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C. H. SPARKS

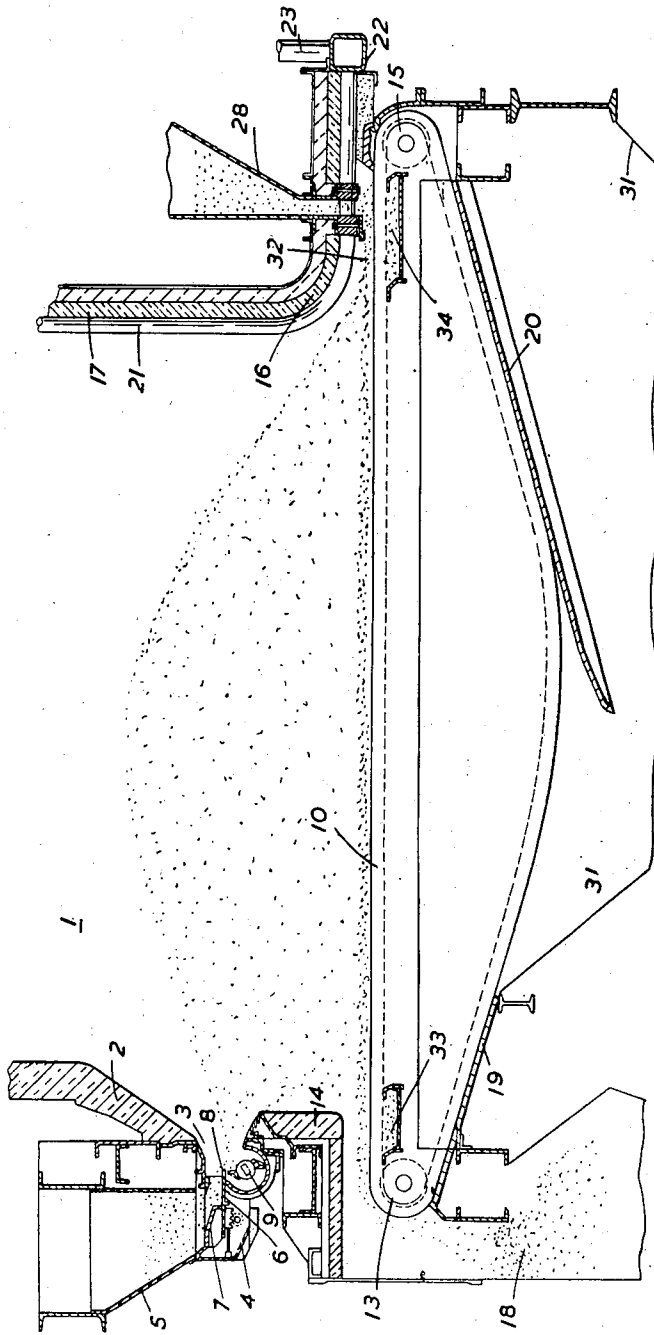
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CHAIN GRATE STOKER HAVING MEANS FOR FEEDING REFRACTORY
MATERIAL THEREUPON FOR INSULATING PURPOSES

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2 Sheets-Sheet 1

FIG. 1.



INVENTOR.

Cedric H. Sparks

BY

Harniss, Dealey & Pence
ATTORNEY

July 19, 1949.

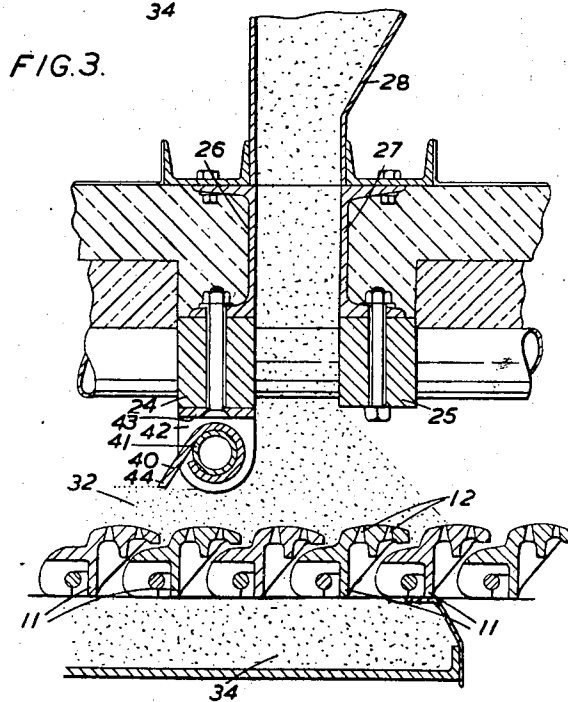
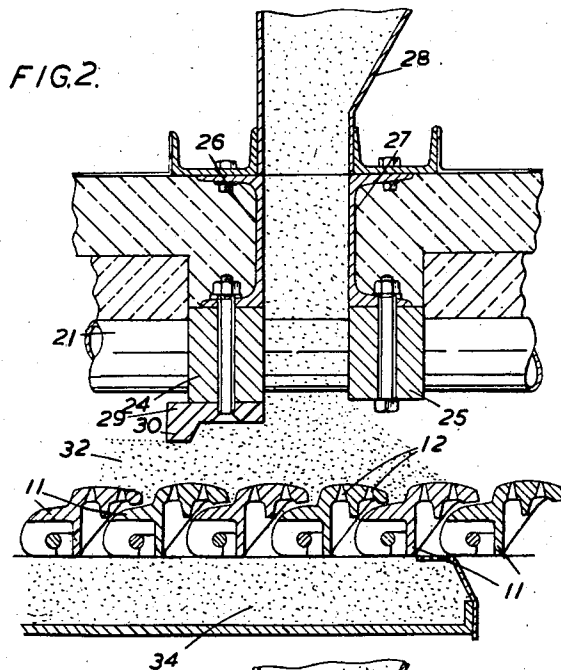
C. H. SPARKS

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2 Sheets-Sheet 2



INVENTOR.

Cedric H. Sparks

BY

Harness Decker & Pinner
ATTORNEY

UNITED STATES PATENT OFFICE

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CHAIN GRATE STOKER HAVING MEANS
FOR FEEDING REFRACTORY MATERIAL
THEREUPON FOR INSULATING PURPOSES

Cedric H. Sparks, London, England

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2 Claims. (Cl. 110—40)

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This invention relates to combustion apparatus of the kind including a stoker adapted to project fuel into a furnace above an endless mechanical grate and during normal operation to distribute fuel over a length of the upper run of the grate extending from near the exit thereof from the furnace. Such combustion apparatus when operating under ideal conditions is advantageous in that by supplying fuel with an approximation to an even distribution over the combustion area of the grate, and with the grate worked at an appropriate speed, the combustion of the distributed fuel takes place upon a layer of ash, once such layer is formed, while the required firing rate is attained with similar and only moderate conditions of heat release in all parts of the combustion area on the grate and the corresponding parts of the furnace. The ash layer not only separates the grate from the burning fuel but protects the grate from radiation within the furnace. The grate which is subject to the flow through of combustion air is therefore maintained at a low temperature. In practical operation, however, the nature of the fuel to be burned may vary widely as regards composition, range of particle size and percentages of particles of various sizes and if the fuel has a low ash content or contains a large proportion of fines which are burned in suspension, parts of the grate, particularly an initial length of the grate run within the furnace, may be uncovered or insufficiently covered by fuel or/and ashes and suffer damage due to radiation within the furnace. An object of the invention is to overcome this difficulty.

The present invention comprises combustion apparatus including a stoker adapted to project fuel into a furnace above an endless mechanical grate and during normal operation to distribute fuel over a length of the upper run of the grate extending from near the exit thereof from the furnace, wherein auxiliary means is arranged to deposit upon the upper run of the grate adjacent or before its entry into the furnace an air-pervious layer of material adapted to screen the grate from radiation within the furnace.

The invention also comprises combustion apparatus including a stoker adapted to project fuel into a furnace from the front thereof above an endless mechanical grate arranged for forward movement in its upper run, the stoker being adapted during normal operation to distribute fuel over a length of the upper run of the grate extending rearwardly from near the front end of the grate run within the furnace, wherein

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auxiliary means is arranged to deposit upon the upper run of the grate adjacent or before its entry into the furnace an air-pervious layer of material adapted to screen the grate from radiation within the furnace.

The invention also includes combustion apparatus of the kind comprising a mechanical grate adapted to receive a rain of fuel particles introduced into a furnace above the grate, wherein means is arranged to deposit upon the grate at or adjacent the end thereof remote from that at which ashes are discharged an air-pervious layer of material adapted to screen the grate from radiation within the furnace.

The invention also includes combustion apparatus of the kind comprising a travelling grate adapted to receive a rain of fuel particles projected rearwardly into the furnace from the front thereof and above the grate which is arranged to discharge ashes at its front end, wherein means is arranged to deposit upon the grate at or adjacent the back of the furnace an air-pervious layer of material adapted to screen the grate from radiation within the furnace.

The invention will now be described, by way of example, with reference to the accompanying partly diagrammatic drawings in which:

Figure 1 is a sectional side view of the lower part of a water-tube boiler furnace showing combustion apparatus of the spreader stoker type with an endless travelling grate;

Figure 2 is a view to a larger scale than Figure 1 showing the bottom of the rear hopper and parts adjacent thereto; and

Figure 3 is a view similar to Figure 2 but illustrating a modified construction of damming means.

Referring to Figures 1 and 2, the furnace 1 is fired from the front through a number of apertures, spaced across the furnace width, in the front wall 2 of the furnace. The section is taken through one of said apertures 3 and in front of each aperture is mounted feeder apparatus 4 of the spreader stoker type adapted to project fuel particles into the furnace for combustion therein.

The feeder apparatus 4 is of known construction and comprises a hopper 5 into which suitably sized coal is arranged to be fed and below which is arranged a horizontal fuel distribution plate 6 which receives the coal from the hopper. Slidable over the upper surface of the fuel distribution plate 6 is a fuel pusher member 7 arranged to be reciprocated (by means not shown) in the forward and rearward direction and in its rearward stroke to feed coal rearwardly over

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the rear edge 8 of the fuel distribution plate below which edge an overthrow rotor 9 is arranged to be rotated. The rotor 9 is disposed with its axis transverse to the furnace and is provided with diametrically opposite rotor blades adapted in their rotary motion to project into the furnace through the opening 3 coal fed over the rear edge of the fuel distribution plate. The fuel distribution plate may be adjusted in position within limits in the forward and rearward direction to control the point at which the coal fed by the pusher member falls from the edge of the plate, whereby the trajectory of the projected coal within the furnace may be suitably varied or corrected.

The floor of the furnace is formed by an endless grate 10 consisting of the same number of grate sections as the number of openings 3 arranged side by side across the furnace. Each grate section consists of two endless chains carrying transverse grate bars 11 of the cross-sectional form shown in Figure 2 with rows of small Venturi nozzles 12 for the passage of combustion air from below the upper run of the grate to the combustion space above the grate. Each endless chain of the grate passes over a driving sprocket 13 in front of and below a front arch 14 at the lowermost end of the front wall 2 and over an idler sprocket 15 behind and below a rear arch 16 at the lowermost end of the water-cooled back wall 17 of the furnace.

The grate is driven by the sprockets 13 so that the upper run of the grate travels from back to front of the furnace and below the front end of the grate an ash hopper 18 is provided for the reception of ashes discharged from the grate. Ramps 19 and 20 at front and rear respectively assist in supporting the grate in the lower run.

The rear wall 17 of the furnace is cooled by a row of steam-generating tubes 21 which conform to the shape of the arch 16 and receive their water from a transverse header 22 arranged rearwardly of the arch and supplied by downcomer tubes 23. Between the rearmost portion of the arch and the header the tubes 21 extend horizontally and each of the spaces between the tubes above the grate is closed over one region by a front block 24 and in a region to the rear thereof by a rear block 25, the blocks being bolted to superjacent, relatively spaced, laterally extending channel irons 26 and 27 to which is secured the lower end of a hopper 28 extending laterally above the angle iron across the width of the furnace. To the under side of each of the front blocks 24 is bolted a damming block 29 having a downwardly extending damming projection 30 at the front thereof.

The damming blocks 29 may be individual to the front blocks 24 or may extend laterally across a number of front blocks or may be replaced by a single damming block extending across the width of the furnace.

Suitable air-pervious material in divided form is fed to the hopper 28 and falls through the space between the channel irons 26 and 27 and through the apertures bounded by adjacent blocks 24 and 25 and adjacent tubes 21 and is discharged upon the grate. The grate in its movement carries such material forwardly upon its surface into the furnace, the thickness of the layer 32 of material carried into the furnace being restricted by the distance between the damming projection 30 of the damming block and the grate surface therebeneath.

A closed hopper 31 is provided below the grate,

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into which combustion air for supply to the grate run within the furnace is admitted under damper control. Appropriate sealing means (not indicated) are provided for preventing such air from by-passing the upper run of the grate between a dead plate 33 of sand-filled tray type normally provided at a region below the front arch 14, and a dead plate 34 of the same type disclosed below the rear arch 16.

During the operation of the furnace, coal fed rearwardly by the reciprocatory fuel pusher member 7 over the rear edge 8 of the fuel distribution plate is projected by the rotor blades of the revolving rotor 9 through the aperture 3 into the furnace. Most of the coal falls onto the fuel bed from near the front end to the rear end of the grate run within the furnace, and is burned on the fuel bed. Some of the coal particles burn in suspension above the fuel bed and a proportion of such particles may be recovered as grits from collecting regions below gas turning zones of the boiler and from centrifugal or other type grit collectors through which the gases may be passed.

The nature of the material discharged upon the grate from the hopper 28 and the thickness of the layer 32 thereof carried into the furnace upon the grate are such as to ensure protection of the grate from radiation within the furnace in spite of conditions that might arise should the fuel delivered from the hopper 28 have a low ash content or contain a large proportion of fine particles entrained by combustion gases. The layer 32 of material also separates the grate from the combustion of the fuel distributed by the spreader mechanism and tends to distribute more evenly over the bed of such fuel the combustion air delivered by the nozzles 12 of the grate bars 11.

The material fed to the hopper 28 may conveniently consist of or include grits recovered from the combustion gases, in which case combustible material in the grits may be burned upon the grate. The grits are conveniently transported to the hopper 28 by aid of an air stream as a vehicle of flow, from which air stream the grits are separated as by a centrifugal separator and allowed to fall into the hopper 28.

The material fed to the hopper 28 may alternatively consist of suitable incombustible refractory material in divided state. It may consist of material in divided state produced by the combustion of solid fuel.

Instead of grits or suitable incombustible refractory material in divided state it may in some cases or under some circumstances, as in the starting up of a boiler, be preferred or most convenient to charge the hopper with combustible carbonaceous material other than grits.

The hopper 28 may if desired be replaced by a number of hoppers across the width of the furnace; one or more hoppers may be appropriated to each grate section.

The damming blocks 29 may be replaced by blocks providing a different distance between the damming projections 30 and the grate surface when it is desired to reduce or increase the thickness of the material layer 32 carried by the grate into the furnace.

Referring to Figure 3, a modified construction of damming means is shown which permits an alteration in the thickness of the layer of material without the necessity of replacing one member by another. The same parts are given the same reference numerals as in Figure 2. According to this construction, the damming means comprises a longitudinal striker 40 projecting from and se-

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cured to a rotatable spindle 41 extending transversely of and parallel to the grate surface and journaled in lugs 42 depending from plates 43 bolted to the front blocks 24 clamped to the tubes 21. Rotation of the spindle 41 varies the distance between the projecting edge 44 of the striker 40 and the grate surface and thereby varies the thickness of the material layer 32.

The presence of the material layer 32 adapted to screen the grate from furnace radiation renders possible operation with the feeder apparatus 4 supplying fuel in such manner that the fuel does not reach a rear portion of the upper run of the grate within the furnace. Such rear portion of the grate may be supplied with combustible material from the hopper 28, or means such as an adjustable dead plate may be provided for cutting off the supply of air thereto.

What is claimed is:

1. In a furnace having front and back walls, a horizontally disposed endless driven grate provided with an upper run for receiving fuel, the grate being so arranged that the upper run advances from the rear to the front of the furnace, and so that the rear portion of the grate is disposed rearwardly of a portion of the back wall of the furnace, means disposed over the initially advancing end of the upper grate run to prevent fuel from falling on the rear end portion of the grate at its initially advancing end, hopper means disposed rearwardly and exteriorly of the furnace back wall portion and connected to said furnace above the rear portion of the grate upper run, said hopper means being disposed exteriorly of said back furnace wall with its entrance end open and accessible whereby air-pervious material may be inserted therein independently of said furnace fuel content, said hopper means being constructed so as to continuously discharge said air-pervious material upon the rear end portion of the grate so that the latter is covered thereby before the grate moves into a position where the fuel falls upon it, and means for regulating the depth of a layer of said air-pervious material dis-

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charged upon the grate, whereby a layer of a predetermined depth of said material is discharged upon said grate irrespective of the composition of the fuel being burned in the furnace.

2. In a furnace having front and rear walls, a horizontally disposed endless driven grate provided with an upper run for receiving fuel and a lower run, a stoker at the front of the furnace for conducting fuel onto the grate, means disposed over the initially advancing end of the upper grate run to prevent fuel from falling on the rear end portion of the grate at its initially advancing end, a device connected to the furnace outwardly and exteriorly of a portion of the rear wall thereof and above the advancing end portion of the upper run of the grate, said device being disposed exteriorly of said rear furnace wall and having accessible means whereby air-pervious material may be inserted therein independently of said furnace fuel content, said device being constructed so as to continuously discharge said air-pervious material upon the grate in the initial part of its upper run, and means for regulating the depth of a layer of said air-pervious material discharged upon the grate so that as each segment of the empty grate approximately begins its movement in the upper run through the furnace, a layer of a predetermined depth of material is discharged upon it, irrespective of the composition of the fuel being burned in the furnace.

CEDRIC H. SPARKS.

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