash, and clinkering avoided. The invention involves certain principles set forth and described in the co-pending application of Buckley, Serial No. 338,352, filed February 8, 1929, but is an improvement on the Buckley grate bar in the respects that the present bar may be manufactured more cheaply, is lighter in weight and is ventilated so that burning out is somewhat more effectively prevented. For purposes of illustration, an adaptation of the bar suitable for use in a locomotive will be described in detail to make clear the advantages of the new construction, but it is to be understood that this particular use of the bar is merely illustrative and that its utility is not confined to that use.

The new bar comprises a longitudinal supporting member or carrier bar and a plurality of fuel-supporting units mounted thereon and preferably removable therefrom, although the carrier bar and the units may be formed as one integral structure. The carrier bar is provided with the customary trunnions and the fuel-supporting units are formed with recesses in their lower edges so that they may be slipped on the bar by a movement transverse to the length thereof. These units are provided with locking means so that they cannot be dislodged from the bar when the latter is shaken in the usual manner. Each unit is provided with a fuel-supporting surface which is made up of a multiplicity of fine fuel-supporting areas and preferably each unit includes a plate-like portion from one face of which project spaced lugs. These lugs lie near the top of the plate and are hollow, there being a chamber in each lug which has a lateral opening through the opposite side of the plate. The top of each lug and the plate adjacent thereto is subdivided by air channels to form the small fuel-supporting areas and there is an opening from the chamber in the lug leading to one of these channels. The lugs are spaced apart along the bar to form air passages between them and air can thus flow up between the lugs to the fuel supported on the unit and can also flow through the chambers to the fuel. The air currents flowing through the passages and chambers serve to ventilate the unit and thus keep its temperature low and protect it from burning out.

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

Fig. 1 is a transverse section through the grate bar of this invention;

Fig. 2 is a fragmentary plan view of a portion of a fuel-supporting unit of the bar;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1; and

Fig. 4 is a fragmentary side elevation of the bar.

Referring now to the drawing, the bar is illustrated as consisting of a supporting member or carrier bar generally designated 10 and made up of a horizontal web 11 having an upstanding flange 12 at its top and strengthening rib 13 projecting from its under surface. This carrier bar is provided at its ends with upstanding flanges 14, from which project trunnions 15. The carrier bar is also provided with the usual shaker arm 16 by which it may be connected to a shaker rod.

Mounted on the carrier bar or formed integral therewith are fuel-supporting units 17, each unit comprising a plate-like portion 18 and a plurality of laterally projecting lugs 19 disposed near the upper edge of the plate on one face only. These lugs are spaced apart to form passages 20 for the upward flow of air between them and each lug has a passage

21 in its outer edge for the upward flow of air. Within each lug is a chamber 22 opening at 23 through the side of the plate 18 opposite to that from which the lugs project and there is an air exit passage 24 through the top of each lug communicating with the chamber. Preferably the under surface 25 of each lug is inclined downwardly toward the plate so that the chamber 22 has a sloping floor 26, thus leading air which enters the opening 23 in an upward direction to the air exit port 24. The top of each lug may be plain or it may have a plurality of minor fuel-supporting projections 27 separated by air channels 28 and intersecting air channels 29. In the construction illustrated, each lug carries several groups of projections of which there are four in a group and similar projections are formed on the top of the plate adjacent to the lug. Each projection tapers in size upwardly as illustrated more clearly in Fig. 3 so that the top surface of the projection is of less size than its base. Each projection is defined on all sides by surface which is exposed to air flow so that each projection is fully protected and cooled by air currents and the fuel supported thereon is in contact with only a small solid area. Thus air reaches the fuel on the top of the grate bar at closely spaced points and a wide distribution of air is accomplished, the actual solid area of the bar in contact with the grate being reduced to a minimum consistent with proper support of the fuel.

It will be observed that the air channels 29 which extend across the lug communicate with the passages 20 and 21. The channels 28 intersecting channels 29 lead to the outer edges of the lug. Between the groups of projections 30 and 31 there is a relatively wide air channel 32 and there is a similar wide channel 33 into which the exit passage 24 leads. This arrangement of the channels and passages insures that the air will flow around all of the projections and thus reach all parts of the fuel bed. Some of the air which reaches the fuel bed passes up through the passages 20 and 21, additional air enters the chamber 22 and flows through it to leave by the passage 24, while further quantities of air flow between the free ends of each lug and the next adjacent fuel-supporting unit on the bar.

In order to maintain the units at the proper spacing, certain of the lugs are provided with spacing projections 34 which contact with similar projections 35 from the plain face of the plate to the next adjacent lug. By properly proportioning these spacing projections, the space between adjacent cross-bars in a series can be regulated and thus the amount of air flowing upwardly to the fuel between adjacent units may be controlled.

In order that the units may be mounted on a bar, each unit is provided with a recess 36 in the lower edge of the plate portion thereof, which recess has a shape generally similar to the section of the carrier bar. The recess is so proportioned that the unit rests on the top of the web of the carrier bar at the points 37 and 38, the flange 12 of the carrier bar lying free of the walls of the recess. At the bottom of the recess are lugs 39 and 40 projecting inwardly into the recess and spaced apart a distance slightly greater than the overall width of the web 11.

In operation, the fuel burned on the bar is reduced to a relatively fine ash by reason of the wide distribution of air to all parts of the fuel bed, and clinkering is almost entirely obviated. The air channels are formed so that their bottom surfaces slope downwardly in such manner as to lead the ash to the air passages and the ash may be discharged from the fuel bed by a slight shaking action which serves merely to jar the fuel-supporting units.

When the carrier member is rocked, as for example, by a movement of the shaker arm 16 to the left (Fig. 1), the weight of the fuel on the units tends to keep them stationary and since there is a relatively loose fit between each unit and the carrier bar, a certain degree of relative movement of the bar and unit are thus permitted. When the rocking of the bar starts, the web pivots about a point at the end of the surface 38 as a fulcrum and the other upper face of the web 11 moves away from the surface 37 in the recess. This movement of the bar relative to the unit continues until the flange 12 is canted in the recess until it binds against the walls thereof, whereupon the unit and bar move together in any further rocking of the bar. When the reverse rocking movement is begun, the bar moves relative to the unit by reason of the inertia of the latter due to the weight of fuel thereon and the surface 37 of the bar strikes the corresponding surface of the wall of the recess of the unit a sharp blow, thus jarring the fuel thereon and tending to free the ash which then slides down through the air channels to the air passages and falls into the ash pan. In the pivoting of the carrier bar in the actual rocking movement, the unit may be raised perpendicularly to a slight extent, then when the rocking action in the other direction occurs, the unit drops down on the carrier bar and at the same time the sharp blow is transmitted to it in the manner previously described. This shaking of the grate serves the usual purpose of rocking of the grate bars but the shaking required with this bar is much less in extent and involves much less effort on the part of the fireman than is the case with bars of the ordinary construction. The fuel-supporting unit is prevented from being dislodged from the carrier bar during the shaking of the grate, since relative movement of the unit and carrier causes one or the other of the lugs 40 to pass

beneath the adjacent edge of the web 11 of the bar, and the unit is thus locked to the bar in such a way that it cannot be freed therefrom.

In the new bar, the placing of the lugs on one side of the unit simplifies the manufacture of the unit to a substantial degree. Each lug being made hollow, lessens the weight of the unit and consequently reduces the total weight of the grate. The hollowing of the lugs also makes it possible to provide air passages through the unit itself as distinguished from passages between the lugs on the face of the bar. As a consequence, the main portion of the plate of each unit is kept cool and injury due to the heat of the burning fuel is thus prevented.

What I claim:

1. A grate bar which comprises a carrier bar and a plurality of fuel-supporting units thereon extending beyond the side edges thereof, each unit including a plate-like portion and a row of hollow lugs projecting from one face only of said plate, the top of said lugs serving as a fuel-supporting surface.

2. A grate bar which comprises a carrier bar and a plurality of fuel-supporting units thereon extending beyond the side edges thereof, each unit incuding a plate and a row of lugs projecting from one face only of said plate, each lug having a chamber within it opening through the other face of said plate.

3. A grate bar which comprises a carrier bar and a plurality of fuel-supporting units thereon extending beyond the side edges thereof, each unit including a plate, and a plurality of lugs projecting from one face of said plate, each lug having a chamber within it having a lateral opening.

4. A grate bar which comprises a carrier bar and a plurality of fuel-supporting units thereon extending beyond the side edges thereof, each unit including a plate and a plurality of lugs projecting from one face of said plate, each lug having a chamber within it having an opening through the opposite face of the plate, the floor of said chamber sloping upwardly away from said opening.

5. A grate bar which comprises a carrier bar and a plurality of fuel-supporting units thereon extending beyond the side edges thereof, each unit including a plate and a plurality of lugs projecting from one face of said plate, each lug having a chamber within it with a lateral opening, and an air opening in the top of the lug communicating with said chamber.

6. A grate bar which comprises a carrier bar and a plurality of fuel-supporting units thereon extending beyond the side edges thereof, each unit including a plate and a plurality of lugs projecting from one face of said plate, each lug having a chamber within it having a lateral opening through the other face of said plate, and an air port in the top of the lug leading from the chamber.

7. In a grate bar, a fuel-supporting unit comprising a plate, and lugs projecting from one face of said plate, each lug being hollow and having a lateral air inlet opening.

8. In a grate bar, a fuel-supporting unit comprising a plate, and lugs projecting from one face of said plate, each lug being hollow and having an air inlet opening through the other face of said plate.

9. In a grate bar, a fuel-supporting unit comprising a plate, and lugs projecting from one face of said plate, each lug being hollow and having a lateral air inlet opening and an air outlet opening at the top.

10. In a grate bar, a fuel-supporting unit comprising a plate, and lugs projecting from one face only of said plate, each lug having its top surface subdivided by air channels into a plurality of small fuel-supporting surfaces and having a vertical air passage in its outer face communicating with certain of said channels.

11. In a grate bar, a fuel-supporting unit comprising a plate, and lugs projecting from one face only of said plate, each lug having its top surface subdivided by air channels into a plurality of small fuel-supporting surfaces arranged in groups and having a vertical air passage in its outer face communicating with certain of said channels.

12. In a grate bar, a fuel-supporting unit comprising a plate, and lugs projecting from one face only of said plate, each lug having upwardly extending projections from its top surface separated by air channels and having a vertical air passage in its outer face communicating with certain of said channels.

13. A grate bar comprising a carrier bar having upstanding arms at its ends and a plurality of fuel-supporting units mounted removably thereon, each unit comprising a plate and a plurality of lugs projecting from one face only thereof, said plate having a recess shaped to receive said carrier bar, said plate also having spaced parts normally free of said carrier bar but alternately movable into locking engagement therewith as said carrier bar and unit move relatively in opposite directions upon rocking of said carrier bar, each of said units engaging the next unit on said carrier bar and one end unit engaging the arm at one end of the carrier bar and maintaining the other units upright.

14. A grate bar comprising a carrier bar having upstanding arms at its ends and a plurality of fuel-supporting units mounted removably thereon, each unit comprising a plate having spaced lugs projecting from one face only thereof near the top of the plate, the plate having a recess to receive said carrier bar and a pair of parts spaced a distance slightly greater than the greatest overall width of said carrier bar, said parts being positioned to engage said carrier bar alter-

nately as said carrier bar and unit move relatively upon rocking of said carrier bar in alternate directions, each of said units engaging the next unit on said carrier bar and one end unit engaging the arm at one end of the carrier bar and maintaining the other units upright.

In testimony whereof I affix my signature.

JAMES S. THOMPSON.