March 10, 1936. V. M. CRUIKSHANK 2,033,570

GRATE

Filed Oct. 26, 1931 2 Sheets-Sheet 1

Fig. 1.

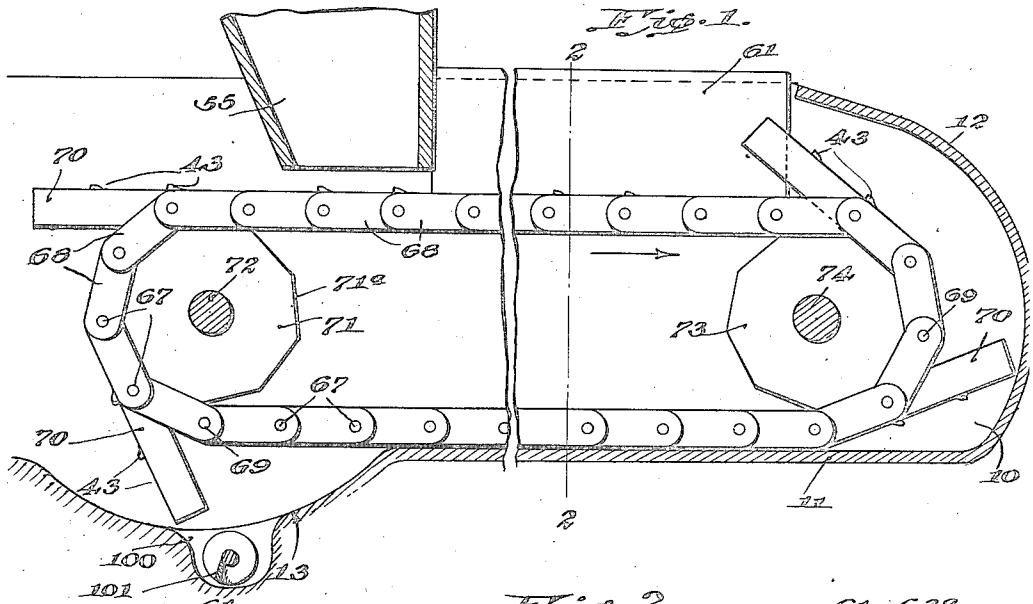


Fig. 2.

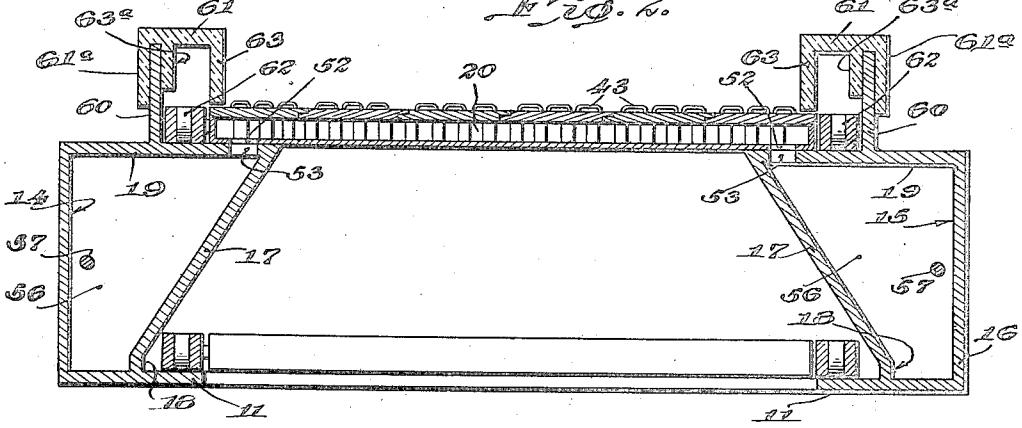


Fig. 3.

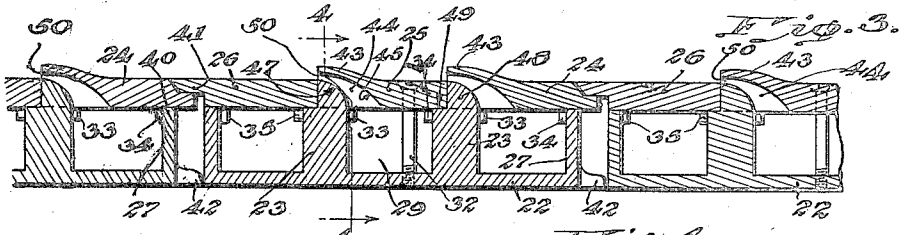
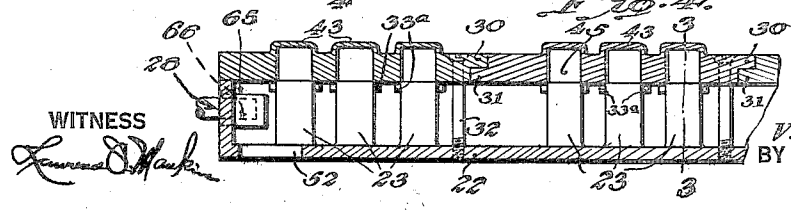


Fig. 4.



WITNESS

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GRATE

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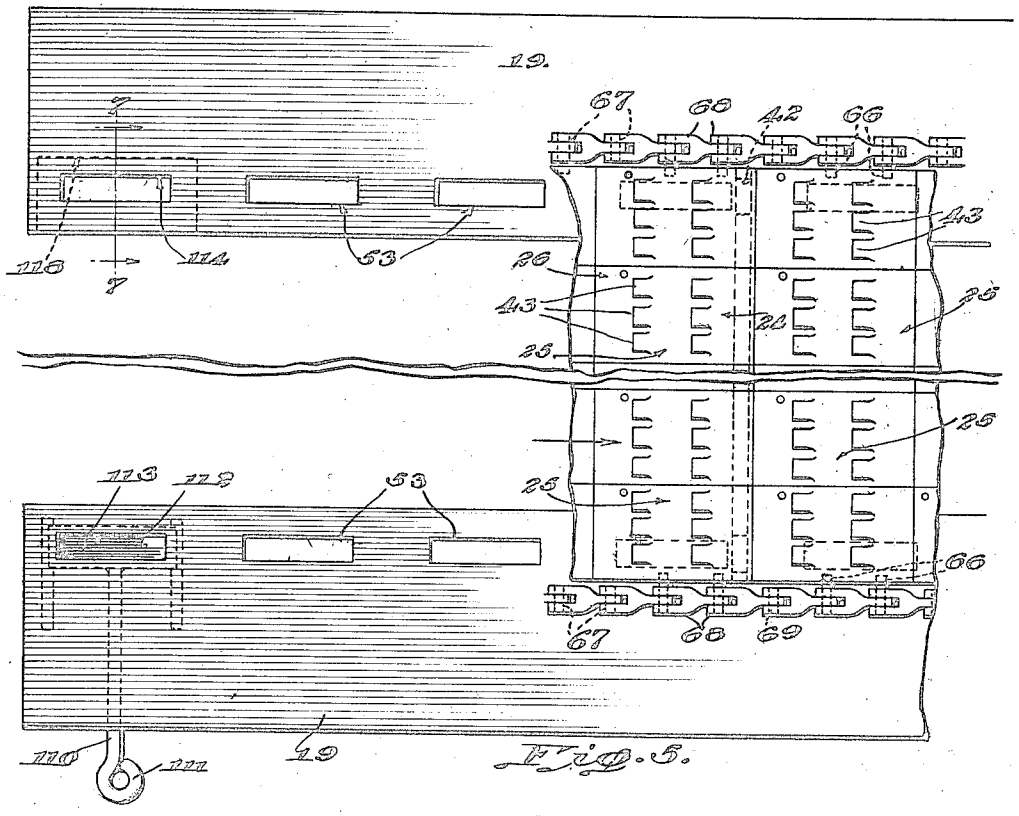


Fig. 5.

Fig. 6.

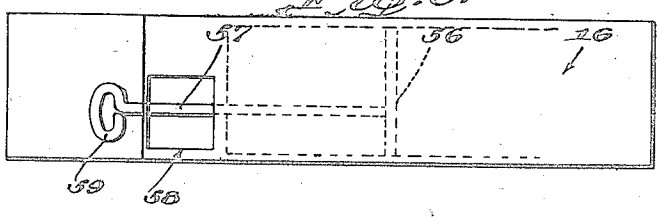


Fig. 7.

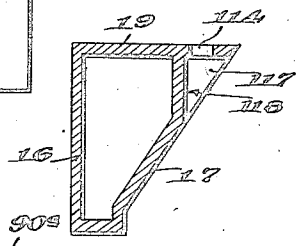
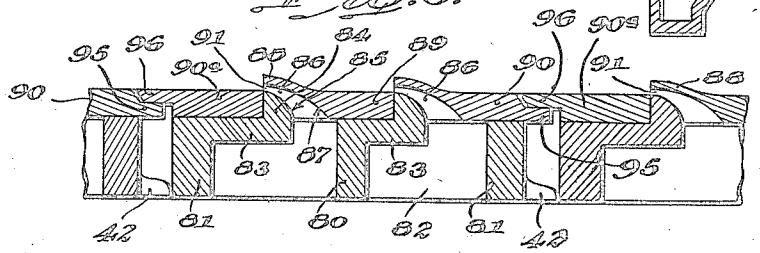


Fig. 8.



WITNESS

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2,033,570

GRATE

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Application October 26, 1931, Serial No. 571,187

13 Claims. (Cl. 110—40)

This invention relates to grates.

An object of the invention is the provision of a grate formed of sections, the sections being so constructed that they may be cheaply and readily cast because cores are substantially eliminated in their manufacture.

Another object of the invention is the provision of a grate formed of sections with overlapping and cooperating lugs for retaining the sections against movement when said sections have been anchored together.

A further object of the invention is the provision of a grate operating in connection with an air supply in which air passages are provided in the top of the grate which supports the fuel with the air passages located in substantially a horizontal plane for directing air in a direction which is opposite to the direction of travel of the grate when chain grates are used in order to insure easy and proper ignition as the fuel enters the firebox and to direct the hot gases of combustion against the natural draft towards the front of the firebox, thereby causing greater agitation and a more complete mixture of the gases so that better combustion and a longer travel are had with a correspondingly hotter firebox and with greater efficiency.

A still further object of the invention is the provision of a grate in communication with an air supply in which the grate is provided with substantially horizontal passages for supplying the fuel with air, the particular construction of the air passages preventing ashes from falling through the openings since said openings are not only located in a horizontal plane but discharge the air in a direction which is reverse to the direction of travel of the grate where chain grates are used, the air being supplied at all times during the operation of the grates.

Another object of the invention is the provision of an endless grate formed of sections having connections with the links of the driving chains so that the sections of the grate at their inner end of travel will be gradually tilted to release the ashes and clinkers just before said sections move upon the return travel through the ash pit.

Another object of the invention is the provision of an endless grate operating in connection with air chambers for supplying the proper quantity of air to the fuel on the grate with means in connection with the supply of air for forcing air through the sections of the grate at a predetermined point in the travel of the sections of the grate for forcing fresh air through the sections and removing any ashes from the section and for discharging said ashes into the ash pit.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawings forming a part of the specification; nevertheless, it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications as define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a vertical section of an endless grate constructed in accordance with the principles of my invention,

Figure 2 is a transverse section taken along the line 2—2 of Figure 1,

Figure 3 is an enlarged fragmentary longitudinal section showing the construction of the grate taken along the line 3—3 of Figure 4,

Figure 4 is a transverse section taken along the line 4—4 of Figure 3,

Figure 5 is a fragmentary plan view with parts broken away showing the construction of my grate,

Figure 6 is a longitudinal side view of an air chamber,

Figure 7 is a transverse section taken along the line 7—7 of Figure 5, and

Figure 8 is a fragmentary longitudinal section similar to the section shown in Fig. 3 of a modified form of the grate.

Referring more particularly to the drawings, 10 designates an ash pit having bottom flanges 11, a rear end wall 12 and a depressed portion 13 for a purpose which will be presently explained.

The sides of the ash pit are formed by a pair of longitudinally disposed air chambers 14 and 15. The outer walls 16 of the air chambers are located substantially in vertical planes while the inner walls 17 are inclined at an angle to the vertical except a portion 18 which is substantially parallel to the side walls 16. The flanges 11 are shown as being formed integrally with the bottom walls of the air chamber and these flanges support the endless stoker when travelling through the ash pit. The air chambers are also provided with top plates 19 and due to the inclination of the inner walls 17, the plates 19 extend inwardly a sufficient distance to support an endless stoker, generally designated by the numeral 20.

The endless stoker in this case is of particular construction and is of such a nature that the same may be cast in sections with substantially the elimination of cores. This is due to the fact that the bottom or base portion of each section is formed separately from the top section with the top section being supported by posts formed integrally with the bottom section.

As shown more particularly in Figs. 3 and 4 the bottom section consists of a base member

22 having posts 23 rising therefrom and these posts are spaced a distance apart for aiding in supporting the top plates 25. End walls 27 are formed integrally with the base member and co-operate with the integrally formed side walls 28 to form a completely enclosed air chamber 29 within each section. The trailing and leading portions of the plates are designated respectively by the numerals 26 and 24.

It will be noted that each top plate 25 is likewise formed of longitudinal members having co-operating flanges 30 and 31 which neatly fit each other for aiding in preventing shifting movement of the members of the top section when said members are secured by means of bolts 32 to the bottom 22. Lugs 33 and 34 depend from the top plates 25 and engage opposite faces of the posts 23 for aiding in maintaining the said plates in proper position. Lugs 35 depending from the plates engage the end walls 27 and posts 23 for aiding in preventing shifting movement of the top plates. Lugs 33a depending from the top plates engage the posts and aid in retaining the plates in position.

The trailing portion of each plate 26 of a section of the endless stoker is provided with a flange 41 which neatly seats within a cut-out portion above the flange 40 at the forward end of an adjacent section 24 of the endless stoker so that when the stoker is travelling in a horizontal plane upon the top plates 19 of the air chambers 14 and 15 the flanges 40 and 41 will co-operate in forming a substantially sealed stoker.

The front wall 27 of each section of the endless stoker is provided with a forwardly projecting lug 42 for a purpose which will be presently explained.

At spaced points on each of the plates 25 are provided curved extensions or lips 43 which are located slightly above the horizontal surface of the plates. The portions below the lips 43 are cut away to provide air passages 44 having a curved upper wall 45. The lower walls of the passages 44 are formed by a curved surface 47 formed upon the outer end of projections or lugs 48 projecting upwardly from the posts 23. It will be noted that the rear edge of each projection or lug 48 is cut away to provide a shoulder 49 for supporting the top plates 25. It will thus be seen that the passages 44 are formed by the co-operating surfaces of the lips 43 and the projections or lugs 48.

The posts 23, as stated above, are spaced apart so that the air may freely circulate within the chamber 29 and pass out through the passages 44 and since the ports 50 of the passages extend rearwardly from the direction of travel of the endless stoker, the air will enter the fuel in a direction which is reverse to that of the travel of the stoker.

The bottoms 22 of each of the sections of the endless stoker adjacent their longitudinal side edges are provided with air openings 52 which are adapted to align with openings 53 formed adjacent the inner edges of the top plates 19 of the chambers 14 and 15 and the air chambers are supplied with air in any approved manner. The method of supplying air however, is not shown since it forms no part of the present invention.

It will be noted that the openings 53 are of definite lengths and widths and are spaced along the length of the top plates 19 of the air chamber in such a manner that the air will be supplied continuously to the various sections of the endless stoker. The inner ends of the air chambers 14 and 15 adjacent a chute 55 which supplies the stoker with fuel are connected with a source of air so that the air will travel from the inner ends of the air chambers to the rear end and thereby will progressively feed the air through the openings 53. The air feed, however, to the fuel on the travelling stoker, is controlled by dampers 56 which neatly fit within the air chambers and have their side edges conforming to the shape of the air chambers and are disposed in vertical planes. Rods 57 are connected with the dampers. A hand-grip 59 is provided on the free end of each rod 57 for manipulating the rod and likewise the dampers. Openings 58 formed in the side walls 16 of the air chambers provide ports for connecting the air chambers with a blower for supplying air to said chambers.

Supporting bars 60 are either formed integrally with the top plates 19 of the air chamber or are rigidly connected thereto. These bars support U-shaped members 61 which embrace the chains, generally designated by the numeral 62 of the endless stoker, for not only aiding in cooling the chains but for aiding in maintaining the fuel upon the endless stoker 20. The inner flanges 63 of the U-shaped members 61 have their lower edges in close association with the horizontal end surfaces of the travelling carrier 20, while flanges 63a co-operate with flanges 61a for aiding in supporting the U-shaped members on the bars 60.

The side walls 28 of each section of the endless stoker are provided with sockets 65, which receive projections 66 on a pair of pins 67 which connect certain of the links 68 together. The pins 69 are devoid of projections so that the associated links are free of the sections 70 of the endless stoker 20. These links are adapted to engage the flat faces 71a of sprockets 71 which are secured to and driven by a shaft 72. This shaft is connected with a suitable source of power (not shown) and is revolved at a speed which is conducive to the proper operation of the endless stoker.

Idling sprockets 73 are spaced from each other and either connected to an axle 74 or are loose on said axle. These sprockets have substantially the same construction as the sprocket 71.

A modified form of the sections of the endless stoker is shown in Fig. 8. In this case the bottom 22 of the form shown in Figs. 3 and 4 is eliminated and the posts 80 are connected together by means of ribs and these ribs in turn connect the end walls 81 with the posts and with the side walls 82. Extending rearwardly from the posts 81 and the rear end wall of each section is a flange or lip 83 from which projects a lug 84. The outer surface of the lug is curved, as shown at 85, to provide a portion of the wall of a curved passage 86. The outer walls of the passage are formed by the curved inner surface 87 of the lips 88 which project slightly above the horizontal surface of the top plates 89 and 90. The top plates together with the plates 90a comprise the upper portions of the sections of the endless stoker. It will be noted that the passages 86 adjacent the discharge ports 91 are located in substantially a horizontal plane and the ports open in a direction which is opposite to the direction of travel of the endless stoker. The remaining elements of the form shown in Fig. 8 are substantially identical with those shown in Figs. 3 and 4. The leading portions 95 of the

plates 90 and trailing portions 96 of the plates 90a are in the form of interfitting flanges which cooperate to substantially seal the adjacent ends of each section of the stoker.

While I have referred to the device as an endless stoker it will be appreciated that the same may be constructed in the form of a stationary grate with the air chamber 29 in each section and with the passages 44 so disposed that the air from the chambers will be forced in a direction which is towards the front end of the furnace where the fuel is fed to the grate.

The operation of my device is as follows: Fuel is fed from the chute 55 in predetermined quantities upon the endless travelling stoker 20 and as the stoker moves in a direction indicated by the arrow in Fig. 1, the fuel will be carried to the rear or inner end of the furnace and will be slowly burned due to the fact that the air from the chambers 29 is forced through the passages 44 and through the fuel. Since the flow of air from the passages 44 is in a direction which is opposite to the direction of travel of the sections of the endless stoker, easy and proper ignition of the fuel is insured as the fuel enters the firebox at the ignition point. The reverse direction of flow of the air also directs the heat or hot gases of the combustion against the natural draft to the front of the firebox causing more agitation and mixing of gases and as a consequence a better combustion and longer travel is provided with a correspondingly hotter firebox and greater efficiency.

When the sections of the endless stoker reach the sprockets 73 and the links travel over the flat faces of the sprockets, the free or rear ends of the sections of the stoker will be elevated as shown in Fig. 1, thereby discharging the ashes and clinkers downwardly adjacent the curved wall at the rear end of the furnace and these ashes and clinkers are carried forwardly until they fall into the depression or the pit 13. As the links of the travelling stoker pass over the flat faces of the sprockets 71, the sections of the stoker will be moved downwardly so that the free edges will scrape over the curved surface of the pit 13 and force the ashes and clinkers into the channel 100, whence they are removed by a screw 101. The ashes are carried on the inner faces of the sections in their travel through the ash pit and are deposited in the channel 100.

As the sections 70 of the travelling stoker continue their movement around the sprockets 71, they will be tilted more and more so that any ashes or clinkers which will adhere to the same will be discharged by gravity so that when the sections assume the horizontal position for their rearward travel over the plates 19 of the air chambers 14 and 15, they will be substantially free of any foreign matter.

As the sections 70 of the endless stoker move over the plates 19, the air openings 52 formed in the bottoms 22 of the sections 70 will periodically align with the various longitudinally disposed openings 53 to receive air from the chambers 19. The members 42 between the end walls of the sections 70 will close the openings 53 between the ends of the sections and prevent the loss of air at these points.

The dampers 56 are adapted to be moved longitudinally of the air chambers 14 and 15 in order to control the length of the air chamber per se in order to prevent certain of the openings 53 from supplying air to the travelling endless stoker. The dampers 56 are moved longitudinally of the air chamber when it is desired to increase or decrease the effective firebed of the fuel on the endless stoker.

When it is desired to clean the air chambers 29 of the sections 70 of the endless stoker, it is only necessary to reciprocate the rod 110 through the handle 111 for moving a valve or damper 112 from the opening 113 at one end of the air chamber 15. The opening 114 in the plate 19 forming the top wall of the air chamber 14 is in direct communication with the ash pit since the air chamber 14 terminates short of the width of the plate 19, as shown by the wall 118 and the cut-away portion 117.

When the valve or damper 112 is open, air will be forced from the air chamber 19 directly through the chambers of the various sections 70 of the endless stoker as the sections pass the opening 113 and thereby blow all of the dust and foreign matter from the chambers and through the opening 114 into the ash pit. This operation is repeated periodically in order to maintain the endless stoker free of foreign matter.

Each section 70 of the endless grate or stoker is a unit in itself and the base member 22 as shown in Figs. 3 and 4 co-operates with the end walls 27, side walls 28 and the top section to form an air chamber which completely encloses the posts 23. As the grate travels over the plates 19 air from the chambers 14 and 15 will pass through the openings 53 and through the aligned openings 52 and enter the chambers 29 and pass outwardly through the passages 44. The space between the two adjacent end walls 27 of the sections 70 would normally permit air to escape from the air chambers 14 and 15 but the lugs 42 pass over the openings 53 and thereby prevent the air from entering this space.

I claim:

1. A grate for furnaces, said grate being formed of hollow sections, each of the sections having a top provided with horizontal air passages for directing air horizontally into the fuel bed, the tops forming a flat surface for supporting fuel, a casing adapted to be supplied with air and adapted to be placed in communication with the hollow sections, means for moving the sections in a continuous manner along over and below and around the ends of the casing, said movable means including a plurality of pivotally connected links, the advancing end of each section being rigidly connected to the adjacently disposed link, the length of each section being materially greater than the length of the connected link and the remaining portion of each section being free of the link, a rotatable means at each end of the casing on which the moving means is trained, the free ends of the unconnected portions of the sections when said sections are carried around the rotatable means projecting outwardly from said rotatable means.

2. A grate for furnaces having a base portion including spaced posts, end and side walls enclosing the posts to form an air chamber, a top portion removably secured to the posts, end and side walls, the top portion having lips projecting thereabove and provided with passages connecting the air chamber with the exterior above the tops.

3. A grate for furnaces having a base portion including spaced posts, end and side walls enclosing the posts to form an air chamber, a top portion removably secured to the posts, end and side walls, the top having spaced lips projecting above the surface of the top portion, the por-

tions below the lips being cut away to form the upper walls of air passages, the upper ends of the posts having upwardly projecting lugs located below the lips and having the outer surface rounded and co-operating with the inner walls of the lips to provide air passages in communication with the air chamber.

4. A grate for furnaces having a base portion including spaced posts, end and side walls forming an air chamber, a top having spaced openings above the posts, lips above the openings, the upper ends of the posts co-operating with the lips to provide substantially horizontally disposed air passages in communication with the air chamber.

5. A grate for furnaces having a base portion including spaced posts, end and side walls forming an air chamber, a removable top having spaced openings above the posts, lips above the openings, the upper ends of the posts having lugs provided with a curved surface co-operating with the lips to provide substantially horizontally disposed air passages in communication with the air chamber.

6. An endless stoker for furnaces formed of a plurality of sections, each section having a base portion including spaced posts, end and side walls forming an air chamber, a top having spaced openings above the posts, lips above the openings, the upper ends of the posts co-operating with the lips to provide substantially horizontally disposed air passages in communication with the air chamber, and means for operating the endless stoker.

7. An endless stoker for furnaces formed of a plurality of sections, each section having a base portion including spaced posts, end and side walls forming an air chamber, a top having spaced openings above the posts, lips above the openings, the upper ends of the posts co-operating with the lips to provide substantially horizontally disposed air passages in communication with the air chamber, and means for operating the endless stoker, the lips being so disposed relative to the direction of travel of the sections that the passages will discharge air into the fuel on the stoker in a direction which is opposite to that of the direction of the travel of said sections.

8. An endless stoking grate composed of a plurality of sections adapted to be moved to dumping positions, chains formed of links, a series of links included in the length of each section of the grate, each section having an advancing end portion rigidly connected with one link of each chain, the remaining portion of each section being free, means for driving the chains and means included in said driving means for causing the connected links to move the free ends of the sections upwardly and outwardly in a dumping position when said connected links move over the driving means.

9. An endless stoking grate composed of a plurality of dumping sections, a chain disposed at each side of the grate and formed of links, a series of links included in the length of each section, pins hingedly connecting the links together, a pair of the pins at each side of a section having extensions, the side edges of an adjacent section and at the advancing end portion of each section having spaced sockets to receive the extensions of each chain securing a link to the advancing end portions of the sections, the opposite ends of the sections being free, sprockets upon which the chains are trained, means for driving a pair of the sprockets, the last-mentioned links when passing over the sprockets at the inner end of the furnace elevating the free ends of the sections for causing dumping of ashes from said sections.

10. In a furnace having an ash pit, a casing at each side of the pit connected at one end with a source of air, an endless stoker movable over the tops of said casings, means for operating said stoker, the endless stoker being formed of hollow sections, each section being provided with an air chamber, the tops of the casings having openings, the inner faces of the sections having openings adapted to align with the openings in the tops of said casings, the outer faces of the sections having substantially horizontal passages for supplying the fuel on the stoker with air, the top of one casing having an extension provided with an opening leading directly to the ash pit, a valve for closing the opening in the top of the other casing opposite the opening in said extension, said valve when open permitting air from said casing to be blown through the air chambers of the sections of the stoker passing over said opening in said extension for forcing foreign matter from said chamber into the ash pit.

11. In a furnace having an ash pit, a casing at each side of the pit connected at one end with a source of air, an endless stoker movable over the tops of said casings, means for operating said stoker, the endless stoker being formed of sections, each section being provided with an air chamber, means for placing the air chambers of the sections in communication with the casings, the outer faces of the sections having substantially horizontal passages for supplying the fuel on the stoker with air, and means controllable at will for forcing into the ash pit foreign matter from each air chamber of the sections.

12. In a furnace having an ash pit, a casing at each side of the pit connected at one end with a source of air, an endless stoker movable over the tops of said casings, means for operating said stoker, the endless stoker being formed of sections, each section being provided with an air chamber, the tops of the casings having openings, the inner faces of the sections having openings adapted to align with the openings in the tops of said casings, the outer faces of the sections having horizontally disposed passages for supplying the fuel on the stoker with air, said passages discharging the air in a direction which is opposed to the direction of travel of the sections of the stoker, means in the form of a transversely disposed movable partition within each casing and manually operable for decreasing or increasing the effective length of said casing and consequently the supply of air along the length of said casings.

13. In a furnace having an ash pit, a casing at each side of the pit connected at one end with a source of air, an endless stoker movable over the tops of said casings, means for operating said stoker, the endless stoker being formed of sections, each section being provided with an air chamber, the tops of the casings having openings, the inner faces of the sections having openings adapted to align with the openings in the tops of said casings, the outer faces of the sections having passages for supplying the fuel on the stoker with air, the leading edge of each section of the stoker being provided with forwardly projecting lugs riding over the openings in the tops of the casings for closing said openings to prevent air from said casings from passing between the adjacent edges of the sections.

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