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A. M. MASSER

GRATE BAR

Filed Jan. 23, 1920

Fig. 1.

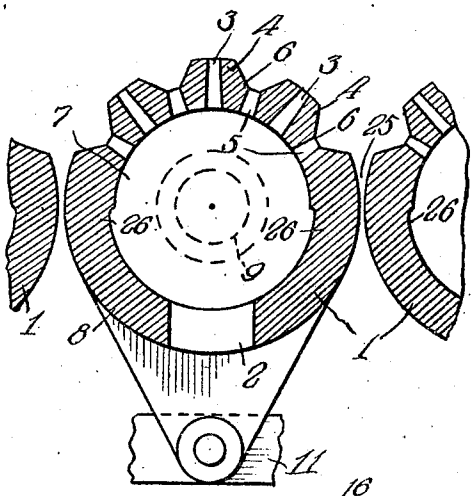
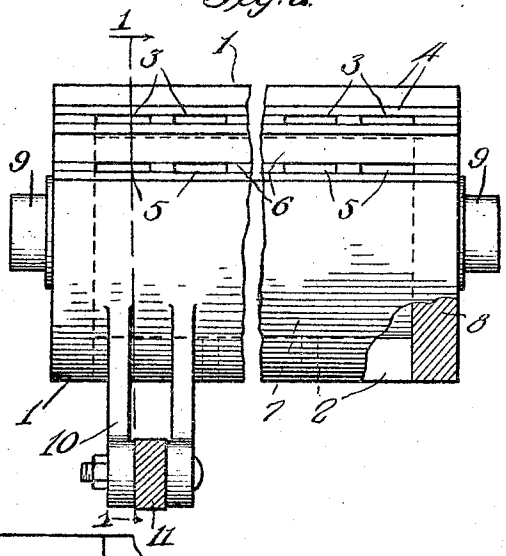


Fig. 2.



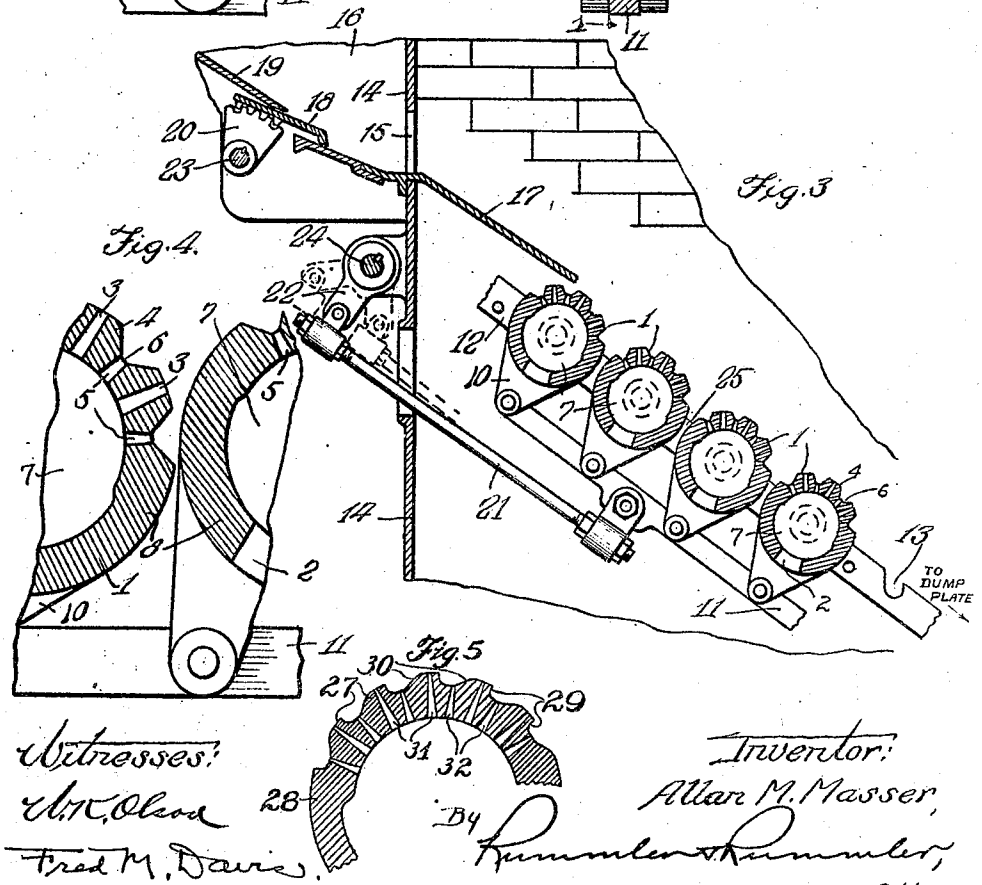


Fig. 3.

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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GRATE BAR.

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To all whom it may concern:

Be it known that I, ALLAN M. MASSER, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Grate Bars, of which the following is a specification.

This invention relates to rockable grate bars, and particularly to those which are intended for use in furnaces having forced draft. Some of the requisite, but often inadequately attained, features of such bars are permanence of form, capability to thoroughly distribute the air to the fuel bed throughout the grate area and to preheat the air nearly to the ignition temperature in transmitting it to the fuel, capability to rapidly conduct away excessive heat from the combustion surfaces of the grate and to distribute such heat to the more remote and downward parts of the grate whereby it may most efficiently preheat the air and whereby any excess heat may be radiated and suitably disposed of without harm, and adaptability to break up and help dispose of cinders and clinkers. The tendency of the ash and cinder material to cake and choke the grate is especially troublesome.

The main objects of this invention are to provide an improved and more efficient form of grate, and especially a grate adapted by rocking of the bars to break up and eliminate clinkers and the like, both by individual action and by mutual coaction; to provide an improved form of hollow grate bar adapted by rocking to engage and grind up clogging material; to provide such a bar having alternate projections and depressions and having apertures disposed and shaped to distribute and discharge the requisite supply of air at a proper temperature in numerous and well distributed streams, so as to effect more even and speedy combustion, and so as to avoid admission and useless heating of more air than required to support complete combustion; to form and dispose the apertures so as to avoid substantial weakening of the bars, and so as to cause upward oscillating currents of air to be discharged into the fuel as the bars are rocked in such manner as to more thoroughly equalize the distribution of air throughout the fuel mass and thus accommodate a thick fuel bed such as may require the least amount of attention and such as may keep free from holes burning through; and to provide a grate characterized by great strength of the bars, oscillation of air streams to avoid cutting holes in the fuel bed, and efficient self cleaning at each bar, so as to assure a clean full bed and consequent high efficiency.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which—

Fig. 1 is a cross section through a group of bars on the line 1—1 of Fig. 2, as used either with automatic or hand shaking means.

Fig. 2 is a side view of one of the bars, the middle part being broken away.

Fig. 3 is a vertical section running lengthwise through the furnace grate as a whole.

Fig. 4 is a section similar to Fig. 1 but showing the bars rocked to their limit in one direction.

Fig. 5 is a fragmentary cross section of a modified form of grate bar.

In the construction shown in the drawings each bar 1 comprises a horizontal hollow body of cylindrical shape having a roughened upward grinding face. Each bar also has a downward air intake aperture 2 and a plurality of upward discharge apertures or nozzles distributed over the grinding face.

Part of said nozzles are formed, as at 3, in the longitudinal ridges or ribs 4, and part are disposed, as at 5, in the hollows or corrugation-troughs 6 between said ribs. The apertures 2, 3 and 5 are all radial and communicate directly with the main cavity or chamber 7 of the bar. This provides for distributed radial playing of the air streams to and fro into the fuel bed.

Each bar is provided with end walls 8, having outwardly projecting trunnions 9 on which the bar is pivoted. A crank arm 10 is also provided on each bar to which is pivotally connected the common rocker bar 11 suspended beneath the grate.

The grate as a whole may be disposed horizontally as in Fig. 1, but is preferably inclined as in Fig. 3, especially when automatic stokers are used. Referring further to Fig. 3, the fire-box is provided with inclined lateral supports 12 for the ends of the grate bars, said supports having journal

bearings 13 adapted to facilitate interchange of bars.

The plate 14, constituting the front wall of the furnace, has a fuel doorway 15 communicating with the lowermost part of the hopper 16. The plate 17, known as the dead plate or coking plate, rests on the lower edge of the doorway 15, with its lower edge inclined downward and overlapping the first grate bar. The automatic pusher 18 is arranged slantwise under the hopper substantially in alinement with said dead plate, and is adapted to feed the fuel backward from the hopper plate 19 over the dead plate 17 and onto the grate bars 1. The pusher 18 is oscillated by a gear sector 20. The rocker bar 11 is oscillated by the connecting rod 21 leading to the crank arm 22. The shafts 23 and 24 on which the gear sector 20 and crank arm 22 are fixed respectively, are oscillatable either automatically or manually, as will be understood, by means well known in the art but not here shown.

The operation of the furnace is as follows: Coal is supplied to the hopper 16, from whence it is fed gradually by the pusher 18 into the furnace and onto the grate, as usual in such devices. Here the tendency of the fuel to form into large solid masses as it cokes is overcome by the agitating and feeding effect of the corrugation teeth or knobs 4 on the grate bars. Moreover, all caked clinker, ash and cinder formation is comminuted either by grinding between the bar teeth and the overlying fuel bed or by crushing between the corrugated bars as the latter coact in oscillating.

Furthermore, the draft of air both between the bars and through the distributing passageways therein insures thorough combustion over the whole bottom layer of the fuel bed. Hence the effect of the grinding action of the bars is to comminute and sift out all ash and clinker material as the mass moves forward toward the dump-plate, not shown. Here any remaining débris may be disposed of as usual from time to time, as understood in the art. The ash material escapes mainly through the clearance spaces 25 about a quarter of an inch wide, between the bars 1, but some of it passes down through the apertures 3 and 5 and out at 2.

The roughened or corrugated zone preferably extends over such an arc relative to the amplitude of oscillation that at the limits of movement only are the edges of said zone opposite to and facing toward the next adjacent bars respectively.

The draft air is heated mainly as it passes upward at comparatively low speed through the cylindrical chamber 7 between the arcuate walls 26, and receives its final high degree temperature as it rushes out through the narrow jets 3 and 5. From these jets the hot air blast is sprayed upward well into the mass of burning fuel so that combustion is hastened and a very intimate and uniform mixture of air with the combustible gases passing to the combustion chamber is assured.

It is to be noted that, as may sometimes be required, a more positive grate feed may be had by forming the grate ribs or teeth as shown in Fig. 5. Here the ribs 27 on bar 28 are formed with a very definite pitch or inclination, same being from left to right as viewed in Fig. 5, where the ribbed part resembles a segment of a circular saw. When the grate swings one way, the square shoulders 29 engage the fuel bed and move it forward to some extent, but in returning, the rounded backs 30 slide under the bed and so have only an up and down or shaking effect on the bed. The air tuyeres 31 and 32 are substantially like the corresponding tuyeres 3 and 5 in Fig. 1. The bars are otherwise alike.

Although but two specific embodiments of this invention are herein shown and described, it is to be understood that some of the details of the constructions shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. A hollow grate bar adapted for rockable mounting, and having an arcuate upper face provided with alternate longitudinal ribs and depressions extending continuously throughout the length of said bars and also provided with draft tuyeres distributed therein to discharge upwardly, whereby the bar may be cooled in use and the direction of the draft jets constantly changed relative to the fuel bed, said bar having lateral zones of smooth cylindrical shape to provide for constant spacing relative to an adjacent bar, and said bar also having a draft inlet aperture for the admission of air to supply said tuyeres.

2. A grate comprising a plurality of rockably mounted air cooled bars spaced apart sufficiently to permit the upward passage of air and the downward escape of ash material between them, said bars being formed with lateral zone faces of smooth and substantially cylindrical shape along their lines of approximate mutual tangency, the upper faces of said bars being longitudinally ribbed and provided with apertures for the escape of draft air, said bars being formed to supply air to said apertures, and means to simultaneously rock said bars, whereby the upwardly projecting ribs may act mechanically on the fuel bed and the air sprays from said apertures may be played to and fro into said bed.

Signed at Chicago this 21st day of January 1920.

ALLAN M. MASSER.