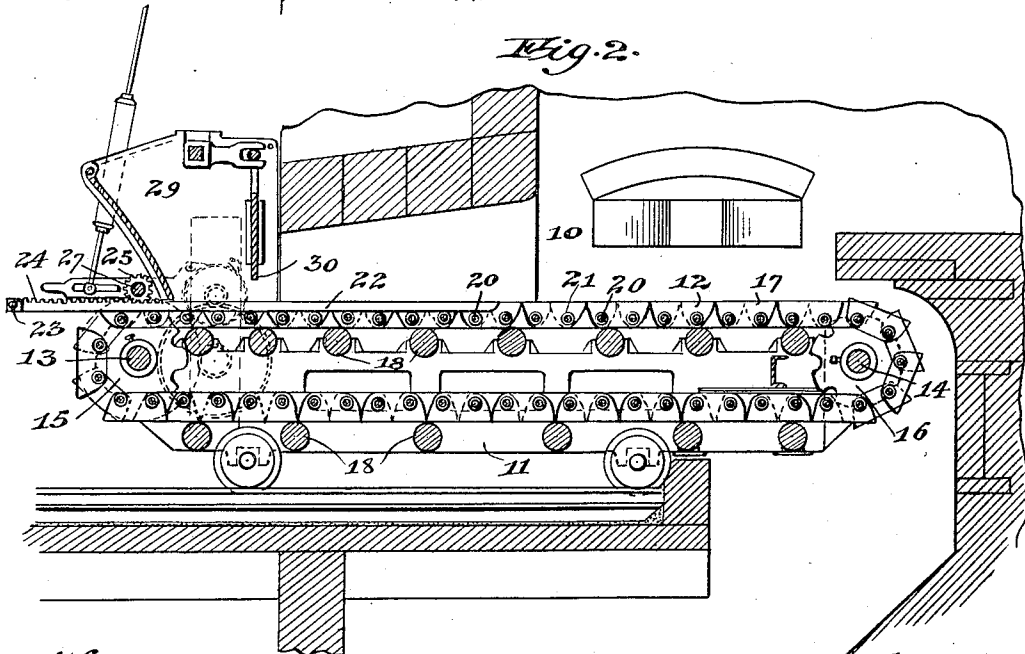
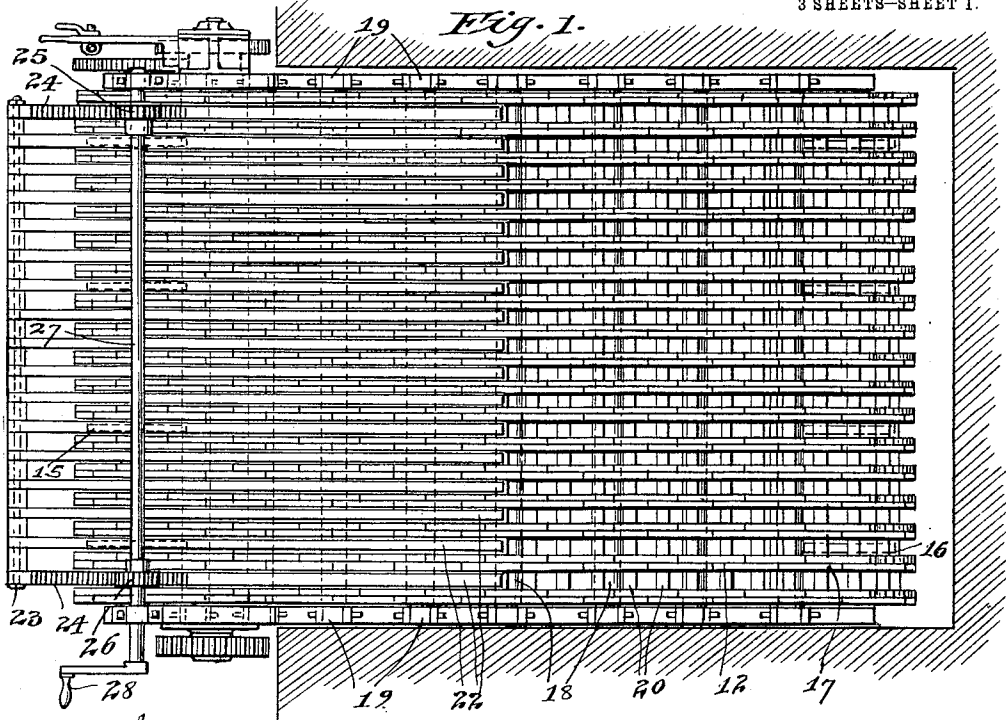


F. B. BIGELOW.
FIRE BOX GRATE.
APPLICATION FILED FEB. 2, 1910.

1,013,114.

Patented Jan. 2, 1912.

3 SHEETS-SHEET 1.



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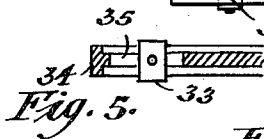
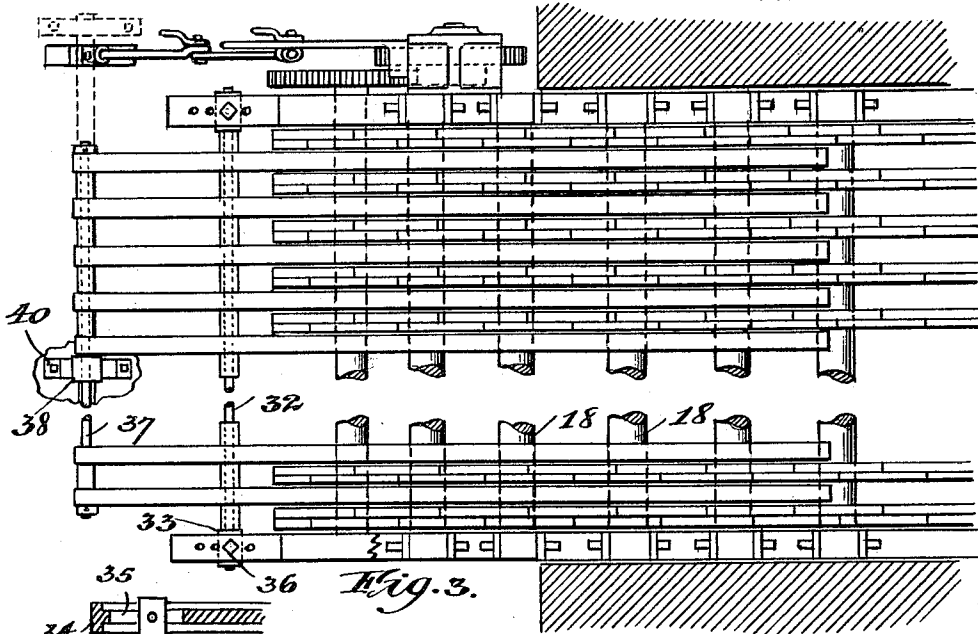
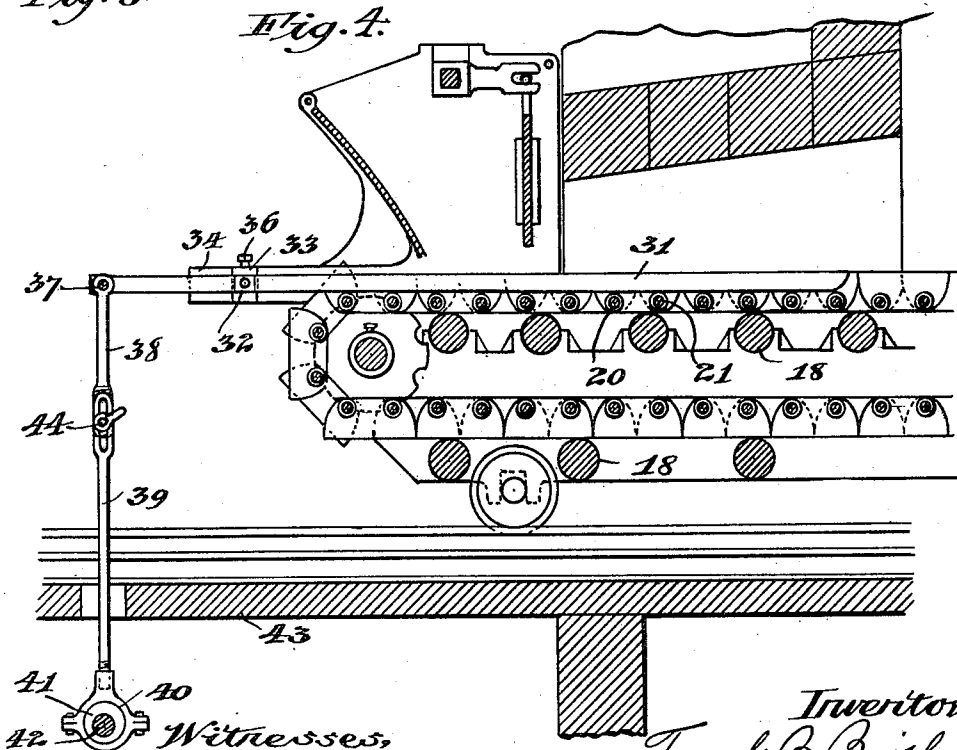


Fig. 4.



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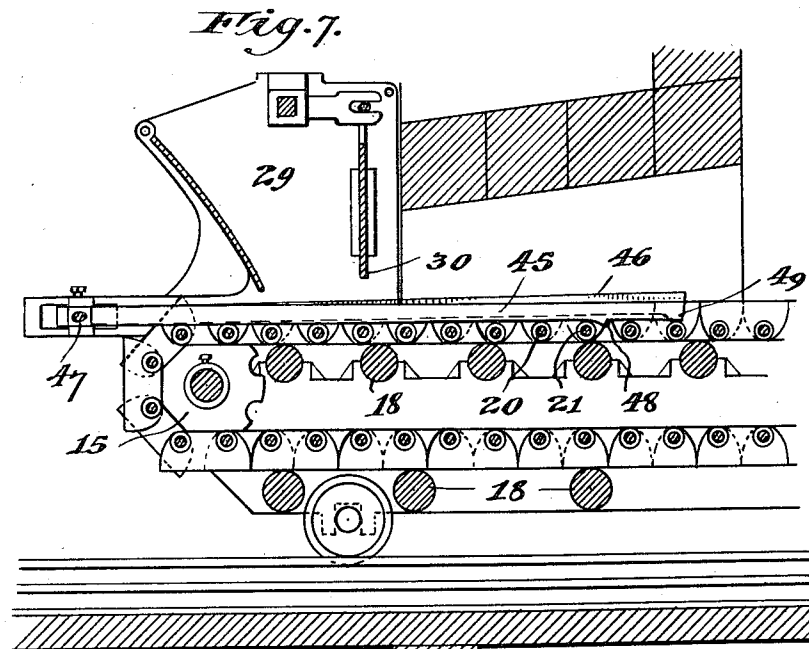
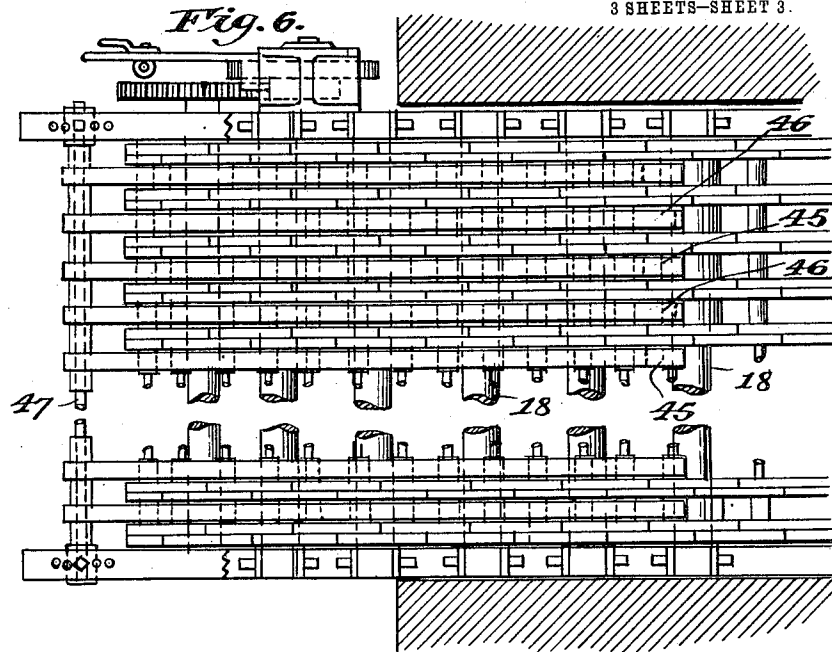
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3 SHEETS-SHEET 3.

1,013,114.



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UNITED STATES PATENT OFFICE.

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FIRE-BOX GRATE.

1,013,114.

Specification of Letters Patent.

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Application filed February 2, 1910. Serial No. 541,564.

To all whom it may concern:

Be it known that I, FRANK B. BIGELOW, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Fire-Box Grates, of which the following is a specification.

In mechanical stokers and automatic furnaces having grates on or over which the coal is fed by mechanical means or power, it is desirable to provide in one portion of the grate, that on which the coking of the coal occurs, only comparatively small air spaces through which the finely-divided coal cannot drop or sift, while at that part of the grate where the combustion of the coke takes place much larger spaces are permissible because the coked coal is in comparatively large pieces, and such larger spaces or apertures are needed to permit a liberal supply of air to pass through the grate and provide oxygen for the burning of the coke and hydro-carbon evolved during the process of coking.

My invention aims to provide a construction of this character in which this desirable result is realized.

This invention, although not limited to grates of any particular or specific kind, is susceptible of embodiment in a traveling chain grate on to which the coal is fed and on which it is conveyed or carried along in the fire-box until its complete consumption or combustion has taken place. In such a grate I space the parallel traveling chains farther apart than is usual, and provide adjustable bars between these chains at the feeding-in end of the grate, these bars acting to prevent the small pieces of uncoked coal from falling or dropping through the grate, and because of their absence from that part of the grate on which the coked coal is burned, a sufficient quantity of air may pass through the spaces between the fuel-supporting and conveying chains to carry on the complete combustion of the coke, the latter not falling through this portion of the grate, even though it has comparatively wide spaces between its chains, because the fine or small pieces of coal in becoming coked cohere together and form masses or pieces of such size that they cannot sift or fall through the grate between the spaced chains. Since the composition of the various coals used in such furnaces or boilers varies greatly, and since

the period of time of coking or driving off the gases differs with these many kinds and qualities of fuel, I make these grate bars adjustable longitudinally of the chains so that their position may be varied to agree with or correspond to the kind of coal used. In other words, the position of the intermediate bars may be adjusted so that the coked coal will receive a sufficient supply of air through the grate as soon as the coking has occurred regardless of the kind or quality of fuel used. By this means a maximum efficiency may be secured without regard to the kind of coal employed. To prevent the formation of excessively large pieces of coked fuel and the resulting large clinkers, I provide means for slightly moving or raising and lowering the intermediate bars disposed between the chains so as to break up the bed of fuel sufficiently to prevent the coherence of a sufficient number of pieces of fuel to be objectionable.

On the accompanying drawings I have illustrated three approved and desirable embodiments of my invention, and on the various figures like reference characters refer to the same parts throughout.

Figure 1 is a horizontal section through a fire-box of a boiler or furnace equipped with a traveling chain grate which embodies my invention. Fig. 2 is a substantially-central vertical longitudinal section of the construction shown in Fig. 1; Figs. 3 and 4 are a broken plan view and vertical section, respectively, on an enlarged scale, of a modified construction in which the fuel supporting bars are rocked to intermittently break or stir up the bed or body of fuel; Fig. 5 is a horizontal section illustrating the adjustable mountings of the bearings of the rocker shaft; and Figs. 6 and 7 are views similar to Figs. 3 and 4 showing another modification.

This furnace has a fire-box 10 removably positioned in which on a wheeled truck 11 is a traveling chain grate 12 much like those in common use except for the improvement due to the presence of the embodiment of my invention therein. At the front end of the truck or carriage 11 is positioned a rotary driving shaft 13 driven by any suitable means, which it is not necessary here to describe, owing to the well-known construction of this part of the grate. At the rear of the truck 11 there is supplied a similar

shaft 14 and on each of these two shafts is fixed a plurality of notched sprocket wheels 15 and 16, respectively, with which cooperate a plurality of parallel spaced grate chains 17 which are caused to travel constantly and steadily by the rotation of shaft 13. The top and bottom stretches of these grate chains are prevented from sagging and are held in proper horizontal position by riding upon the plurality of rotatable rollers 18 mounted in suitable bearings 19 at the sides of the truck or carriage 11. Cross or transverse rods 20 pass through apertures in the links and act as pivot pins for the same, the chains being spaced apart and held in proper parallel relation by sleeves or bushings 21 rotatable on the rods. It is with these rods 20 that the sprocket wheels 15 and 16 cooperate to drive the chains. At the front end of the grate where the coking of the coal takes place, that is, where the gases are driven off and consumed, I dispose between the chains intermediate longitudinal bars 22 which at their front ends are united together by a bolt or rod 23 and which rest upon and are supported by the rotatable sleeves or bushings 21 on the connecting rods 20. The function of these intermediate bars is to prevent the fine uncoked coal from sifting or dropping through the grate before it has become coked, and since there are no bars at the back portion of the grate where the consumption or combustion of the coke takes place, a generous and suitable supply of air is permitted to pass through the spaces between the chains to carry on the combustion. As is obvious, it is desirable to allow this large supply of air to reach the coal as soon as it has become coked, and, since the period of coking varies with different fuels, I provide means for adjusting these united parallel intermediate bars 22, this means constituting in the present instance a rack 24 on each of the outer bars, and with the teeth of which cooperate those of pinions 25 and 26 on a manually rotatable transverse shaft 27, which may be turned by the handle 28 fastened to one end or by suitable mechanical means. The rotation of this shaft causes the simultaneous movement of all of the intermediate bars longitudinally of the chains, as will be readily apparent from an inspection of the drawing. The coal is received in a hopper 29 at the front of the fire-box and is fed to the chain-grate at the bottom of the hopper, the thickness of the fire being controlled by a vertically-adjustable gate 30. As the coal is carried rearwardly on the conveying chains, its gases are driven off by the heat in the fire-box and the fuel becomes coked. In the meantime, however, it is prevented from falling through the grate owing to the presence of the intermediate bars 22 between the chains. The position of these

bars and the speed of travel of the chains are so related that the coal will have become completely coked at substantially the same time that it reaches the inner ends of the bars, whereupon the full supply of air is permitted to pass to the coked coal through the unobstructed apertures of the grate between the chains at the rear portion of the fire-box.

In Figs. 3, 4, and 5 I have illustrated a modified construction in which the intermediate bars disposed between the chains are rocked vertically to prevent the formation of large pieces of coke. The chain grate construction is substantially the same as that shown in Figs. 1 and 2, but in this new style of furnace the intermediate bars 31 are mounted so as to be capable of oscillation on a transverse shaft 32 supported in adjustable bearings or supports 33 mounted on a pair of forwardly-extending arms 34 of the hopper casting. Preferably these arms 34 have their webs slotted at 35 so as to accommodate bearings or supports 33, the latter being held in adjusted position by set-screws 36. The bars 31 project forwardly beyond the shaft 32 and are united at their front ends by a transverse rod 37, which is linked at 38 to an eccentric rod 39 fastened at its lower end to an eccentric strap 40 encircling an eccentric 41 on an operating shaft 42, which may be located below the floor 43 if desired. The connection 44 between the link 38 and the eccentric rod 39 is adjustable so that the length of the connection between the rod 37 and the eccentric 41 may be varied as is required when the shaft 32 is adjusted toward or from the furnace to provide the necessary position of the bars 31 to secure the most effective and economical consumption of the fuel being used. It will be readily understood that as the shaft 42 and the attached eccentric 41 rotate, the bars 31 are rocked slightly on the shaft 32 and by this movement they lift or break up certain portions of the bed of fuel so as to prevent the formation of large masses of coke. It should be noted also that the bars 31 when not raised by the eccentric and its connections rest upon and are partially supported by the sleeves 21 on the cross-rods 20 connecting the conveyer chains together.

In the other modification shown in Figs. 6 and 7 the movable bars 45 and 46 are, as in the previous instance, oscillatory on the transverse or cross-shaft 47 which is adjustable toward and from the furnace to provide the proper projection of the bars into the fire-box. Each of a portion of the bars 45, has on its under edge a projection or lug 48 with which cooperate the spacing sleeves 21 on the connecting rods 20, whereby as these sleeves and rods travel into the fire-box they cause the elevation of the bars 45,

the latter dropping as soon as the projection 48 is free from the sleeve or spool which has raised it. The remaining bars 46, or any number of them desired, each has a projection 49 on its under edge which coöperates in like manner with the spacing sleeves or spools, the position of the projections or lugs 48 and 49 being such that the two sets of bars are rocked or elevated alternately. 5
10 Owing to this construction, the different portions of the bed of fuel are broken up intermittently and in succession. It will be readily understood by those skilled in the art that, owing to the sudden dropping or 15 descent of the bars, the mass of fuel is jarred sufficiently to break it up and prevent coherence together of any considerable number of pieces of coke. The projections 48 and 49 may, of course, be made on any desired number of bars. 20

As is indicated in the first part of this specification, the use of these intermediate fuel supporting bars for the purpose indicated is not limited or restricted to the 25 especial and particular types of furnaces and mechanical stokers herein set forth and described, but the invention is capable of advantageous employment in many kinds of devices of similar character. Furthermore, my invention is not restricted to the 30 precise and exact structural features shown and described, which may be varied within wide limits without departure from the heart of my invention or sacrificing any of its benefits and advantages. 35

What I claim is—

1. In a furnace grate, the combination of a plurality of fuel supporting members spaced apart to permit the passage of air 40 therebetween to the fuel supported thereby, and means coöperating with said members throughout a portion of the length of the grate to prevent the dropping of fine fuel particles through the grate and permit a 45 reduced flow of air between said members.

2. A furnace grate composed of fuel-supporting members spaced apart, and longitudinal adjustable intermediate members between said fuel-supporting members where 50 the coking of the coal takes place acting to prevent the fine uncoked coal from falling through the grate, whereby a greater quantity of air may pass through that portion of the grate where the coke is consumed than 55 at that portion where the coking of the coal occurs, substantially as described.

3. A furnace grate composed of traveling fuel-supporting and conveying members spaced apart, and relatively stationary intermediate members adjustable longitudinally 60 of said fuel-supporting members and disposed between the same where the coking of the coal takes place, said intermediate members acting to prevent the fine uncoked coal 65 from falling through the grate, whereby a

greater quantity of air may pass through that portion of the grate where the coke is consumed than at that portion where the coking of the coal occurs, substantially as described.

4. A furnace grate composed of a plurality of traveling fuel-supporting chains spaced apart, a plurality of intermediate bars between said fuel supporting chains where the coking of the coal takes place 70 acting to prevent the fine uncoked coal from falling through the grate, and means to simultaneously adjust said bars longitudinally of said chains, whereby a greater quantity of air may pass through that portion 80 of the grate where the coke is consumed than at that portion where the coking of the coal occurs, substantially as described.

5. In a furnace grate, the combination of fuel-supporting members spaced apart, movable intermediate means between said fuel-supporting members where the coking of the coal takes place acting to prevent the fine uncoked coal from falling through the grate, whereby a greater quantity of air may pass 90 through that portion of the grate where the coke is consumed than at that portion where the coking of the coal occurs, and means to move said intermediate means to prevent the formation of comparatively large masses of 95 coke, substantially as described.

6. In a furnace grate, the combination of fuel-supporting members spaced apart, a movable intermediate member between said fuel-supporting members where the coking of the coal takes place acting to prevent the fine uncoked coal from falling through the grate, whereby a greater quantity of air may pass through that portion of the grate 100 where the coke is consumed than at that portion where the coking of the coal occurs, and means to move said intermediate member to prevent the formation of comparatively large masses of coke, substantially as described. 105 110

7. In a furnace grate, the combination of traveling fuel-supporting and conveying members spaced apart, movable intermediate members between said fuel-supporting members where the coking of the coal takes 115 place acting to prevent the fine uncoked coal from falling through the grate, whereby a greater quantity of air may pass through that portion of the grate where the coke is consumed than at that portion where the 120 coking of the coal occurs, and means to move said intermediate members to prevent the formation of comparatively large masses of coke, substantially as described.

8. In a furnace grate, the combination of traveling fuel-supporting and conveying members spaced apart, movable intermediate means adjustable longitudinally of said fuel-supporting members and disposed between the same where the coking of the 125 130

coal takes place, said intermediate means acting to prevent the fine uncoked coal from falling through the grate, whereby a greater quantity of air may pass through that portion of the grate where the coke is consumed than at that portion where the coking of the coal occurs, and means to raise one end of said intermediate means to prevent the formation of comparatively large masses of coke, substantially as described.

9. In a furnace grate, the combination of a plurality of traveling fuel-supporting chains spaced apart, a plurality of intermediate bars between said fuel-supporting chains where the coking of the coal takes place acting to prevent the fine uncoked coal from falling through the grate, means to simultaneously adjust said bars longitudinally of said chains, and means to raise one end of said intermediate bars, whereby a greater quantity of air may pass through that portion of the grate where the coke is consumed than at that portion where the coking of the coal occurs, and the formation of comparatively large masses of coke is prevented, substantially as described.

10. In a furnace grate, the combination of a plurality of traveling fuel-supporting chains spaced apart, means connecting said chains together, and a plurality of intermediate bars between said fuel-supporting chains where the coking of the coal takes place acting to prevent the fine uncoked coal from falling through the grate, one or more of said intermediate bars having projections on their under surfaces coacting with said means connecting the chains together whereby the bars are rocked to break up the bed of fuel and prevent the formation of excessively large masses of coke, the construction of the grate being such that a greater quantity of air may pass through that portion of the same where the coke is consumed than at that portion where the coking of the coal occurs, substantially as described.

11. A furnace grate having traveling spaced fuel-supporting members, relatively stationary fuel-supporting members disposed between said traveling members to reduce the air supply to a portion of said grate, and means for adjusting the position of said relatively stationary members whereby to vary the size of the portion of the grate having a reduced air supply, substantially as described.

12. A furnace grate having traveling spaced main fuel supporting members and relatively stationary adjustable supplemental fuel supporting members located between the main members at one end of the grate and terminating short of the other end of the grate, the spaces between the main fuel supporting members at said other end of the grate being unobstructed for the passage of air, said stationary means being

adjustable without interference with said fuel-supporting members, substantially as described.

13. A furnace grate having spaced main fuel supporting members and supplemental fuel supporting members located at one end of the grate between the main members and terminating short of the other end of the grate to prevent fine fuel from falling through the grate, the spaces between the main fuel supporting members at said other end of the grate being unobstructed for the passage of air, said supplemental fuel supporting members being adjustable longitudinally of the grate to vary the size of the portion of the grate having unobstructed air spaces, substantially as described.

14. A furnace grate having spaced main fuel supporting members, supplemental fuel supporting members located between the main members at one end of the grate and terminating short of the other end of the grate, the spaces between the main grate members at said other end of the grate being unobstructed for the passage of air said supplemental members projecting externally beyond the first mentioned end of the grate, and means to adjust the supplemental members longitudinally of the grate to vary the length of that portion of the grate having unobstructed air spaces, substantially as described.

15. A furnace grate having spaced main fuel supporting members, supplemental fuel supporting members of less length than the grate located between the main members at one end of the grate and projecting externally beyond said end of the grate, the spaces between the main members between the inner ends of the supplemental members and the other end of the grate being open and unobstructed for the passage of air, means to adjust the supplemental members longitudinally of the grate to vary the lengths of the open spaces, and means to work the supplemental members in a vertical direction, substantially as described.

16. In a furnace grate, the combination of spaced fuel-supporting members, supplemental members upon which the fuel is partially supported disposed between said fuel-supporting members and acting to prevent the fine uncoked coal from falling through the grate, and means for adjusting said supplemental members longitudinally to increase or diminish the size of the coking section of the grate, substantially as described.

17. A furnace grate composed of traveling fuel-supporting and conveying members spaced apart, and supplemental fuel-supporting members disposed between said traveling members and serving to prevent the falling of fine particles of fuel through

the grate and to reduce the air supply to the fuel located above said supplemental members, the grate being divided by said supplemental members into a coke forming section and a coke burning section, and means for adjusting said supplemental members longitudinally of the grate to vary the rela-

tive areas of the coke forming and coke burning sections of the grate, substantially as described.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
