Sept. 18, 1945. H. E. PRESTON 2,385,027

STOKER

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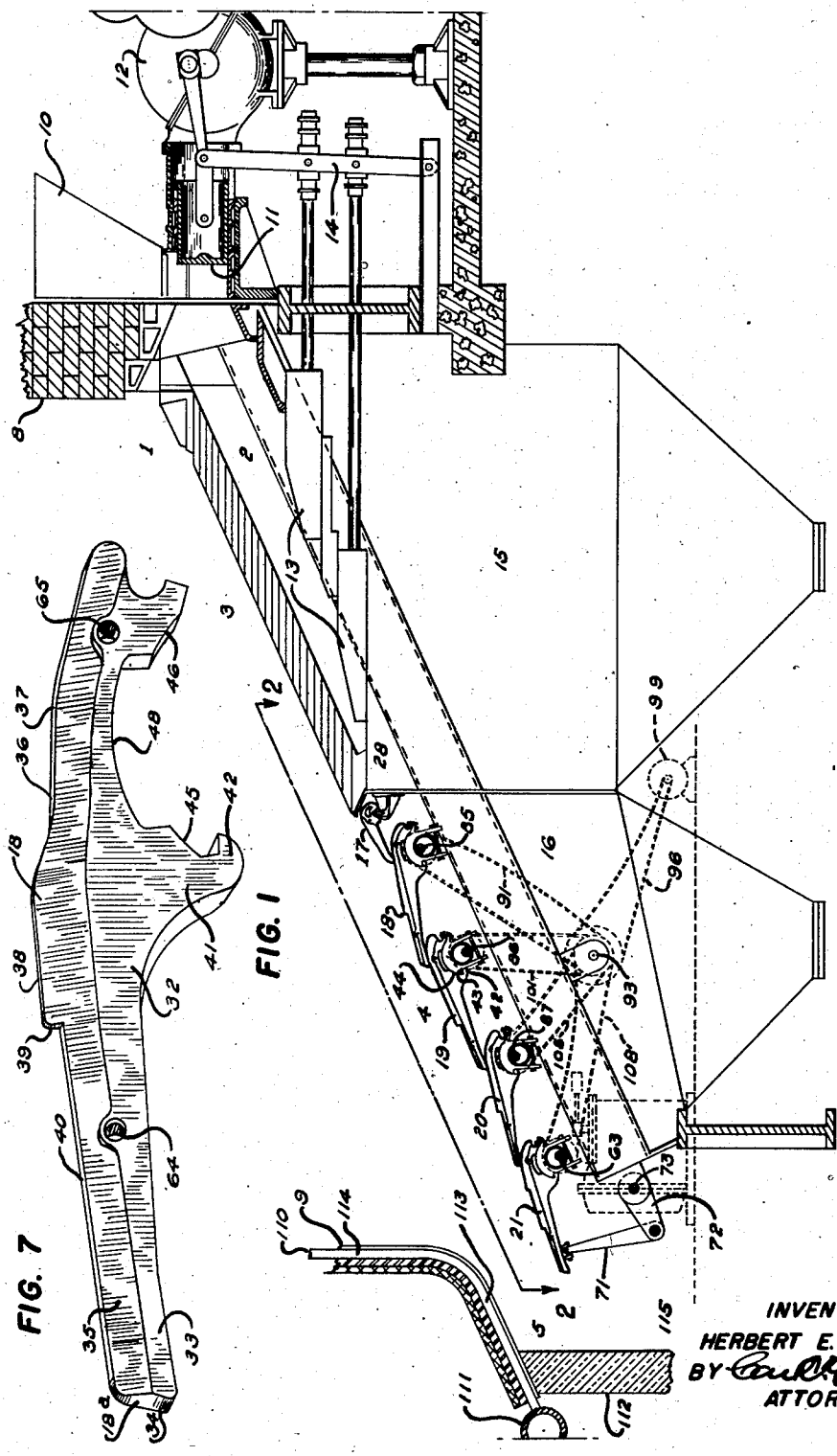


FIG. 1

FIG. 7

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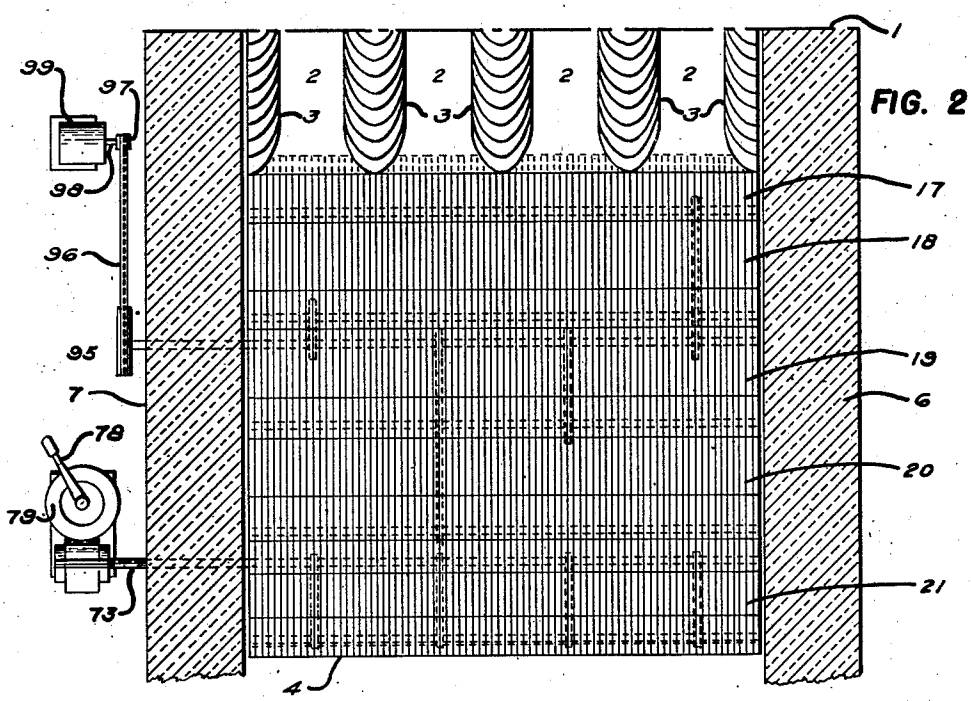
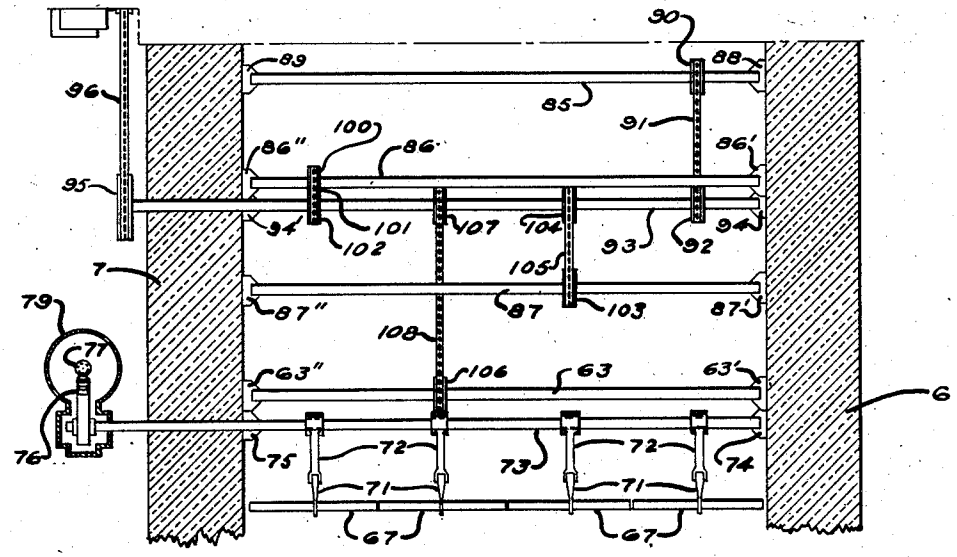


FIG. 2

FIG. 3



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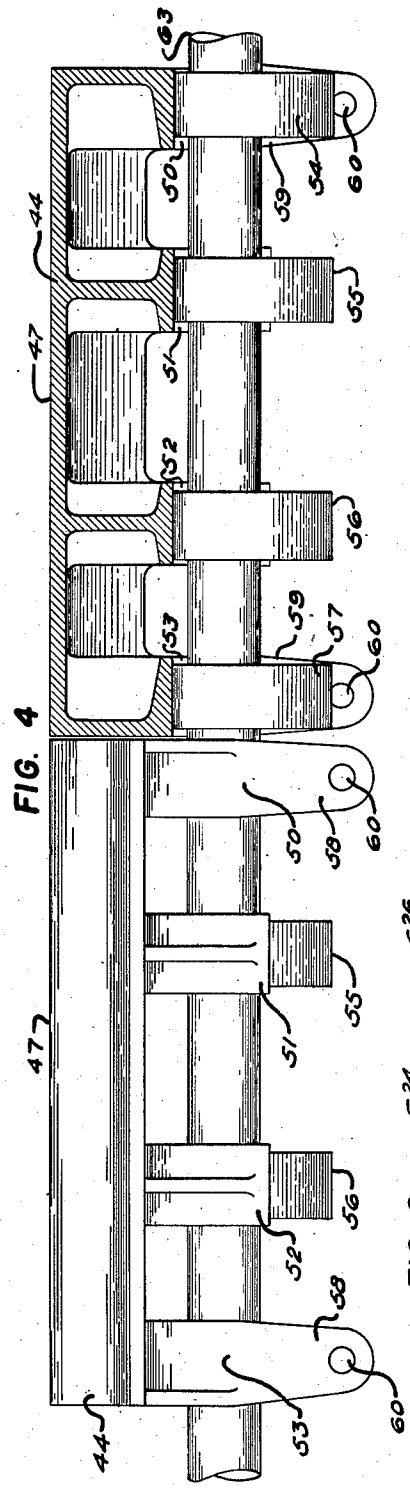


FIG. 4

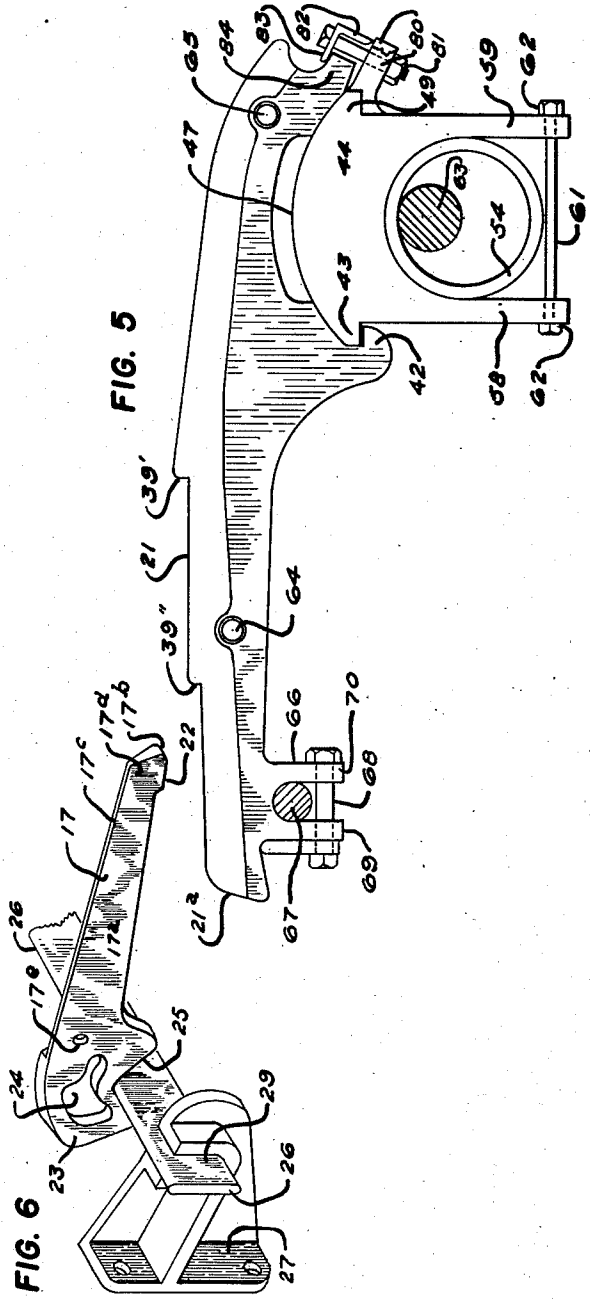


FIG. 5

FIG. 6

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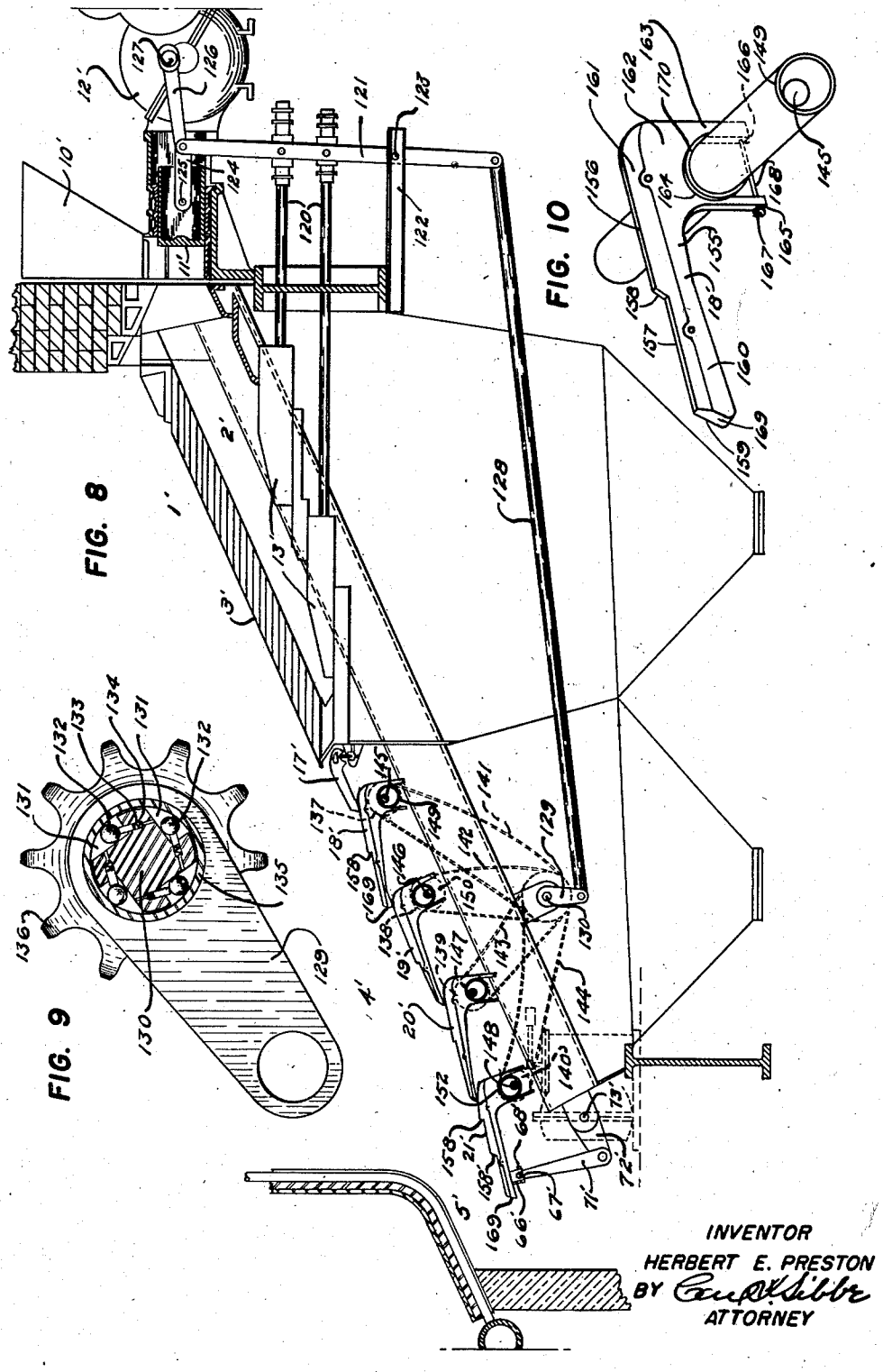


FIG. 8

FIG. 9

FIG. 10

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FIG. 13

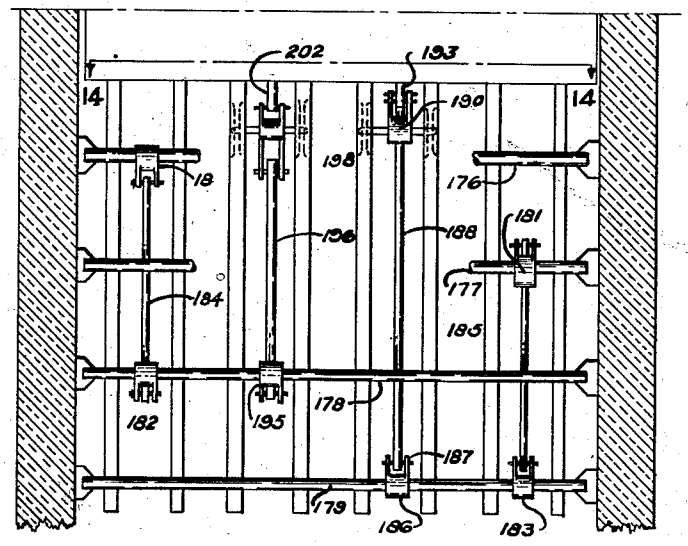
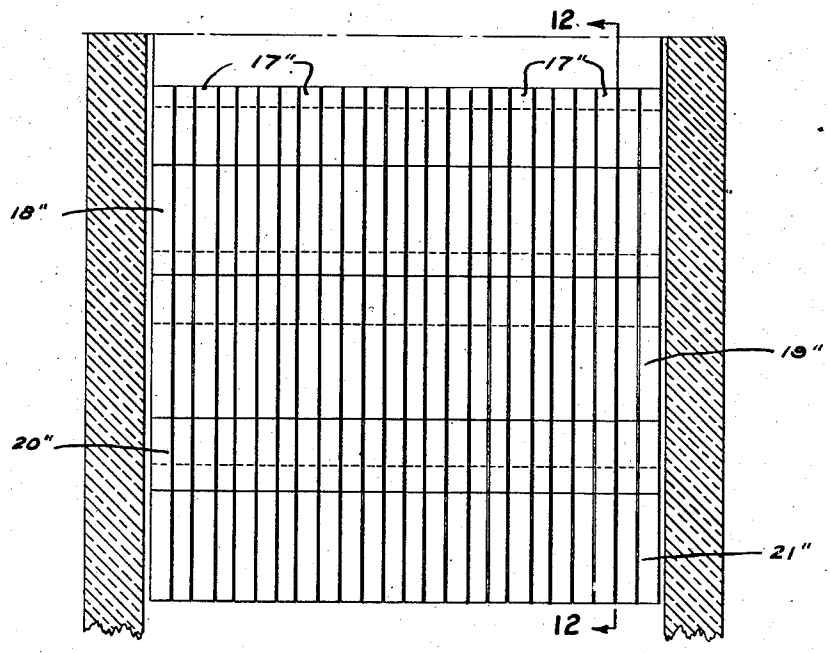


FIG. 11



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FIG. 12

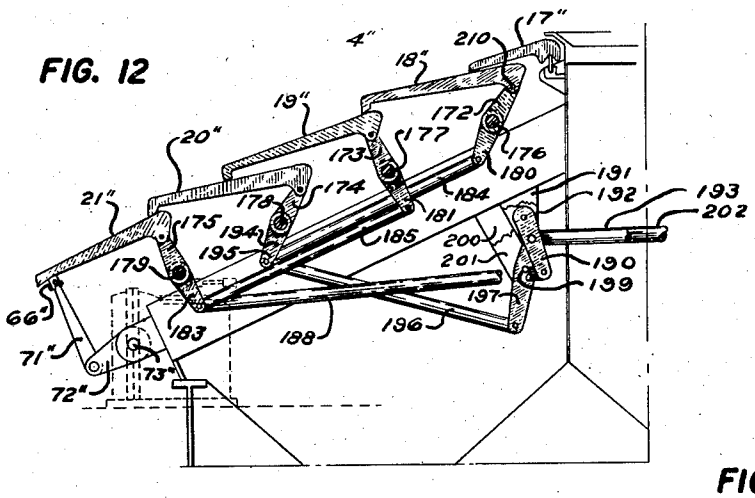


FIG. 14

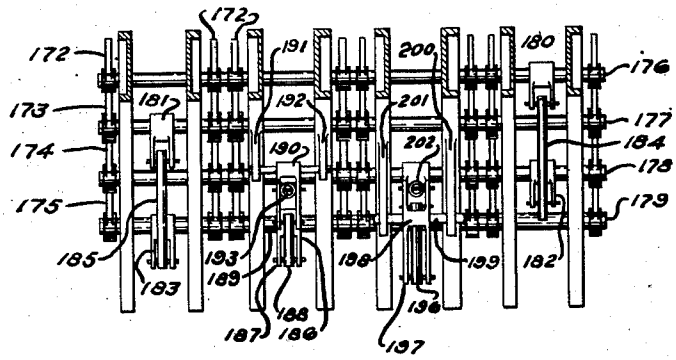


FIG. 15

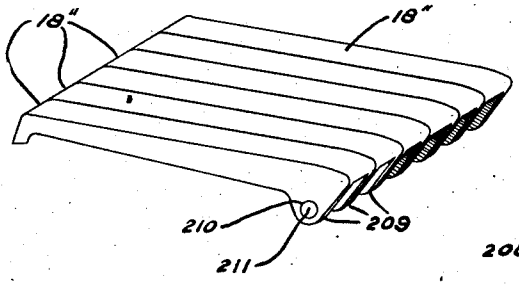
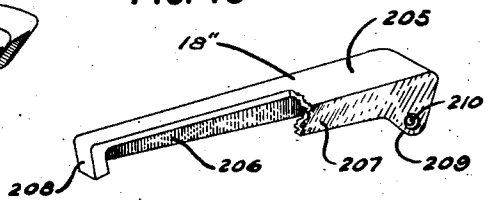


FIG. 16



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2,385,027

UNITED STATES PATENT OFFICE

2,385,027

STOKER

Herbert E. Preston, Philadelphia, Pa., assignor, by mesne assignments, to American Engineering Company, Philadelphia, Pa., a corporation of Pennsylvania

Application October 29, 1941, Serial No. 416,936

14 Claims. (Cl. 110—44)

This invention relates to stoker furnaces, and more particularly to stokers of the multiple retort, underfeed type provided with extension grates or overfeed sections.

One object of the present invention is to provide in a stoker of the stated character, a novel overfeed section which effectively feeds the partially consumed fuel and refuse toward a place of disposal, the feeding thereof being so effected as to insure complete combustion of the fuel.

Another object is to provide a generally improved stoker having an underfeed section and an overfeed section, the parts of which being so disposed as to continuously feed the fuel toward a discharge passage through which the ashes pass into a place of disposal from which they may be removed from time to time.

Another object is to provide in a stoker of the stated character an overfeed section which operates to break up large clinker formations, and to progressively feed the partially consumed fuel, ashes, and clinker toward a discharge passage.

A further object is to provide an overfeed section so constructed that a multiplicity of uniform, finely divided streams of air may pass therethrough into the fuel bed to insure proper combustion of the fuel as it passes thereover.

A further object is to provide in a stoker of the stated character an extension grate comprising a series of successive sections, each of which is operated to produce a lifting, as well as progressive feeding action of the fuel, thereby breaking up clinker masses and insuring proper combustion, as the fuel and refuse passes toward a place of disposal.

A further object is to provide an extension grate of the stated character having a series of relatively small grate elements mounted on eccentric means whereby an oscillatory movement is imparted thereto, these sections being provided in rows whereby agitation, as well as feeding of the fuel and refuse is effected as it moved towards an ash pocket.

A still further object is to provide an overfeed section consisting of a series of rows of relatively narrow grate elements, the spacing of said grate elements in each of said rows may be readily varied across the width of said section, to insure the proper supply of air from one end of the section to the other, and thus insuring complete combustion of the fuel.

A still further object is to provide an extension grate of the stated character having a series of rows of relatively small grate elements, cam means for actuating each of the rows of grate elements, the said cams being so disposed that the movement of one row of elements may be varied with respect to the next row to provide the proper amount of agitation of the fuel supported on said grate elements.

A further object is to provide in a stoker of the stated character an extension grate which may be operated by or independently of the operating mechanism of the stoker proper.

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

Of the drawings:

Fig. 1 is a longitudinal sectional view taken through one of the retorts of an underfeed stoker showing the structure of the extension grate and its relation to the stoker proper.

Fig. 2 is a partial plan view taken substantially along line 2—2 of Fig 1.

Fig. 3 is a plan view partly in section and with the extension grates removed showing the operating mechanism for the extension grates.

Fig. 4 is an elevational view, partly in section, of the supporting means for the extension grate bars and the cam means for operating the same.

Fig. 5 is an enlarged side view of the lowermost row of grate bars showing the operating means therefor.

Fig. 6 is a perspective view of the supporting structure for the row of grate elements provided at the upper end of the extension grate, one grate element being shown in position.

Fig. 7 is a perspective view of one of the intermediate grate bars.

Fig. 8 is a longitudinal sectional view taken through one of the retorts of a stoker showing a modified operating mechanism for the extension grate.

Fig. 9 is a side view, partly in section, showing the operating lever and the clutch mechanism associated with the operating mechanism of the structure shown in Fig. 8.

Fig. 10 is a perspective view of one of the grate bars shown in Fig. 8, and the cam means operating the same.

Fig. 11 is a plan view of a still further modification of the present invention.

Fig. 12 is a side view taken substantially along line 12—12 of Fig. 11.

Fig. 13 is a plan view of the structure shown in Fig. 11 with the grate bars removed and with certain parts broken away to show the operating mechanism for the grate bars shown in Figs. 11 and 12.

Fig. 14 is an elevational view, partly in sec-

tion, taken substantially along line 14—14 of Fig. 13.

Fig. 15 is a perspective view of a group of six grate bars which may comprise a unit, said grate bars being of the type shown in Figs. 11 and 12, and

Fig. 16 is a perspective view of one of the grate bars shown in Fig. 15, a portion thereof being broken away to show its structure.

Referring more particularly to Figs. 1 and 2 of the drawings, the numeral 1 represents a stoker of the inclined grate multiple retort type comprising alternately disposed retorts 2 and tuyère rows 3. An extension grate or overfeed section 4 is disposed at the rear of the retorts and tuyère rows 2 and 3, respectively, which feeds the partially consumed fuel and refuse toward, and the refuse through a discharge passage 5 provided at the rearmost end of the furnace. The stoker 1 is disposed between side walls 6 and 7 of the furnace (Fig. 2) and is bounded at the front end by a wall 8 and at the rearwardly disposed end by a wall 9. Fuel is fed to the stoker from hoppers 10 disposed exteriorly of the front wall 8 by a series of rams 11 driven by any suitable power mechanism indicated at 12. The fuel so entering the stoker is fed along the retorts and tuyère rows 3 by pushers 13 which are operatively connected to the power mechanism by any suitable link and lever mechanism indicated generally at 14. Air for combustion purposes is supplied to the underfeed section from a plenum chamber 15 and to the extension grates from a subplenum chamber 16. Air under pressure is supplied to plenum chambers 15 and 16 by any suitable fan or blower mechanism, not shown.

As shown more particularly in Figs. 1 and 2, the extension grate or overfeed section 4, comprises five rows of grate elements 17, 18, 19, 20 and 21, respectively. These rows of elements, as shown more particularly in Fig. 1, are disposed in overlapping relation and progressively feed the fuel and refuse toward the discharge passage 5.

The uppermost row of grate elements 17 each comprises an elongated body portion 17a, as shown more particularly in Fig. 6, which is relatively wide at the bottom, as shown at 17b, and tapers toward the upper edge 17c, thereby presenting a relatively narrow edge to the fuel supported thereon. The rearwardly disposed end 17d of each grate bar 17 is provided with an offset portion 22 which rests upon a grate bar 18 of the next lower row of the series. The forwardly disposed end 23 of each grate bar 17 is provided with an irregular opening 24, through which air may pass for cooling purposes. The forwardly disposed end 23 is enlarged and has provided at the lower side thereof a notch 25 which engages a transversely disposed bar 26, supported by brackets 27 secured in any suitable manner to the supporting framework 28 disposed between the extension grate 4 and the underfeed section of the stoker proper. Each bracket 27 is provided with an open ended slot 29 which receives the supporting bar 26. Each bar 17 has provided therein an aperture 17e for receiving a locking pin. By this means any desired number of grate bars 17 may be connected into groups.

Each of the grate bars 18, 19, 20 and 21 are substantially identical in structure and accordingly a detailed description of one will suffice for all. For the purpose of illustration, a detailed description of a grate bar 18 will now be given.

As shown more particularly in Figs. 1 and 7, each grate bar 18 consists of an elongated body portion 32 which terminates at its rearwardly disposed end in a substantially vertical fuel feeding portion 18a. The lower extremity of body portion 32 is provided with relatively parallel sides 33 and 34, the side 33 terminating in a bevel portion 35 which extends to the upper edge 36 of the grate bar. The upper edge 36 is substantially arcuate near the forwardly disposed end thereof, as shown at 37, and is provided with a vertically projecting portion 38 having a vertically disposed surface 39 at the rearwardly disposed end thereof which acts as a fuel feeding surface during operation of the device. The upper edge of bar 18 from surface 39 to the rearmost end is relatively straight, as shown at 40. Each grate bar 18 also comprises a downwardly extending portion 41 which terminates at its lowermost end in a hook 42 which is adapted to engage the offset portion 43 of a supporting member 44 (Figs. 1 and 5). Each grate bar 18 is also provided with arcuate portions 45 and 46 which in assembly rest upon the upper arcuate surface 47 of supporting member 44. The under surface of each grate bar 18 also has provided therein a recess 48 which in assembly provides an air space through which draft air may circulate for cooling purposes.

The supporting members 44 for each of the rows of grate bars 18, 19, 20 and 21 are identical in construction, and accordingly a detailed description of one only will be given herein. Referring more particularly to Figs. 1, 4 and 5, it is seen that each supporting member 44 consists of the upper arcuate portion 47 which terminates at the sides thereof in offset portions 43 and 49, the former of which, as heretofore stated, is adapted to be engaged by the hooks 42 of the associated grate bars. Each supporting member 44 is substantially hollow in construction, as shown more particularly in Fig. 4, and is provided with four bifurcated portions 50, 51, 52 and 53 which rest upon cams 54, 55, 56 and 57, respectively. The legs 58 and 59 of the end bifurcations 50 and 53, respectively, are longer than those of the intermediate bifurcations and are provided with apertures 60 for receiving strap bolts 61, the latter of which may be secured in position by any suitable means, such as by the nuts 62, secured to the outermost ends of the said bolts. As shown in Fig. 5, bolts 61 are slightly spaced from the lower ends of cams 54 and 57 to prevent binding.

The cams 54, 55, 56 and 57 are secured in any suitable manner, such as by welding to operating shaft 63. Apertures 64 and 65 are provided in each of the grate bars 18, 19, 20 and 21 for the purpose of securing any given number thereof into groups.

The lowermost grate bars 21 are of substantially the same construction as the intermediate bars 18, 19 and 20, except that each is provided with three vertically disposed fuel feeding faces 39', 39'', and 21a, and also with a downwardly extending bifurcated member 66 at the rearwardly disposed end thereof. Members 66 are adapted to receive rods 67 which are held in position by bolts 68 extending through apertures provided at the lower ends of the legs 69 and 70 of the said bifurcations 66. Each rod 67 is pivotally attached to the upper end of a link 71 which in turn is pivoted to the outer end of an arm 72 secured in any suitable manner to a shaft 73. Shaft 73 may be mounted in any suitable bearings 74 and 75 provided in side walls 6 and 7, respec-

tively. The left hand end of shaft 73 extends through side wall 7 and is secured in any suitable manner to a worm wheel 76 which engages a vertically disposed worm gear 77, which in turn may be actuated by any suitable means, such as by a hand crank 78 (Fig. 2). Worm gear 77 and worm wheel 76 may be enclosed within any suitable casing 79. As shown in Fig. 3, the lowermost grate bars 21 are divided into groups of four across the width of the furnace, each group being supported by a rod 67, and is actuated by a respective link 71 and arm 72.

Referring more particularly to Fig. 5, it will be seen that each supporting member 44 has provided at the right hand side thereof a pair of laterally extending ears 80 through which extend bolts 81. An angle 82 is provided to hold the outer end of each of the grate bars 18, 19, 20 and 21 in position. As shown in Fig. 5, the upper flange 83 of angle 82 engages the forwardly disposed offset portions 84 of the associated grate bars and the bolts 81 then are tightened. This effectively holds the forward end of each grate bar in position.

The supporting members 44 of grate bars 18, 19, 20 and 21 are operated respectively by shafts 85, 86, 87 and 63, respectively. Shaft 85 is mounted in any suitable bearings 88 and 89 provided in side walls 6 and 7, respectively, and has secured thereto a sprocket wheel 90 which is connected by a chain 91 to a sprocket wheel 92 secured to a drive shaft 93. Drive shaft 93 is mounted in any suitable bearings 94 and 94' provided in side walls 6 and 7. The left hand of shaft 93 extends through side wall 7 and has secured to the outer end thereof a sprocket wheel 95 which is connected by a chain 96 to a sprocket wheel 97 provided on the outer end of the drive shaft 98 of an electric motor 99. Thus, upon actuation of motor 99, a rotary motion is imparted to shaft 93, and consequently to shaft 85 which, through the cams 54, 55, 56 and 57 mounted thereon, imparts an oscillatory movement to the supporting members 44 and the grate bars 18 supported thereon. Shaft 86 is mounted in bearings 86' and 86'', provided in side walls 6 and 7, respectively, and also has secured thereto a sprocket wheel 100 which is connected by a chain 101 to a sprocket wheel 102 secured to shaft 93. Shaft 87 is mounted in bearings 87' and 87'', and also has a sprocket wheel 103 secured thereto which is connected to a third sprocket wheel 104 provided on shaft 93 by a chain 105. Shaft 63 is mounted in bearings 63' and 63'', and likewise has secured thereto a sprocket wheel 106 which is operatively connected to a fourth sprocket wheel 107 provided on shaft 93 by a chain 108. Accordingly, upon operation of motor 99, a rotary motion is imparted to shafts 85, 86, 87 and 63, and consequently an oscillatory movement is imparted to the grate bars 18, 19, 20 and 21 which results in agitation and feeding of the fuel supported thereon toward the discharge passage 5.

As shown in Fig. 1, rear wall 9 comprises a series of fluid conducting tubes 110, secured at their lower ends to a header 111 provided exteriorly of the lower portion 112 of rear wall 9. These tubes extend forwardly and upwardly, as shown at 113, and then vertically, as shown at 114, and may terminate in a boiler, not shown. Header 111 may also be operatively connected to the boiler. The passage 5, as shown in Fig. 1, is bounded at the lower end by grate bars 21, and at the upper end by the inclined portion 113 of tubes 110. The sides of the passage are bounded by the side walls 6 and 7 of the furnace. The depth of passage 5 may be varied by simply actuating grate bars 21 toward or from tubes 110. In the event that it should be desired to dump the ashes, grate bars 21 are actuated to their lowermost position of adjustment. The ashes supported on the grate bars 21 then gravitate into a pit 115 from which they may be removed from time to time by any suitable means.

The grate bars of each of the rows 17, 18, 19, 20 and 21 are spaced apart slightly to provide openings for draft air. These spaces may be varied from front to rear of the extension grate in order to permit sufficient quantities of air to enter the fuel bed to insure complete combustion of the fuel. The spacing of these grate bars may be effected by sliding them laterally on their respective supporting members 44, and then securing them in position by tightening bolts 81.

Figs. 8, 9 and 10 illustrate another embodiment of the present invention. This construction is generally similar to that just described, except that the individual extension grate bars of the extension grate or overfeed section 4' of the stoker 1' differ slightly in construction from those previously described. The operating mechanism also differs from that of the structure shown in Fig. 1.

As shown in Fig. 8, stoker 1' also consists of a series of alternately disposed retorts 2' and tuyère rows 3'. Fuel is fed to the stoker 1' from hoppers 10' by a series of rams 11' driven by any suitable power mechanism 12'. Pushers 13' provided in the bottom of each retort underfeed the fuel to the overfeed or extension grate section 4' which, in turn, feeds the refuse through the discharge opening 5' provided at the rear of the stoker. The pushers 13' of each retort have secured to the forwardly disposed ends thereof connecting rods 120 which are pivotally connected at their forward ends to a lever 121 pivoted intermediate its ends to the supporting framework 122, as shown at 123. The upper end of lever 121 is pivoted to the outer end of a link 124, the inner end of which being pivotally connected to a rod 125 provided centrally of ram 11'. Link 124 and lever 121 are pivotally connected to one end of a pitman 126, the opposite end of which being connected to the crank shaft 127 of operating mechanism 12'.

The lower end of lever 121 has pivotally connected thereto one end of a link 128, the opposite end of the latter of which is connected to the lower end of an arm 129 pivotally mounted on an operating shaft 130. Shaft 130 has provided therein a series of slots 131, each of which having provided therein a ball 132, as shown more particularly in Fig. 9. A spring 133 extending through the projecting portion 134 adjacent to each slot tends to hold the balls in the position shown in Fig. 9. Arm 129 has secured thereto a hub or sleeve 135 which surrounds the slotted portion of the shaft 130 and retains the balls 132 in position.

From the foregoing description, it is seen that when arm 129 is turned in a counter-clockwise direction (Fig. 9), the balls tend to move to the left toward the narrow portion of slots 131, thereby causing binding of the hub to shaft 130 and consequently the latter moves with arm 129. When arm 129 is actuated in a clockwise direction, the balls tend to move toward the enlarged portion of slots 131, thereby releasing the binding action and permitting arm 129 to move independently of shaft 130.

Shaft 130 has secured thereto four sprocket

wheels 136 similar to sprocket wheels 92, 104, 107 and 102 of the construction shown in Figs. 1 to 3, only one of which is shown. These sprocket wheels 136 are connected to sprocket wheels 137, 138, 139 and 140 by chains 141, 142, 143 and 144, respectively. Sprocket wheels 137, 138, 139 and 140 are mounted respectively on shafts 145, 146, 147 and 148, on which are respectively mounted cams 149, 150, 151 and 152.

Extension grate 4' also consists of five transverse rows of grate bars 17', 18', 19', 20' and 21'. Grate bars 17' are identical in construction to the grate bars 17 already described, and accordingly, a detailed description thereof need not be given. Grate bars 18', 19', 20' and 21' are substantially identical in construction and accordingly a detailed description of one will suffice for all. For the purpose of illustration, a detailed description of one of the grate bars 18' will now be given.

As shown more particularly in Figs. 8 and 10, each grate bar 18' comprises an elongated body portion 155 having an upper edge 156 which terminates in an offset portion 157 intermediate the ends providing a substantially vertical fuel feeding face 158. The sides 159 and 160 of body portion 155 are substantially parallel, the side 160 terminating at its upper end in a tapered portion 161 thereby providing a relatively narrow upper edge 156 to the fuel supported thereon. The forwardly disposed end 162 of each grate bar is provided with a depending bifurcated portion 163, the upper portion 164 of which being of arcuate construction and having substantially the same curvature as cam 149, and which in assembly rests upon said cam. The legs 165 and 166 extend slightly below the lower extremities of cam 149 and are provided with aligned apertures 167 for receiving retaining bolts 168 which hold the grate bars in position. The end of each grate bar 18' terminates in a vertically disposed fuel feeding portion 169.

From the foregoing description, it is seen that upon operation of the power means 12', by virtue of the clutch mechanism between arm 129 and shaft 130, a progressive movement is imparted to shaft 130 which through the chain and sprocket mechanisms connecting shaft 130 with shafts 145, 146, 147 and 148 oscillatory movement is imparted to the grate bars 18', 19', 20' and 21' of the extension grate or overfeed section 4'. In order to permit draft air to pass into the fuel bed, grate elements 18', 19', 20' and 21', may be spaced apart, the width of the spaces being governed by the quantity of air necessary to insure proper combustion of the fuel. Spacing washers 170, or any other suitable means, may be provided to properly space the grate bars.

Each of the lowermost grate bars 21' has provided at the lower end thereof a bifurcated portion 66' similar to the portion 66 of grate bars 21 for receiving rods 67' which are retained in position by bolts 68'. Rods 67' are, as previously described, attached to the upper end of links 71', the lower ends of which being connected to arms 72' secured to a shaft 73'. Shaft 73' is adjusted by mechanism similar to that shown in Figs. 2 and 3, or by any other suitable mechanism for the purpose of adjusting grate bars 21'. Each of the lower grate bars 21' in addition to vertical fuel feeding faces 158 and 169 has a third feeding face 158'.

Figs. 11 to 16 illustrate a further embodiment of the present invention. This construction comprises an extension grate 4'' which also consists of five rows of grate bars 17'', 18'', 19'', 20'' and 21''. Grate bars 17'' are similar in all respects to grate bars 17, previously described and accordingly a detailed description thereof will not be given.

Grate bars 18'', 19'', 20'' and 21'' are pivotally connected to the upper ends of levers 172, 173, 174 and 175, respectively, which levers are secured to shafts 176, 177, 178 and 179, respectively.

The grate bars of each row may be connected into groups, as shown in Fig. 15. One lever 172, 173, 174 or 175 is required for each group of grate bars in the respective rows, and therefore the number of such levers employed is governed by the number of groups of grate bars across the extension grate.

Shafts 176, 177, 178 and 179 have respectively secured thereto downwardly extending arms 180, 181, 182 and 183. To enable simultaneous operation of shafts 176 and 178 arms 180 and 182 are connected by a link 184, while to enable simultaneous operation of shafts 177 and 179 arms 181 and 183 are connected by a link 185. Shaft 179 also has secured thereto a downwardly extending arm 186, to the lower bifurcated end 187 of which is pivotally connected one end of a link 188. The opposite end of link 188 is connected to the lower bifurcated end 189 of a lever 190, which is pivoted at the upper end thereof to brackets 191 and 192. A rod 193 is operatively connected at one end thereof to lever 190 intermediate the ends of the latter. The other end of rod 193 may be connected to any suitable operating mechanism such as to a lever 121 shown in Fig. 8, which in turn may be connected to any suitable power mechanism. Shaft 178 has also secured thereto an arm 194 to the lower bifurcated end 195 of which is attached one end of a link 196. The other end of link 196 is pivotally connected to the lower bifurcated end 197 of a lever 198 pivoted intermediate its ends on a rod 199, supported at the opposite ends thereof in brackets 200 and 201. The upper end of lever 198 has secured thereto one end of an operating rod 202, the opposite end of which, like rod 193, may be connected to any suitable operating lever such as the operating lever 121 shown in Fig. 8, which in turn may be operatively connected to a driving mechanism, such as the power mechanism 12'. Thus upon actuation of rod 193, a rocking movement will be imparted to shaft 179, which in turn will cause an oscillating movement of the grate bars 21''. Shaft 177 by virtue of its connection with shaft 179 will be simultaneously operated causing a similar movement to be imparted to grate bars 19''. It is also seen that upon actuation of rod 202, an opposite movement will be imparted to shafts 178 and 176, casing an oscillatory movement to be imparted to grate bars 20'' and 18''. If rods 193 and 202 are operated simultaneously, and in the same direction, grates 18'' and 20'' will move in a direction opposite to that of grates 19'' and 21''.

The individual grate bars 18'', 19'', 20'' and 21'' are substantially identical in construction and accordingly a description of one will suffice for all. Accordingly, a description of grate bars 18'' will now be given.

As shown in Fig. 15, a group of six bars are provided; these bars may be secured together and operated as a group. Each grate bar 18'' comprises a relatively flat upper fuel supporting surface 205 having at the sides thereof a pair of downwardly extending flanges 206 and 207,

and at its rearwardly disposed end a vertical flange 208 which constitutes a fuel feeding surface. The forwardly disposed end of each bar 18'' is provided with a pair of downwardly extending ears 209 having aligned apertures 210 provided therein for receiving a pin 211, thereby enabling pivotal attachment of the bars 18'' to levers 172, and the connection of several grate bars into groups.

Each grate bar 21'' is provided with a bifurcated portion 66'' at the lower end thereof connected to a link 71'' which in turn is connected to an arm 72'' secured to a transverse shaft 73'', which is adjusted by a mechanism similar to that shown in Fig. 3, and previously described in detail herein.

The grate bars 17'', 18'', 19'', 20'' and 21'' may be spaced slightly apart to provide passages for draft air, the width of these spaces being determined by the quantity of air necessary to insure complete combustion of the fuel supported thereon. It is also seen that the number of grate bars connected into groups may differ from that illustrated in Fig. 15. By connecting the grate bars into groups fewer operating levers 172, 173, 174 and 175 are required. The groups may be connected by extending the pins 211 through the apertures 210 of the desired number of grate bars. The rearwardly disposed ends of the grate bars rest at all times upon the bars of the next lower row of the series.

From the foregoing description of the different embodiments of the present invention it is seen that effective and highly efficient constructions have been provided. The structures are such that the different rows of grate elements may operate in any desired predetermined sequential order. For example, it may be desired to have one row of grate elements move downwardly, while the adjacent rows move upwardly. This may be done by simply disengaging the driving connection between shaft 93 and one of the shafts 85, 86 and 87 or 63 of the construction in Fig. 1, and then adjusting the shaft to the desired position. The driving connection between that shaft and drive shaft 93 is then reestablished. Groups of grate bars in the same rows may operate differently by so arranging the cams. It is also seen that in the construction shown in Figs. 11 to 16 other of the rows than those connected by links 184 and 185 may be connected without departing from the invention. For example, the grate bars 18 and 21 may be connected for simultaneous movement, while bars 19 and 20 may also be connected for simultaneous movement.

It is therefore to be understood that it is not intended to limit the invention to the specific embodiments herein shown and described, but only by the scope of the claims which follow.

What is claimed is:

1. An overfeed section for stokers comprising a series of rows of grate bars, said rows of grate bars being disposed in substantially parallel relation longitudinally of said overfeed section, the grate bars of each of said rows being mounted in spaced relation forming a series of passages for draft air, means for pivotally supporting the grate bars of one of said rows, cams for supporting the grate bars of said other rows, means for operatively connecting said cams to said grate bars, and means for operating said cams whereby oscillatory movements are imparted to said rows of grate bars.

2. An overfeed section for stokers comprising a series of rows of grate bars, said rows of grate bars being disposed in substantially parallel relation longitudinally of said overfeed section, the grate bars of each of said rows being mounted in spaced relation forming a series of passages for draft air, means for pivotally supporting the grate bars of one of said rows, cams for supporting the grate bars of said other rows, means for operatively connecting said cams to said grate bars, means for operating said cams whereby oscillatory movements are imparted to said rows of grate bars, and means for vertically adjusting the grate bars of one of said rows.

3. An overfeed section for stokers comprising a series of rows of grate bars, said rows of grate bars being disposed in substantially parallel relation, the grate bars of each of said rows being mounted in spaced relation forming a series of passages for draft air, each of said grate bars having a bifurcated portion provided at one end thereof, cam means adapted to engage the said bifurcated portions, means for retaining said cam means in engagement with said bifurcated portions whereby upon operation of said cam means orbital movements are imparted to said rows of grate bars, means operatively connecting said cam means for simultaneous movement, and operating means for said cam means.

4. An overfeed section for stoker furnaces comprising a series of rows of grate bars disposed in substantially parallel relation longitudinally of said overfeed section, each of said rows of grate bars extending from the rearmost of said rows being disposed in overlapping relation, a shaft adjacent each of said rows, cam means secured to each of said shafts, cam followers operatively connected to said cam means, means for detachably securing said grate bars to said cam followers, and operating means for said cam means.

5. An overfeed section for stoker furnaces comprising a series of rows of grate bars disposed in substantially parallel relation longitudinally of said overfeed section, said rows of grate bars being disposed in overlapping relation, supporting means for each of said rows of grate bars including cam means, means operatively connecting said grate bars to said cam means whereby upon operation of the latter orbital movements will be imparted to said rows of grate bars, and operating means for said cam means.

6. An overfeed section for stoker furnaces comprising a series of rows of grate bars disposed in substantially parallel relation longitudinally of said overfeed section, said rows of grate bars being disposed in overlapping relation, supporting means for each of said rows of grate bars including cam means, means operatively connecting said grate bars to said cam means whereby upon operation of the latter orbital movements will be imparted to said rows of grate bars, operating means for said cam means, means operatively connecting said cam means for simultaneous movement, and power means for actuating said cam means.

7. An overfeed section for stoker furnaces comprising a series of rows of grate bars disposed in overlapping relation, a shaft disposed beneath each of said rows of grate bars, cam means of substantially arcuate construction secured to each of said shafts, cam followers operatively connected to each of said cam means, each of said cam followers comprising an elongated body por-

tion having a substantially arcuate upper surface adapted to support said grate bars, means extending outwardly from the forwardly and rearwardly disposed sides of said body portion adapted to engage locking means operatively connected to said grate bars to hold the latter in operative position, and a series of spaced bifurcations depending from said body portion, each of said bifurcations having a rounded upper surface adapted to engage said cam means whereby upon operation of said cam means, said cam followers are actuated in orbital paths to effect vertical as well as longitudinal movements of said rows of grate bars.

8. A cam follower comprising an elongated body portion having a substantially arcuate upper surface, means extending outwardly from the forwardly and rearwardly disposed sides of said body portion adapted to be engaged by locking means for grate bars, and a series of spaced bifurcations depending from said body portion adapted to receive cam means.

9. A cam follower comprising an elongated body portion having a substantially arcuate upper surface, means extending outwardly from the forwardly and rearwardly disposed sides of said body portion adapted to be engaged by locking means for grate bars, a series of spaced bifurcations depending from said body portions adapted to receive cam means, and the legs of certain said bifurcations being longer than those of the others and having apertures provided at the lower ends thereof adapted to receive means for retaining the said cam follower in engagement with the cam means.

10. An overfeed grate construction for stokers comprising a series of rows of grate bars, said rows of grate bars being disposed in substantially parallel relation longitudinally of said overfeed section, cam means for each of said rows of grate bars, means operatively connecting said rows of grate bars to said cam means whereby upon operation of the latter orbital movements are imparted thereto, means operatively connecting said cam means for simultaneous movement, and operating means for said cam means.

11. An overfeed grate construction for stoker furnaces comprising a series of rows of grate bars, said rows of grate bars being disposed in substantially parallel relation longitudinally of said grate construction, each of the said rows of grate bars extending from the rearmost row of said series being disposed in overlapping relation with an adjacent row of grate bars, cam means for each of said rows of grate bars, means operatively connecting said rows of grate bars to their respective cam means whereby upon operation of the latter orbital movements are imparted thereto, means operatively connecting said cam means for simultaneous movement, and operating means for said cam means.

12. An overfeed grate construction for stoker furnaces comprising a series of rows of grate bars, said rows of grate bars being disposed in substantially parallel relation longitudinally of said grate construction, each of the said rows of grate bars extending from the rearmost row of said series being disposed in overlapping relation with an adjacent row of grate bars, cam means for each of said rows of grate bars, means operatively connecting said rows of grate bars to their respective cam means whereby upon operation of the latter orbital movements are imparted thereto, means operatively connecting said cam means for simultaneous movement, operating means for said cam means, and means for vertically adjusting one end of the grate bars of said rearmost row to vary the effectiveness thereof.

13. An overfeed grate construction for stoker furnaces comprising a series of rows of grate bars, said rows of grate bars being disposed in substantially parallel relation longitudinally of said grate construction, each of the said rows of grate bars extending from the rearmost row of said series being disposed in overlapping relation with an adjacent row of grate bars, cam means for each of said rows of grate bars, means operatively connecting said rows of grate bars to their respective cam means whereby upon operation of the latter orbital movements are imparted thereto, means operatively connecting said cam means for simultaneous movement, operating means for said cam means, an additional row of grate bars disposed adjacent to and arranged in overlapping relation with the foremost of said rows of grate bars of said series, and means for pivotally supporting said additional row of grate bars.

14. An overfeed section for stoker furnaces comprising a series of rows of grate bars disposed in overlapping relation, a shaft associated with each of said rows of grate bars, cam means secured to said shafts, cam followers mounted on said cam means, each of said cam followers comprising an elongated body portion having a substantially arcuate upper surface adapted to support a number of grate bars, means extending from the sides of the said body portion disposed toward the front and rear of said overfeed section adapted to engage locking means operatively connected to said grate bars for retaining the latter in operative position, and a series of spaced bifurcated portions depending from said body portions, each of said bifurcated portions having a rounded upper surface adapted to engage an associated cam means, operating mechanism for said cam means whereby upon operation of the latter said cam followers are actuated in orbital paths thereby effecting vertical as well as longitudinal movements of said rows of grate bars, and means for vertically adjusting the grate bars of the rearmost of said rows to vary the effectiveness thereof.

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