May 5, 1942. J. S. BENNETT 2,282,157

STOKER

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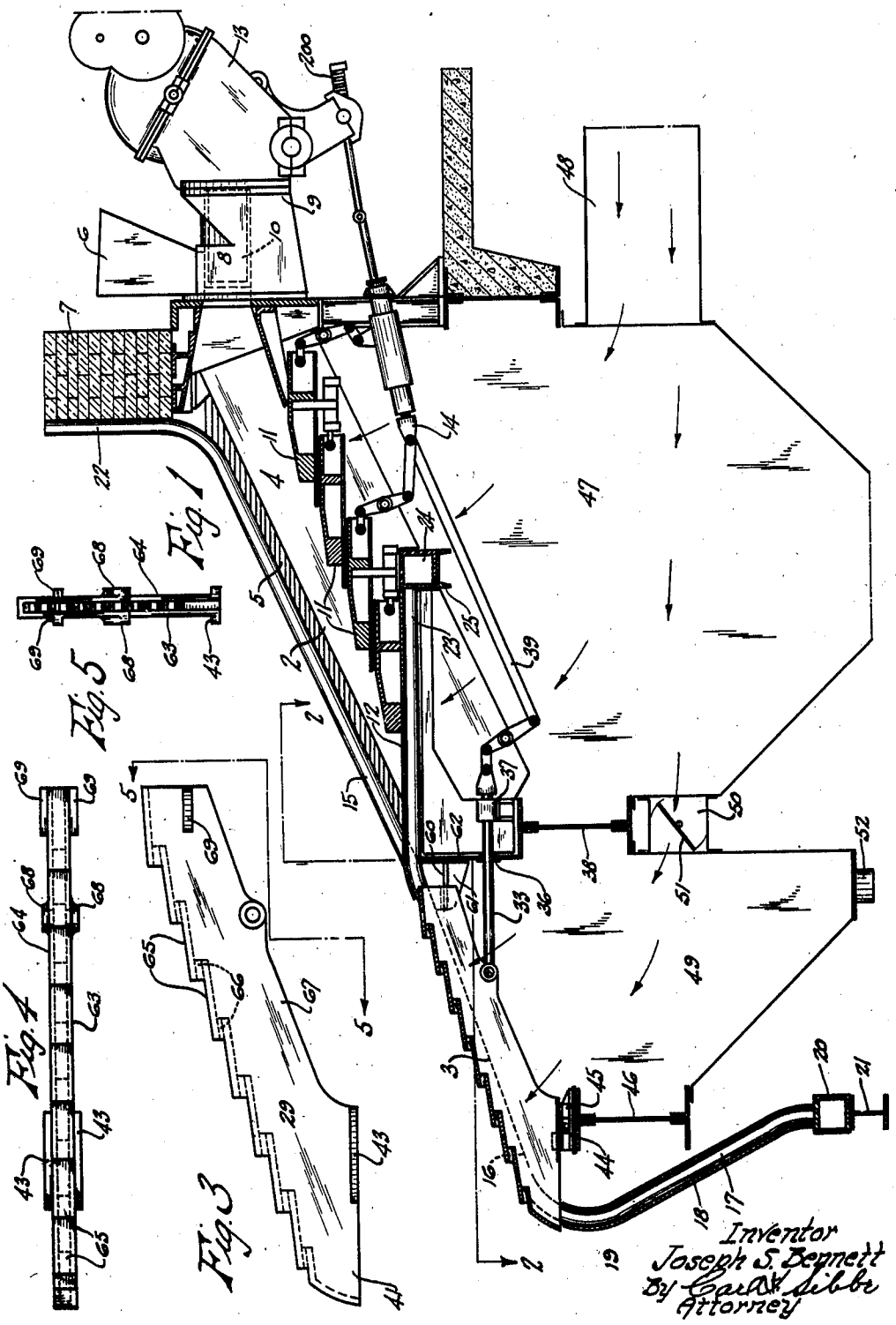


Fig. 1

Fig. 5

Fig. 4

Fig. 3

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Fig. 2

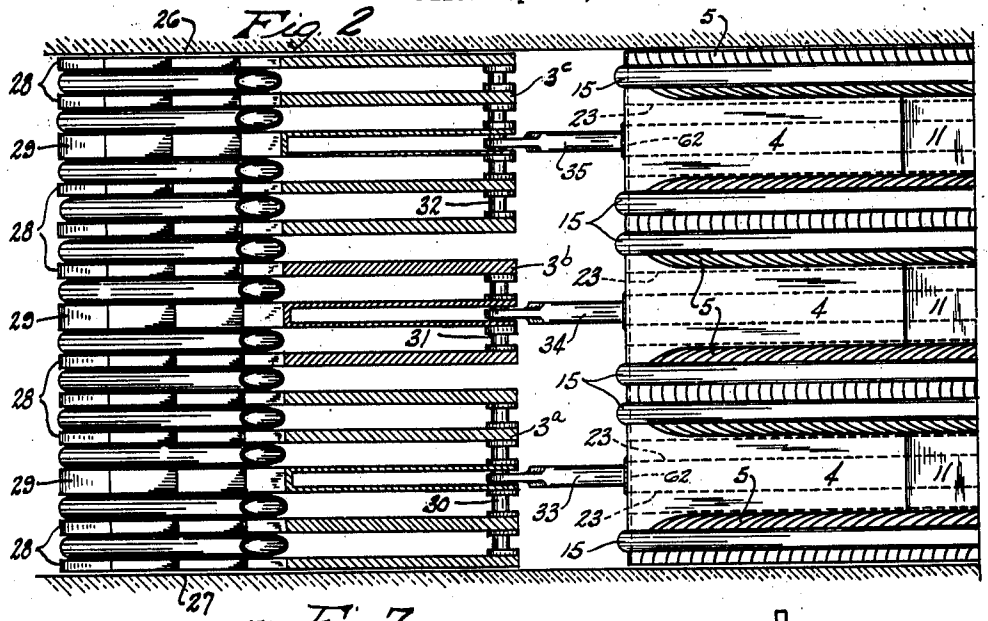


Fig. 7

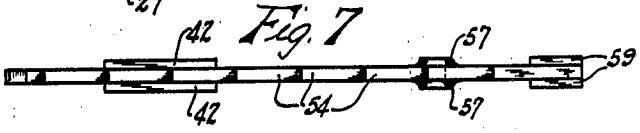


Fig. 8

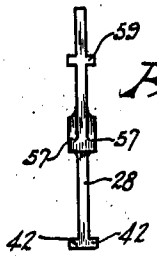


Fig. 6

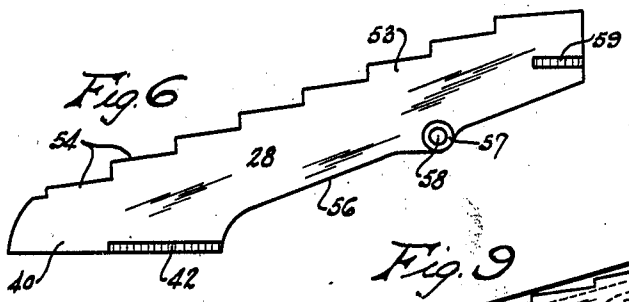


Fig. 9

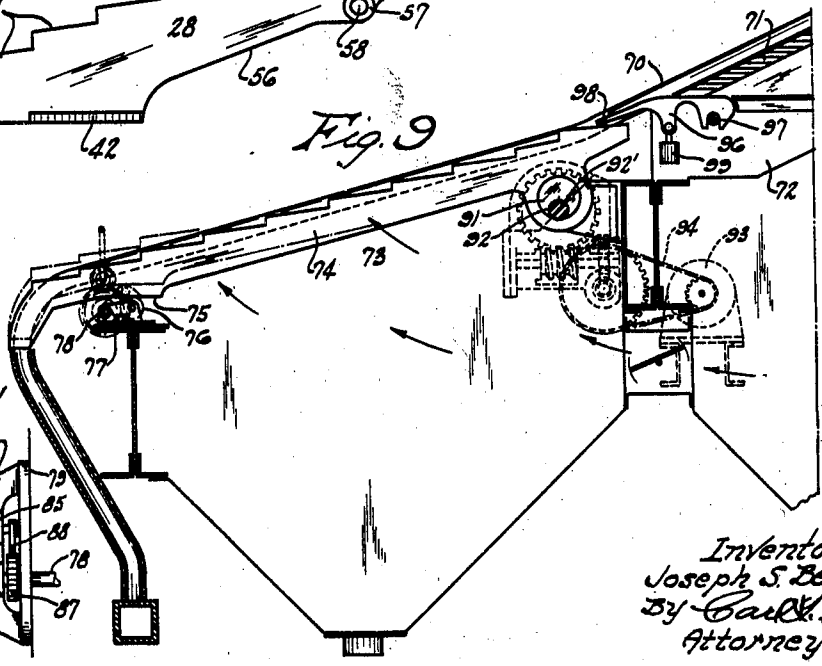


Fig. 11

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Fig. 12

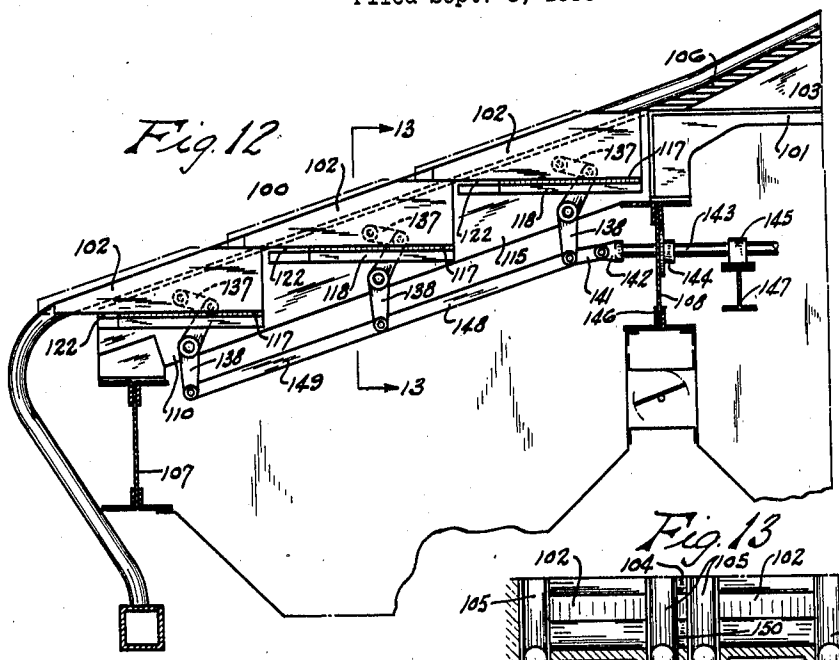


Fig. 13

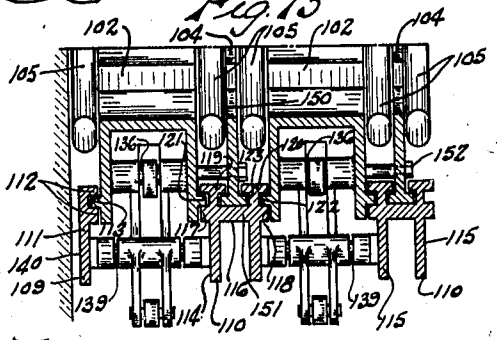


Fig. 15

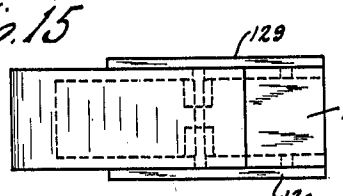


Fig. 14

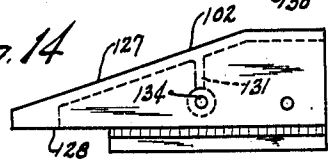


Fig. 16

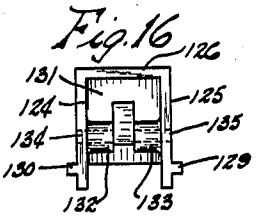


Fig. 17

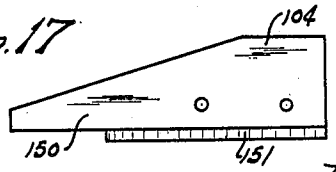


Fig. 18

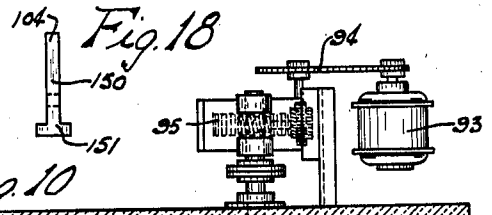
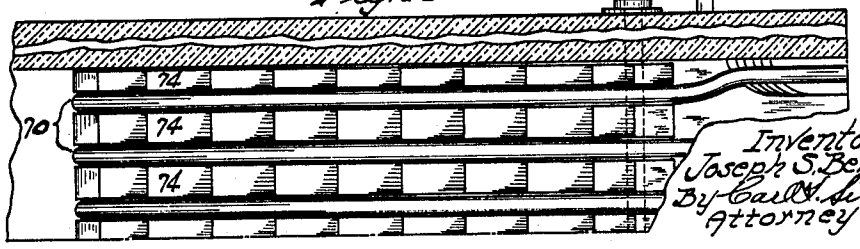


Fig. 10



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Fig. 19

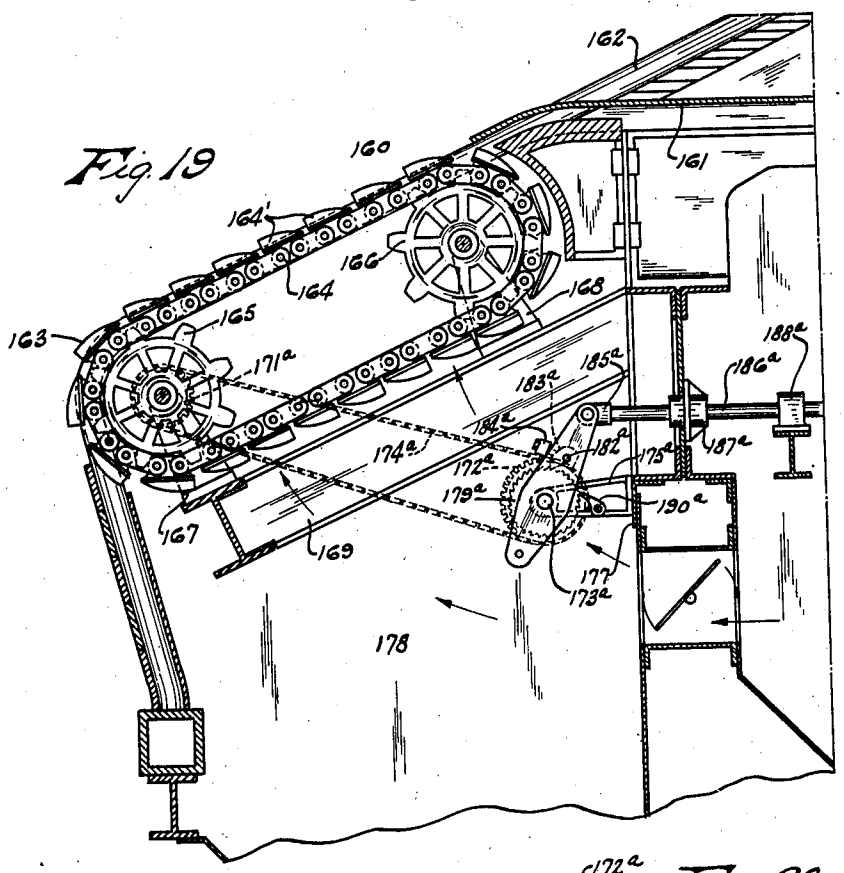
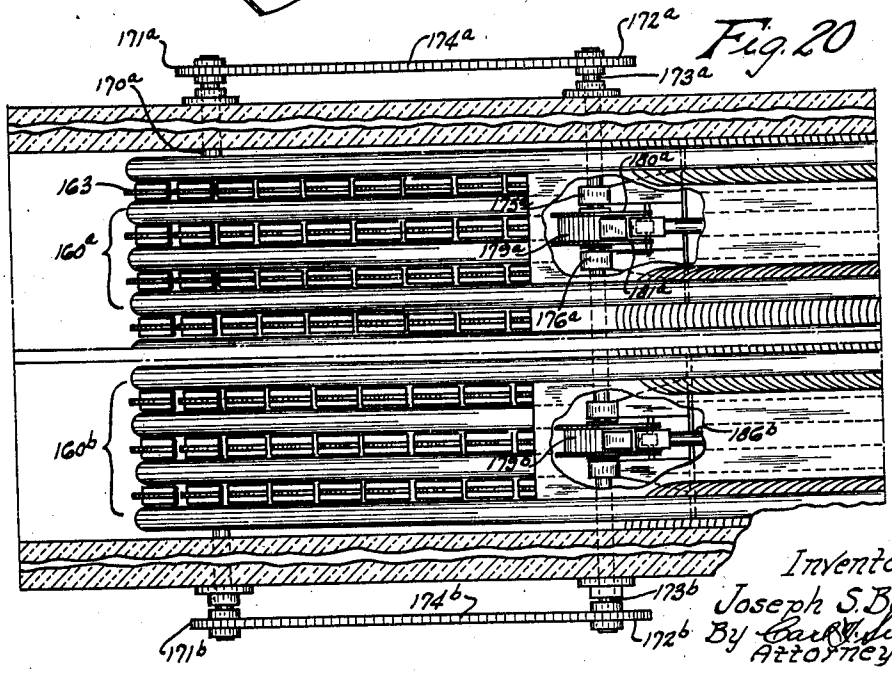


Fig. 20



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Patented May 5, 1942

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UNITED STATES PATENT OFFICE

2,282,157

STOKER

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Application September 3, 1936, Serial No. 99,234

10 Claims. (Cl. 122—4)

This invention relates to stokers, and more particularly to stokers of the inclined grate, multiple retort underfeed type.

One object of the present invention is to provide a generally improved stoker which is economical to manufacture, and which insures the highest efficiencies throughout the operating range thereof.

Another object is to provide a novel overfeed section in stokers of the stated character which feeds the consumed, as well as the partially consumed fuel and clinker toward an ash pocket.

A further object is to provide a novel grate section, particularly adapted for use with fluid cooled stokers of the underfeed type, the grate section being so disposed as to effectively feed fuel and residue to an ash pocket as well as break up any clinkers forming at the top of the fuel bed.

Other and further objects will become apparent as the description of the invention progresses.

Of the drawings:

Fig. 1 is a longitudinal view taken through one of the stoker retorts, showing the preferred embodiment under the present invention.

Fig. 2 is a plan view partly in section, taken substantially along line 2—2 of Fig. 1.

Fig. 3 is a side elevational view of one of the grate bars of the overfeed section of the stoker shown in Fig. 1.

Fig. 4 is a plan view of the grate bar shown in Fig. 3.

Fig. 5 is an end view taken substantially along line 5—5 of Fig. 3.

Figs. 6, 7 and 8 are side, top and end views respectively, of another form of grate bar for the stoker shown in Figs. 1 and 2.

Fig. 9 is a side elevational view of the overfeed section of a stoker showing grate bars of an alternative construction.

Fig. 10 is a fragmentary plan view of the construction shown in Fig. 9.

Fig. 11 is a detail view of the mechanism for adjusting the lower ends of grate bars shown in Figs. 9 and 10.

Fig. 12 is a side elevational view partly in section of the overfeed section of a stoker, showing a still further type of grate bar construction.

Fig. 13 is a sectional view taken substantially along line 13—13 of Fig. 12.

Figs. 14, 15 and 16 are side, top and end views of the grate bars shown in Figs. 12 and 13.

Figs. 17 and 18 are side and end views respectively of the grate bars disposed between the tubes.

Fig. 19 is a side elevational view partly in section of the overfeed section of a stoker, showing a still further type of construction, and

Fig. 20 is a plan view of the construction shown in Fig. 17 with certain parts broken away to show the construction of the operating mechanism therefor.

Referring to the drawings, the numeral 1 designates generally a stoker of the inclined grate type, having an upper underfeed section 2, and a lower overfeed section 3.

The underfeed section of the stoker consists of a series of alternately disposed retorts 4 and tuyère rows 5. Fuel is supplied to the stoker from hoppers 6, disposed exteriorly of front wall 7, and mounted upon the cylinders 8 of the ram boxes 9. The fuel from hoppers 6 gravitating into one end of cylinders 8 is fed to the retorts 4 by rams 10. Fuel is underfed along the retorts 4, and tuyère rows 5 to dead plates 12, and thence to overfeed section 3 by a series of pushers 11. Section 3 then overfeeds the fuel and residue to an ash pocket 19 disposed at the lower rearwardly disposed end of the stoker. The rams 10 are driven by any suitable power mechanism 13. The pushers 11 are also driven by the power mechanism 13 through any suitable link and lever mechanism indicated generally at 14. Inasmuch as the specific construction of the operating mechanism for the fuel feeding elements forms no part of the present invention a detailed description thereof will not be given herein. For a complete description of such a mechanism reference may be had to United States Patent No. 2,005,005.

As shown in Figs. 1 and 2, each tuyère row has mounted thereon a pair of fluid conducting tubes 15. These tubes extend beyond the lower end of the tuyère rows, as shown at 16, and form a portion of the overfeed section 3, and are then bent downwardly, as shown at 17, to form a portion of the front wall 18 of ash pocket 19, and terminate at their lower ends in a header 20 supported upon a transverse beam 21. Tubes 15 also extend upwardly from tuyère rows 5, as shown at 22, and terminate at their upper ends in a boiler (not shown). The portion 22 of tubes 15 make intimate contact with the inner surface of wall 7, and thus constitute a cooling medium for said wall. Mounted beneath and in intimate contact with each dead plate 12 is a pair of tubes 23. These tubes terminate at the forward ends thereof in a header 24 disposed

transversely of the stoker, and mounted upon any suitable supporting beam 25. The rearwardly disposed portions of the tubes 23 are bent downwardly in substantial parallel relation with section 16 of tubes 15, and also form a portion of the overfeed section 3. These tubes are then bent downwardly in substantial parallel relation with section 17 of tubes 15, and also terminate in header 20. Headers 20 and 24 are connected to the boiler by any suitable downtake and uptake connections respectively, in a well known manner. Disposed between tubes 15 and 23, and between the terminal tubes 15, and the furnace side walls 26 and 27 are a series of movable grate bars 28. Also disposed between each pair of tubes 23 is a slightly wider grate bar 29. As shown in Fig. 2, the overfeed section 3 of the stoker is divided into units 3^a, 3^b and 3^c. The end units 3^a and 3^c consist of the same number of grate bars, there being one grate bar 29 disposed centrally of the unit, and two grate bars 28 disposed on either side thereof. The central unit 3^b on the other hand, comprises a central grate bar 29 and one grate bar 28 disposed on either side thereof. It is obvious, however, that the number of grate bars 28 and 29 contained in the units may be varied without departing from the present invention. The grate bars of each of the units 3^a, 3^b and 3^c are rigidly connected near the forward ends thereof for simultaneous movement by rods 30, 31 and 32 respectively. Rods 30, 31 and 32 are operatively connected to reciprocable rods 33, 34 and 35 respectively, which extend through suitable bearings 36 and 37 disposed forwardly of overfeed section 3 and mounted in any suitable manner upon a transverse beam 38. The other ends of said rods are connected to the link and lever mechanism 14 by a second link and lever mechanism 39. The extents of movement of units 3^a, 3^b and 3^c, as well as that of the associated rams and pushers, may be varied by varying the number of washers 200 on the operating mechanism, as shown in Fig. 1. The lower edges 40 and 41 of grate bars 28 and 29 respectively, are provided with laterally extending bearing flanges 42 and 43. These flanges in assembly rest upon anti-friction rollers 44 mounted for movement in bearing blocks 45 supported upon a transverse beam 46. Thus, upon operation of the power mechanism 13 reciprocatory movement will be imparted to the rams 10, pushers 11, and units 3^a, 3^b, and 3^c of the overfeed section 3. Draft air is supplied to the stoker from a plenum chamber 47, which in turn is supplied with air by any suitable fan mechanism (not shown), through a connecting passage 48. Air is supplied to the overfeed section 3 from a second chamber 49 disposed therebeneath and connected to chamber 47 by a communicating passage 50. Passage 50 has provided therein a movable damper 51, whereby the flow of air from chamber 47 to overfeed section 3 may be controlled. Any siftings passing between the grate blocks 28 and 29 collect at the bottom of chamber 49 from which they may be removed from time to time by simply opening a closure member 52 provided at the bottom thereof.

Referring to Figs. 6 to 8, it will be observed that each of the grate bars 28 is of substantially rectangular form, and comprises a relatively thin body portion 53 having an inclined serrated upper edge 54 and an inclined lower edge 56, which terminates at the lower end thereof in the horizontally disposed lower edge 40. Inclined edge 56 has provided intermediate the ends thereof an apertured bossed portion 57 for receiving rods 30, 31 or 32, as the case may be. The upper end of body portion 53 is provided with a pair of laterally extending projections 59 which, in assembly, rest upon bearing surfaces 60 provided on a bracket 61, secured to and extending rearwardly of the upper front wall 62 of chamber 49.

Referring to Figs. 3 to 5, each grate bar 29 comprises a pair of substantially flat side plates 63 and 64 arranged in spaced relation and connected at the upper inclined edges thereof by a series of offset substantially parallel members 65 arranged in stepped relation. A series of apertures 66 are provided along the upper edge of grate bars 29, through which draft air may pass. The inclined lower edges 67 of the side plates 63 and 64 have each provided intermediate the ends thereof an apertured boss 68 through which rods 30, 31 or 32, as the case may be, extend. Also extending laterally from each of the side plates 63 and 64 is a relatively flat projection 69, which in assembly rests upon the flat bearing surfaces 60 of brackets 61.

Figs. 9 to 11 show an alternative construction wherein the lower ends of the tubes 70 provided over each of the tuyère rows 71 of the stoker 72 also form a portion of the overfeed section 73. Disposed between tubes 70 are a series of grate bars 74. The lower edge 75 of each grate bar 74 rests upon a roller 76 rotatably mounted at the free end of an arm 77 secured to a shaft 78. Shaft 78 extends through the side wall 79 of the furnace and is journalled in a bearing 80 provided in a bracket 90, secured to said side wall. The outer end of shaft 78 has secured thereto a gear 81 which meshes with a second gear 82 mounted on a shaft 83 supported in a second bearing 85 of bracket 90. A hand crank 86 is secured to one end of shaft 83. Also secured to shaft 78 is a ratchet wheel 87 which is held against movement in one direction by a pawl 88, pivotally supported on bracket 90. Thus upon rotation of gears 82 and 81 by crank 86, arm 77 will be swung about its pivot, to raise or lower supporting rollers 76 to adjust the lower ends of grate bars 74. Pawl 88 engaging ratchet wheel 87 retains the parts in adjusted position. Each of the grate bars 74 is provided with an enlarged aperture 91 near the upper end thereof, in which operates a cam 92 eccentrically mounted on a shaft 92'. Shaft 92' is operated by an electric motor 93 through chain and sprocket mechanism 94 and reduction gearing 95. Thus, upon operation of motor 93, cams 92 are actuated in an orbital path thereby imparting a reciprocatory, as well as a rocking movement to the grate bars 74. In the event it is desired to increase the effectiveness of the overfeed section, the lower ends of grate bars 74 are elevated, as shown in broken lines in Fig. 9, to bring the upper serrated edges thereof a greater distance above the tubes 70. In order to prevent the passage of siftings past the upper ends of the grate bars 74, a series of plates 96 are provided. These plates are pivoted at 97, and the lower rearwardly disposed ends 98 thereof engage the upper edges of the grate bars 74 and thus form a seal between the points of contact thereof. These plates are held in contact with the grate bars 74 by any suitable means, such as weights 99.

Figs. 12 to 18 inclusive show a further embodiment of the present invention, wherein the

overfeed section 100 of the stoker 101 comprises a series of relatively wide overlapping grate blocks 102 in line with the retorts 103, and a series of relatively narrow grate blocks 104 disposed between the pairs of tubes 105 extending rearwardly from the tuyère rows 106. Supported on transverse beams 107 and 108, in any suitable manner, are a series of inclined supporting members 109 and 110. As shown in Fig. 13, a supporting member 109 extends rearwardly of and in substantial alignment with the end row of tuyères, while a supporting member 110 extends rearwardly and in substantial alignment with each of the intermediate tuyère rows.

Supporting member 109 consists of a relatively flat plate 111 having three pairs of horizontally disposed flanges 112 arranged in stepped relation over the length thereof. The flanges 112 of each pair are spaced slightly from each other forming a horizontally disposed groove 113.

Supporting members 110 each comprises a pair of side plates 114 and 115 having three horizontally disposed and relatively flat grate supporting members 116 integral therewith and arranged in offset relation over the length thereof. Extending laterally of side plates 114 and 115, and in substantial alignment with each of the members 116 are a pair of projections 117 and 118. Also extending upwardly from each member 116 and in alignment with plates 114 and 115 are a pair of vertically extending T-shaped projections 119 and 120. The outer flanges of projections 119 and 120 are substantially parallel with projections 117 and 118 respectively, and form therewith pairs of open ended grooves 121 and 122. The inner flanges of projections 119 and 120 form with the upper surfaces of members 116 guide slots 123 of substantially inverted T-shaped form.

Referring more particularly to Figs. 14 to 16, it will be seen that each of the grate bars 102 comprises a pair of substantially triangular side plates 124 and 125 connected at the upper ends thereof by a relatively flat bearing portion 126 and an inclined fuel feeding portion 127. The lower, rearwardly disposed ends of side plates 124 and 125 are offset, as shown at 128, forming a bearing portion which rests upon the bearing portion 126 of the next lower grate block of the series. Side plates 124 and 125 are also provided with longitudinally extending projections 129 and 130, which in assembly operate in grooves 113 or 118, and 117 respectively, of supporting members 109 and 110, as shown in Fig. 13. Depending from the lower surface of inclined member 127 is a web 131, which terminates at the lower end thereof in a pair of spaced bosses 132 and 133 extending inwardly of side plates 124 and 125. Side plate 124 and boss 132 are provided with a transverse aperture 134 in alignment with a transverse aperture 135 extending through boss 133 and wall 125. Apertures 134 and 135 in assembly receive a rod 136 to which is pivotally connected one end of a link 137. The other end of link 137 is pivotally connected to the upper ends of a pair of levers 138 journaled on a rod 139 mounted in plates 114 and 115 of adjacent supporting members 110, or in the lower end 140 of supporting member 109 and plate 114 of a supporting member 110 when disposed near the side walls of the furnace. The levers 138 for the upper grate block 102 of each series are pivotally connected to the free end of a link 141, the other end of which being pivotally connected to a coupling member 142 secured to a reciprocatory rod 143 mounted in bearings 144 and 145. Bearings 144 and 145 are mounted on beams 146 and 147 respectively, as shown in Fig. 12. The lower ends of the levers 138 for the second and third grate bars 102 of the series are respectively connected to the free ends of links 148 and 149, the other ends of which being also pivotally connected to the coupling member 142.

Grate bars 104 are also of substantially triangular construction and each comprises a relatively thin web portion 150, which extends vertically between a pair of tubes 105, and a lower flanged portion 151 which engages in the slot 123 provided in the supporting members 110. Each grate bar 104 is rigidly secured to and held in spaced relation with the grate bar 102 disposed to the left thereof by bolts 152, or by any other suitable securing means. Rods 143 may be reciprocated by any suitable operating mechanism, such as that shown for the rods 33 in Fig. 1. Thus upon reciprocation of rods 143 grate bars 102 and 104 will also be reciprocated to feed fuel and refuse toward the ash pocket disposed at the lower end of the stoker. This construction also functions to break up any clinkers forming at the top of the fuel bed.

Figs. 19 and 20 show a still further modification of the present invention. In this construction the overfeed section 160 of the stoker 161 consists of a series of alternately disposed fluid conducting tubes 162 and feeding elements 163. The fuel feeding elements in this construction comprise a series of endless chain units 164 which are trained about sprocket wheels 165 and 166 mounted in suitable brackets 167 and 168 respectively, extending upwardly from any suitable framework 169. The overfeed section 160 may comprise a number of independently operable units. For the purpose of illustration, however, two units indicated at 160^a and 160^b are shown in Fig. 20. Mounted on a shaft 170^a, upon which the sprocket wheels 165 for section 160^a are supported, is a sprocket wheel 171^a. Sprocket wheel 171^a is connected to a second sprocket wheel 172^a secured to one end of a drive shaft 173^a extending transversely of overfeed section 160 by a chain 174^a. Shaft 173^a is mounted in suitable bearing brackets 175^a and 176^a, secured to and extending rearwardly of the front wall 177 of the air supply chamber 178 disposed beneath the overfeed section 160. Secured to shaft 173^a and disposed between bearing brackets 175^a and 176^a is a ratchet wheel 179^a. Loosely mounted on shaft 173^a and disposed on either side of ratchet wheel 179^a are a pair of operating levers 180^a and 181^a having pivotally connected intermediate the ends thereof at 182^a an operating pawl 183^a. Pawl 183^a is held in engagement with ratchet wheel 179^a by a weight 184^a. The upper ends of levers 180^a and 181^a are pivotally connected to a coupling 185^a mounted at the rearwardly disposed end of a rod 186^a, slidably supported in bearing 187^a and 188^a. Rod 186^a may be reciprocated by any suitable power mechanism, such as that shown for the rods 33 in Fig. 1. Thus upon each rearward movement of rod 186^a a rotary movement is imparted to ratchet wheel 179^a shaft 173^a, sprocket wheel 172^a, sprocket wheel 171^a, and sprocket wheels 165^a and 166^a, thereby causing a rearward travel of the upper section of chains 164^a. Ratchet wheel 179^a is held against movement in the reverse direction by a holding pawl 190^a pivotally mounted on bearing bracket 175^a, as shown in Fig. 17. Thus upon the return movement of rod 186^a, pawl 183^a

simply ratchets over ratchet wheel 179a. To increase the effectiveness of the overfeed section each chain 164 has provided thereon a series of vertically disposed feeding elements 164'.

Section 160b is similar in construction to section 160a and is also driven by a reciprocating rod 186b through ratchet wheel 179b, secured to a shaft 173b, and the chain and sprocket drive mechanism 172b, 174b and 171b, as shown in Fig. 20. By dividing the overfeed section 160 into units, such as 160a and 160b, the units are adapted for relative movements which may be desirable under certain conditions of operation. It also is possible by this construction to vary the strokes of reciprocating rods 186a and 186b to thereby vary the feeding capacity of the individual units and in this way maintain the desired fuel bed conditions. The strokes of the individual units may be varied by varying the number of individual washers shown at 200 on the operating mechanism in Fig. 1.

From the foregoing description it is seen that each of the various forms of overfeed sections herein shown effectively feeds the consumed or partially consumed fuel toward the ash pocket of the stoker, and also breaks up any clinkers forming at the top of the fuel bed.

By employing fluid cooled structures it is also apparent that the overfeed sections may be made relatively long, thus increasing the effective grate area without appreciably increasing the cost of the installation. The various overfeed sections just described are also of such a character that they may form the entire grate of the stoker if it is so desired.

It therefore is seen that the present invention affords a stoker design which is highly efficient in operation, as well as economical in manufacture.

While the embodiments herein shown and described are admirably adapted to fulfill the objects primarily stated, it is to be understood that the invention is not to be limited thereto, since it may be embodied in other forms, all coming within the scope of claims which follow.

What is claimed is:

1. A stoker comprising an underfeed section and an overfeed section, said underfeed section consisting of a series of alternately disposed retorts and tuyère rows, dead plates disposed at the lower ends of said retorts, one or more fluid cooled members mounted in cooling relation with each of said tuyère rows and dead plates, said members extending rearwardly of the underfeed section and forming a portion of said overfeed section, individual feeding elements disposed between the extended portions of said members and lying in substantial alignment with said tuyère rows and retorts, means for connecting said elements into groups transversely of said stoker, and independent operating means for each of said groups.

2. A stoker, comprising an underfeed section and an overfeed section, said underfeed section consisting of a series of alternately disposed retorts and tuyère rows, one or more fluid conducting members mounted in intimate relation with each of said tuyère rows, said members extending rearwardly of said underfeed section and forming a portion of said overfeed section, a plurality of grate bars disposed between the extensions of said members in alignment with said tuyère rows and also forming a portion of said overfeed section, supporting means for the lower ends of said grate bars, means for elevating said supporting means to vary the effectiveness of said grate bars, cam means operatively connected to each of said grate bars for actuating the same, and means for operating said cam means.

3. A stoker, comprising an underfeed section and an overfeed section, said underfeed section consisting of alternately disposed retorts and tuyère rows, one or more fluid conducting members mounted in intimate relation with each of said tuyère rows, said members extending rearwardly and forming a portion of said overfeed section, a series of feeding elements disposed in overlapping relation between said members and also forming a portion of said overfeed section, the elements in line with said retorts being relatively wide, while the elements in line with said tuyère rows being relatively narrow, means connecting one of said relatively wide elements with one of said relatively narrow elements, and independent operating means for each pair of said interconnected elements.

4. An inclined grate stoker, comprising an underfeed section and an overfeed section, said underfeed section consisting of alternately disposed retorts and tuyère rows, tubes mounted in cooling relation with said tuyère rows, said tubes extending rearwardly and forming a portion of said overfeed section, a header for the lower ends of said tubes, movable feeding means disposed between said tubes and in line with said tuyère rows, additional feeding means mounted in spaced relation with said first mentioned feeding means and disposed in substantial alignment with said retorts, supporting means for said feeding means, independent of said tubes and means for actuating said feeding means to feed fuel and refuse toward the rear of said stoker.

5. A stoker, comprising an underfeed section and an overfeed section, said underfeed section consisting of a series of alternately disposed retorts and tuyère rows, dead plates disposed at the lower ends of said retorts, one or more fluid cooled members mounted in cooling relation with each of said tuyère rows and dead plates, said members extending rearwardly of the underfeed section and forming a portion of said overfeed section, individual feeding elements disposed between said members, certain of said feeding elements comprising a substantially rectangular body portion, a pair of laterally extending supporting flanges disposed at the lower edge of said body portion, a pair of laterally extending projections provided at the upper end of said body portion for supporting the upper end thereof, and means for actuating said feeding elements.

6. A stoker, comprising an underfeed section and an overfeed section, said underfeed section consisting of a series of alternately disposed retorts and tuyère rows, dead plates disposed at the lower ends of said retorts, one or more fluid cooled members mounted in cooling relation with each of said tuyère rows and dead plates, said members extending rearwardly of the underfeed section and forming a portion of said overfeed section, individual feeding elements disposed between said members, certain of said feeding elements comprising a body portion consisting of a pair of parallel plates disposed in spaced relation, a series of connecting members for said plates disposed in stepped relation along the upper edges thereof, supporting means provided at the lower edge of each of said plates,

laterally extending bearing means provided near the upper ends of each of said plates, and means for actuating said feeding elements.

7. A stoker, comprising an underfeed section and an overfeed section, said underfeed section consisting of a series of alternately disposed retorts and tuyère rows, dead plates disposed at the lower ends of said retorts, one or more fluid cooled members mounted in cooling relation with each of said tuyère rows and dead plates, said members extending rearwardly of the underfeed section and forming a portion of said overfeed section, individual feeding elements disposed between said members, means for connecting said feeding elements into groups, each group comprising an intermediate element having a body portion consisting of a pair of parallel plates disposed in spaced relation, a series of connecting members for said plates disposed in stepped relation along the upper edges thereof, supporting means provided at the lower edge of each of said plates, and laterally extending bearing means provided near the upper end of each of said plates; and one or more end elements disposed at either side of said intermediate element, each of said end elements comprising a substantially rectangular body portion, a pair of laterally extending supporting flanges disposed at the lower edge of said body portion, a pair of laterally extending projections provided at the upper end of said body portion for supporting the upper end thereof, and boss means provided near the lower edge of said body portion; and independent actuating means for each of said groups of feeding elements.

8. A stoker comprising an underfeed section and an overfeed section, said underfeed section consisting of a series of alternately disposed retorts and tuyère rows, one or more fluid conducting members mounted in intimate relation with each of said tuyère rows, said members extending rearwardly of said underfeed section and forming a portion of said overfeed section, grate bars disposed between the extensions of said members in alignment with said tuyère rows and also forming a portion of said overfeed section, supporting means for the upper and lower ends of said grate bars, means for adjusting the lower of said supporting means for said grate bars to vary the effectiveness thereof, and means for actuating said grate bars.

9. A stoker comprising an underfeed section and an overfeed section, said underfeed section consisting of a series of alternately disposed retorts and tuyère rows, dead plates disposed at the lower end of each of said retorts, one or more fluid conducting tubes mounted in intimate relation with each of said tuyère rows and dead plates, said tubes extending rearwardly and forming a portion of said overfeed section, individual feeding elements disposed between the extended portions of said tubes, supporting means for the upper and lower ends of said elements, means for actuating said elements, and means for adjusting the lower supports for said elements to vary the effectiveness thereof.

10. A stoker comprising an underfeed section and an overfeed section, said underfeed section consisting of a series of alternately disposed retorts and tuyère rows, dead plates provided at the lower ends of said retorts, one or more fluid conducting tubes mounted in cooling relation with said tuyère rows and dead plates, said tubes extending rearwardly and forming a portion of said overfeed section, individual grate bars disposed between said tubes and lying in juxtaposition therewith, supporting means for the upper and lower ends of said grate bars, the lower of said supporting means for said grate bars consisting of rocker arms having anti-friction rollers rotatably mounted thereon in engagement with the lower ends of said grate bars, a shaft to which said rocker arms are secured, gearing for actuating said shaft to adjust the position of said rollers, means for holding said shaft in adjusted position, and operating means for said grate bars.

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