

Jan. 19, 1937.

J. GOETZ

2,068,018

STOKER

Filed Jan. 5, 1935

Fig. 1.

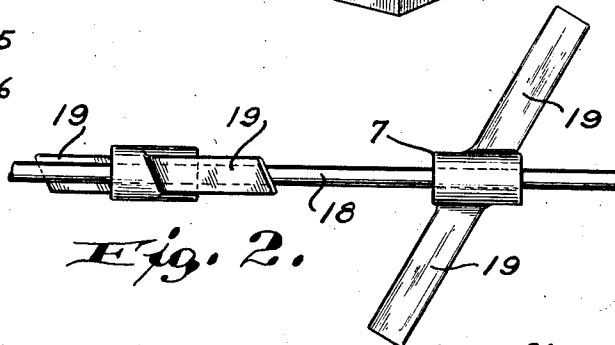
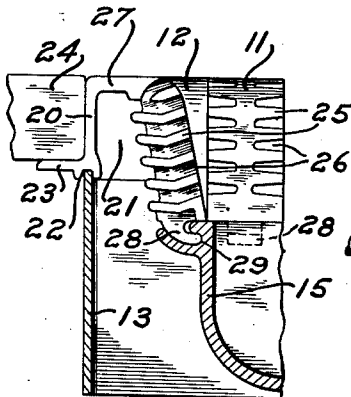
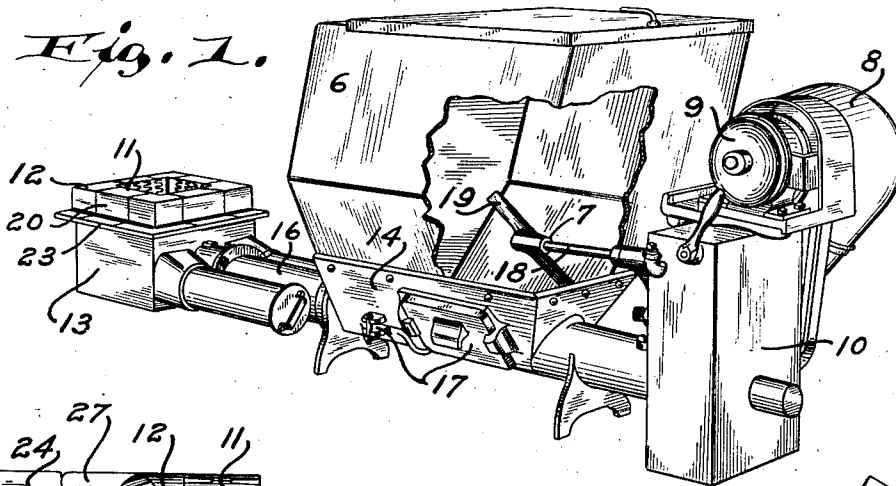


Fig. 2.

Fig. 3.

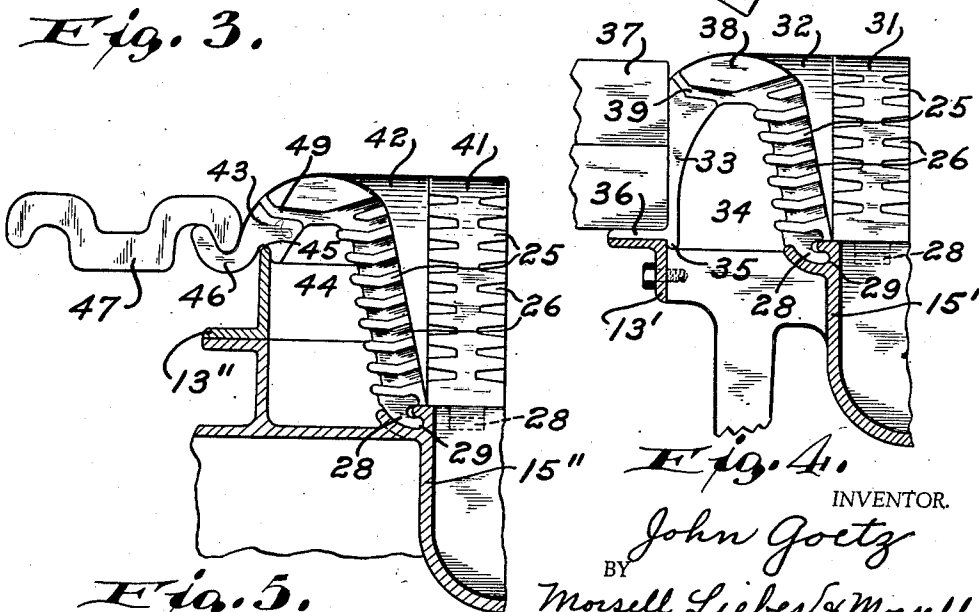


Fig. 4.

Fig. 5.

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2,068,018

STOKER

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Application January 5, 1935, Serial No. 569

6 Claims. (Cl. 110—45)

The present invention relates in general to improvements in the art of feeding fuel to combustion chambers, and relates more specifically to improvements in the construction and operation of stokers for delivering coal which has been more or less pulverized, into furnaces or the like.

Generally defined, an object of the invention is to provide an improved fuel stoker which is simple and compact in construction, and which is, moreover, highly efficient in operation.

Some of the more specific objects of the present invention are as follows:

To provide improved mechanism for insuring automatic and effective delivery of pulverized coal and air to the combustion chamber of a furnace or the like.

To provide improved and durable grate bar structure for effecting unobstructed delivery of abundant quantities of air to the burning fuel, while at the same time protecting the grate against destruction by extreme heat.

To provide an improved stoker grate assembly which can be conveniently installed and dismantled, and wherein fine fuel is prevented from falling through the air delivery passages of the grate.

To provide improved mechanism for insuring proper delivery of more or less pulverized fuel from a supply hopper to the grate assembly and combustion chamber.

To provide improved fuel stirring and agitating mechanism for preventing bridging of the fuel within the supply hopper and over the fuel feed screw for delivering the fuel to the grate.

These and other objects and advantages will be apparent from the following detailed description.

A clear conception of embodiments of the improved features, and of the mode of constructing and of utilizing stokers built in accordance with the invention, may be had by referring to the drawing accompanying and forming a part of this specification, in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a perspective view of one of the improved stoker units, showing the grate fully assembled, and having a portion of the fuel supply hopper broken away in order to reveal the interior thereof;

Fig. 2 is an elevation of a modified form of fuel stirrer or agitator adapted to be used in units of larger capacity than that shown in Fig. 1;

Fig. 3 is an enlarged, transverse, vertical section through a portion of the air-box and grate assembly of the stoker shown in Fig. 1;

Fig. 4 is a similarly enlarged, transverse, vertical section through a modified air-box and grate assembly; and

Fig. 5 is a likewise enlarged, transverse, vertical section through a further modified air-box and grate assembly.

While the invention has been illustrated herein as being applied to a particular type of pulverized coal stoker, it is not intended to unnecessarily restrict the scope by such specific embodiment; and the novel features may obviously be more generally applicable to other types of stoker mechanism.

Referring to Fig. 1 of the drawing, the improved stoker unit shown therein comprises in general a fuel supply hopper 6 having an agitating rotor 7 disposed therein above the ordinary horizontal fuel delivery screw; a blower 8 for delivering air to the combustion chamber; an electric motor 9 for driving the blower 8 and the gearing disposed within a gear box 10 for propelling the fuel feed screw; a grate assemblage comprising side bars 11 and corner bars 12 for supporting the fuel bed; and an air-box 13 for supporting the grate assemblage and for receiving the air from the blower 8 and delivering the same through the grate to the fuel bed.

The hopper 6 is mounted upon a casing 14 within which the fuel feed screw is located, and which communicates with a fuel delivery casing 15 at the grate assembly, through a horizontal feed screw casing 16. The hopper supporting casing 14 is provided with pressure release and clean out plates 17 which is automatically displaced by excessive pressure caused by tramp iron admitted to the feed screw with the fuel, and may also be manually removed for inspection purposes.

The improved agitating rotor 7 may be either of single formation, as shown in Fig. 1, or of double construction, as shown in Fig. 2. The rotor 7 comprises one or more stirrers mounted upon a constantly rotating shaft 18, and each having a pair of oppositely disposed vanes 19 extending outwardly from a supporting hub and at an angle relative to the axis of the shaft 18. The vanes 19 may also be twisted as shown in Fig. 2, and when two stirrers are utilized, the vanes 19 of one stirrer are preferably disposed in a plane ninety degrees in advance of the plane of the other stirrer vanes 19. The angular disposition

of the vanes 19 causes the same, during revolution of the rotor 7, to agitate the fuel within the hopper 6 and to prevent possible bridging thereof across the fuel feed screw.

Referring specifically to Figs. 1 and 3, the improved grate assembly shown therein is of relatively small size and capacity, especially adapted for use in domestic heating furnaces or boilers. The individual grate and corner bars 11, 12 of this assemblage are provided with adjoining, upright, rear walls 20 spaced from the grate bars proper, to provide an unobstructed, continuous, relatively large air duct 21 extending entirely around the grate and communicating with the open upper end of the air-box 13. While there are only four corner bars 12 in each assemblage, there may be any desired number of intervening grate bars 11; and each of the rear walls 20 is provided with a groove 22 at the lower end thereof, engageable with the upper end of the outer wall of the air-box 13, and has a flange 23 projecting outwardly therefrom for supporting an adjacent fire-brick structure 24, as shown in Fig. 3.

The intermediate grate bars 11 are each provided with oppositely disposed side fins 25 of angular formation, as shown in Fig. 3, forming air passages 26, and projecting rearwardly into the air duct 21. The angular formation of these fins 25 prevents fine fuel from escaping from the fuel bed into the duct 21 when the air flow through the passages 26 ceases; and the rear projections of the fins 25, being exposed to the flow of air within the duct 21, are constantly cooled thereby. The upper extremity of each grate bar 11 is connected with the upper end of the corresponding rear wall 20 by means of a relatively thin top web 27; and the lower extremity of each of these bars 11 is provided with a hook 28 adapted for engagement with a groove 29 formed in the upper end of the fuel delivery casing 15. By lifting the rear wall 20 of the grate bar 11 out of engagement with the air-box 13 and subsequently swinging the bar forwardly, the locking hook 28 thereof will be withdrawn from the groove 29, so that the bar may thereafter be readily removed without obstruction.

The corner grate bars 12 are all of like construction, and these bars need not have rear cooling fins projecting into the air duct 21. The grate bar 12 is, therefore, entirely free from obstruction around the bars 11, and the lower ends of these corner bars merely rest upon the top of the fuel delivery casing 15 and are not necessarily provided with locking hooks coacting with the groove 29. The corner bars 12 are also provided with outwardly projecting flanges 23 for supporting brick structure 24, and when this structure is in place, all of the bars 11, 12 are locked against possible displacement.

Referring to Fig. 4, the improved grate assembly disclosed therein is of intermediate size and capacity, somewhat greater than that of the bars 11, 12. The individual grate and corner bars 31, 32 of this modified assemblage are also provided with rear walls 33 spaced from the fuel supporting portions of the bars, to provide a continuous, unobstructed and relatively large air duct 34 extending entirely around the grate and communicating with the upper open end of an air-box 13'. There may also be any desired number of intermediate grate bars 31 in this modified assemblage, and each of the bars 31, 32 is provided with a lip 35 adapted for insertion within the upper end of the air-box 13', and with a flange

36 adapted to rest upon the box and to coact with fire-brick structure 37, as shown in Fig. 4.

Each of the intermediate grate bars 31 is also provided with oppositely disposed side fins 25 of angular formation, forming air passages 26, and projecting rearwardly into the air duct 34. The angular formation of the fins 25 of this modification again prevents fine fuel from escaping from the fuel bed into the duct 34, and the rear projections of the fins 25 serve to cool the grate bars. The upper end of each of the modified bars 31 is connected with the upper portion of the corresponding rear wall 33, by means of a relatively heavy connecting portion 38 having additional cooling air passages 39 therein, and the lower extremity of each of these bars 31 is also provided with a locking hook 28 adapted for engagement with a groove 29 formed in the upper end of the fuel delivery casing 15'.

The corner grate bars 32 are also of like construction and need not necessarily be provided with rearwardly extending cooling fins projecting into the air duct 34. These corner bars 32 moreover are not necessarily provided with retaining hooks 28 coacting with the groove 29 and are normally locked in place against the air-box 13' by the brick structure 37.

Referring to Fig. 5, the improved grate assembly illustrated therein is of relatively large size and capacity as compared to the two previous disclosures. The individual grate and corner bars 41, 42, respectively, of this further modification are likewise provided with relatively short rear wall portions 43 cooperating with the adjacent wall of the air-box 13'' to provide a continuous, unobstructed, relatively large air duct 44 extending completely around the grate. As in the other forms of grates previously described, there may be any desired number of intermediate grates 41 cooperating with four corner bars 42; and each of these bars has a recess 45 at the lower end of the wall portion 43 thereof, coacting with the upper edge of the adjacent air-box wall. Each of the rear wall portions 43 is also provided with an integral flange 46 forming a recess for the reception of outer bed plates 47, as illustrated in Fig. 5.

Each of the modified large grate bars 41 is likewise provided with oppositely disposed side fins 25 of angular formation, forming air passages 26 and projecting rearwardly into the air duct 44. The angular formation of the fins 25 of this second modification again prevents fine fuel from escaping into the duct 44, and the rear fin projections likewise serve to cool the grate bars. The upper portion of each grate bar 41 is connected to the rear wall portion 43 thereof, by means of a relatively heavy connecting portion 48 having additional cooling air passages 49 therein, as disclosed; and the lower end of each of these bars 41 is likewise provided with a releasable retaining hook 28 adapted to interlock with a groove 29 formed in the upper part of the fuel delivery casing 15''.

The corner grate bars 42 are likewise of similar structure and need not be formed with rear cooling fins projecting into the air duct 44. These corner grate bars 42 do not necessarily have retainer hooks 28 engageable with the groove 29, but do have recesses 45 and are normally held in position by the relatively heavy bed plates 47.

During normal operation of the improved stoker, the hopper 6 is supplied with an abundant quantity of more or less pulverized coal, and the blower 8 and fuel feed mechanism are operable

by the electric motor 9 to deliver air to the air-box 13 and coal to the fuel delivery casing 15, respectively. When the fuel feed screw is operating, the agitator shaft 18 is also rotating, and the revolving vanes 19 of the agitator 7, by virtue of their inclination, constantly urge the fuel charge back and forth within the hopper 6 and thereby prevent bridging and insure continued delivery of fuel to the lower feed screw. As the feed screw forces the pulverized coal upwardly through the delivery casing 15, the fuel builds up against the inclined grate bars and becomes ignited. Air from within the air-box 13 flows through the unobstructed air duct surrounding the grate and is delivered through the passages 26 into the fuel bed and thus supports combustion, in an obvious manner.

As this relatively cool air from the blower 8 flows through the air duct surrounding the grate bars, it is not only uniformly distributed throughout the entire grate, but it also cooperates with the rearwardly extending fin projections to effectively dissipate the heat; and this maintains the grate bars in cool condition. When the air subsequently flows inwardly through the passages 26, it carries with it any fine fuel which may have lodged upon the angular fins 25; and the cooling of the larger grate bars is further enhanced by the air flowing through the passages 39, 49. As previously indicated, the angular formation of the fins 25 with substantially horizontal, rear shelf portions and upwardly inclined front portions, positively prevents fuel from escaping into the air-box 13, even when the stoker is idle, while at the same time insuring most effective distribution and delivery of fresh air to the heating fuel bed. The formation of the corner and intermediate grate bars with integral rear wall portions cooperating with the air-box 13 to provide an unobstructed, spacious air supply duct, also enhances the air distribution and positively protects the grate bars against rapid deterioration due to burning. The individual grate bars are effectively retained in assembled position but may be readily removed for interchanging or renewal by virtue of the coaction between the retaining hooks 28 and grooves 29, and the further coaction of the rear walls thereof with the air-box structures.

From the foregoing description it will be apparent that the present invention provides a simple, compact, and durable stoker assembly, which is highly effective in actual use. The improved agitating and stirring structure insures continued delivery of fuel to the grate assembly, and the latter insures delivery of an abundant supply of uniformly distributed and preheated air to the burning fuel bed. The fins on the grate bars not only serve to prevent rapid destruction of these bars, but also serve to effectively pre-heat the entering combustion air; and these improved grate bars may be readily manufactured, assembled, and dismantled. The improved stoker has proven highly successful in actual commercial use and is well adapted for various types of service.

It should be understood that it is not desired to limit the invention to the exact details of construction and to the precise mode of operation herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. A grate assembly comprising a series of ad-

joining grate bars each having a central web and integral fins projecting laterally from the opposite sides of the web to form a plurality of superimposed air passages of uniform cross-sectional area on each side of the web, the front fuel supporting surfaces of each web and the associated fins lying in a common inclined plane and the outlet ends of said passages extending substantially perpendicular to said plane, and the rear ends of said fins extending horizontally and rearwardly beyond said web and providing substantially horizontal unrestricted inlet ends for said passages in open communication with said inclined outlet ends, whereby free and abundant flow of air through said passages is assured and gravitation of fuel therethrough is prevented when the air flow ceases.

2. A grate assembly comprising a series of adjoining grate bars each having a central web disposed in a substantially vertical plane and substantially horizontal parallel fins projecting laterally from the opposite sides of the web and beyond the rear edge thereof to form a plurality of superimposed air passages of uniform cross-sectional area extending along each side of the web, the front fuel supporting surface of each bar lying in an inclined plane disposed perpendicular to the plane of said web and the discharge portions of said passages extending substantially perpendicular to the fuel supporting surface, and the rear intake portions of said passages extending substantially horizontally and at an angle to said discharge portions, whereby unimpaired flow of air through said passages is assured and fuel is prevented from falling through said grate when the air flow ceases.

3. A grate assembly comprising a series of adjoining side bars each having a central web and integral fins projecting laterally from the opposite sides of the web and beyond the rear edge thereof to form superimposed air passages along each side of each web in alinement with the corresponding passages of adjacent bars, the portions of said passages remote from the fuel bed being unrestricted in cross-section and directed substantially horizontally and the portions adjacent the fuel bed being inclined upwardly, and the rearwardly extending portions of the adjoining fins of successive bars coacting with each other to provide continuous fins extending along the rear of the assembled grate.

4. A grate assembly comprising a series of adjoining side bars each having a central web and integral fins projecting laterally from the opposite sides of the web and beyond the rear edge thereof to form superimposed air passages along each side of each web in alinement with the corresponding passages of adjacent bars, the portions of said passages remote from the fuel bed being unrestricted in cross-section and directed substantially horizontally and the portions adjacent the fuel bed being inclined upwardly, and the rearwardly extending portions of the adjoining fins of successive bars coacting with each other to provide continuous fins extending along the rear of the assembled grate, and corner bars coacting with the adjacent sides of the fins of the end side bars of said series.

5. A grate assembly comprising a horizontal series of adjoining independently removable side bars each having a central web disposed in a vertical plane and integral fins projecting horizontally from opposite sides of the web and beyond the rear edge thereof to form superimposed parallel air passages extending along both sides

and the rear of each bar, the portions of said passages adjacent the front of the bar being inclined forwardly and upwardly and the rear portions of said passages being disposed substantially horizontal.

5 6. A grate assembly comprising a horizontal series of adjoining independently removable side bars each having a central web disposed in a vertical plane and integral fins projecting horizontally from opposite sides of the web and beyond the rear edge thereof to form superimposed

parallel air passages extending along both sides and the rear of each bar, the portions of said passages adjacent the front of the bar being inclined forwardly and upwardly and the rear portions of said passages being disposed substantially horizontal, and the fins of each bar being alinear with the corresponding fins of adjacent bars to provide substantially uniform cross-section throughout the entire lengths of said passages.

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