

May 10, 1938.

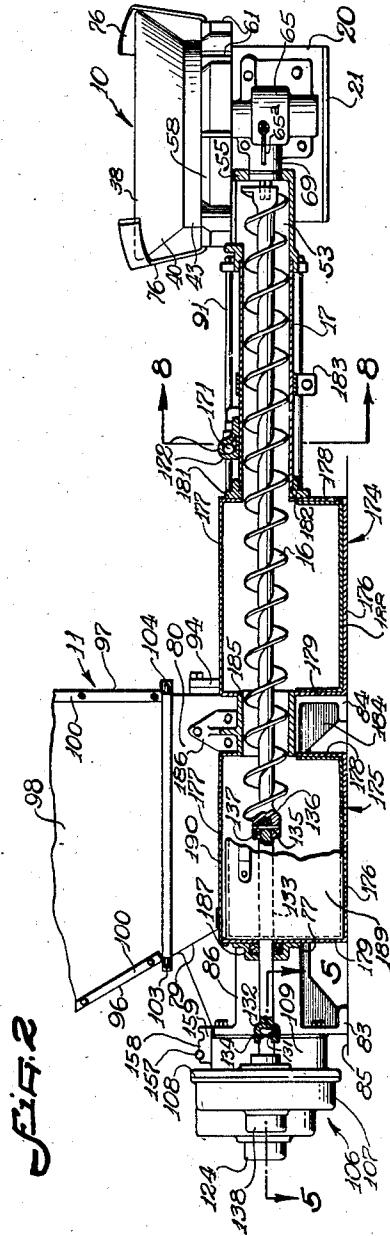
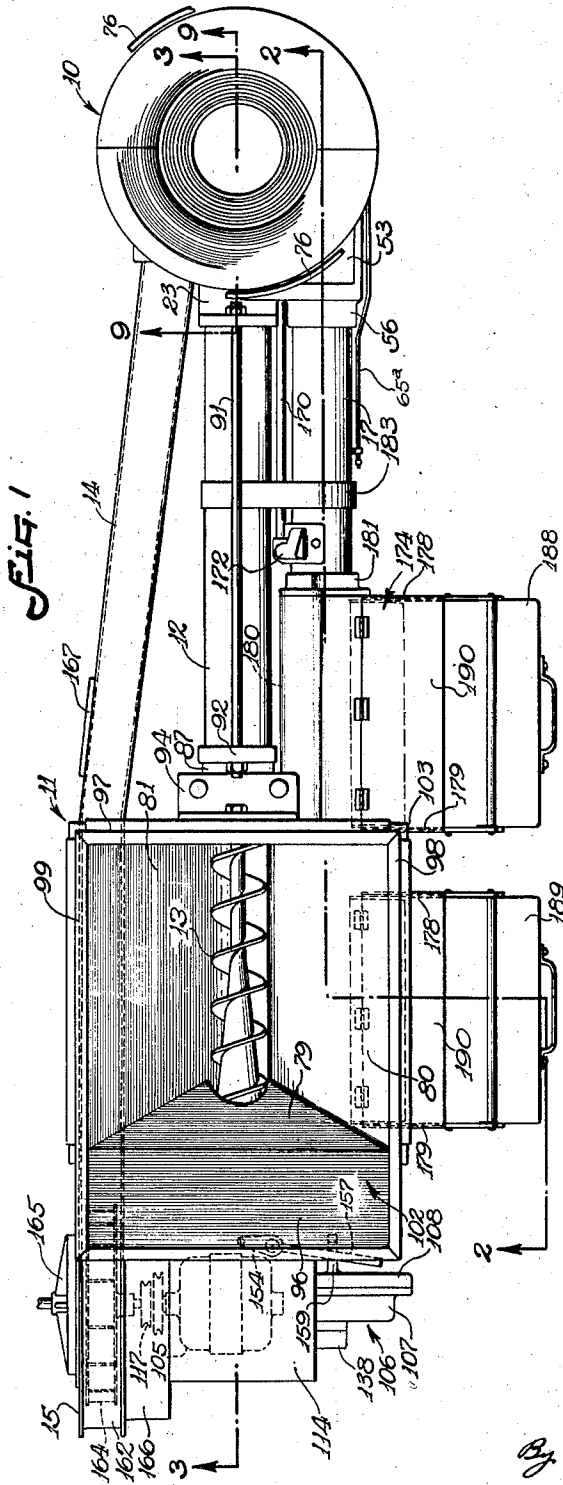
J. H. WALTER

2,116,774

MECHANICAL STOKER

Filed Nov. 25, 1932

5 Sheets-Sheet 1



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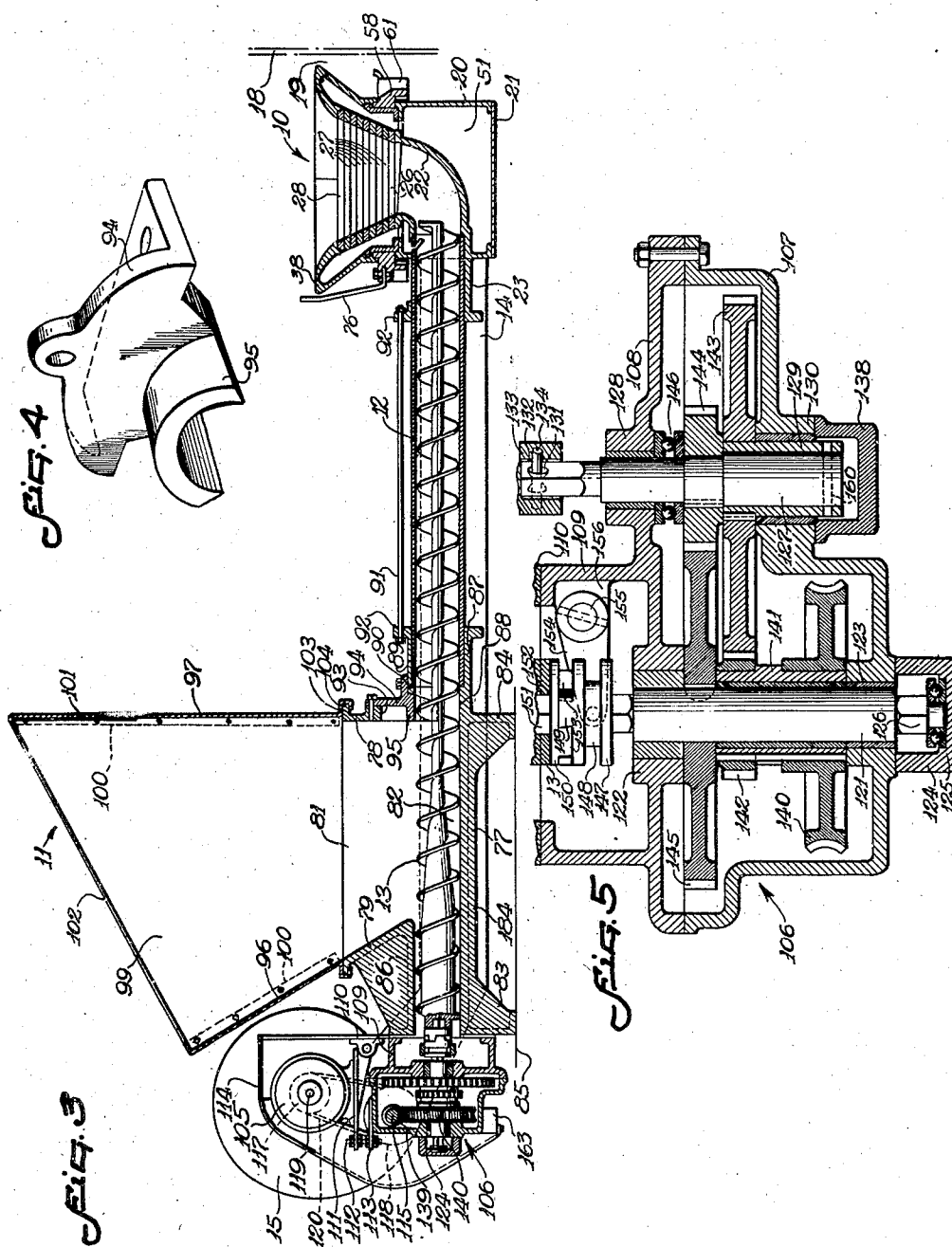
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Fig. 6

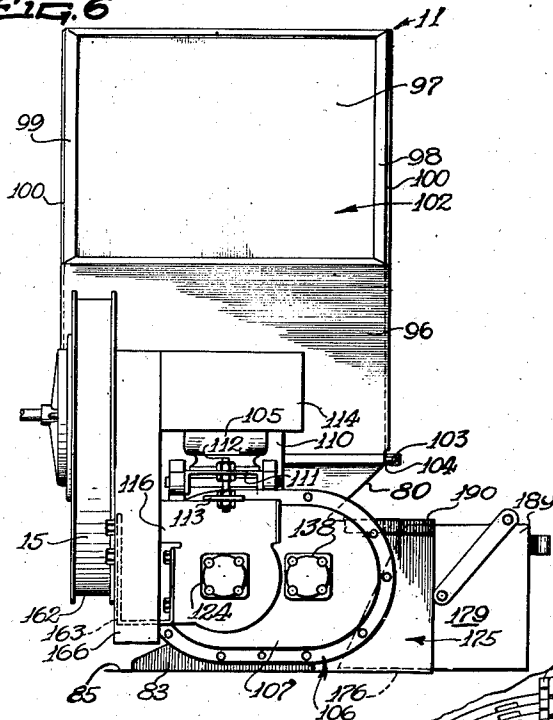


Fig. 7

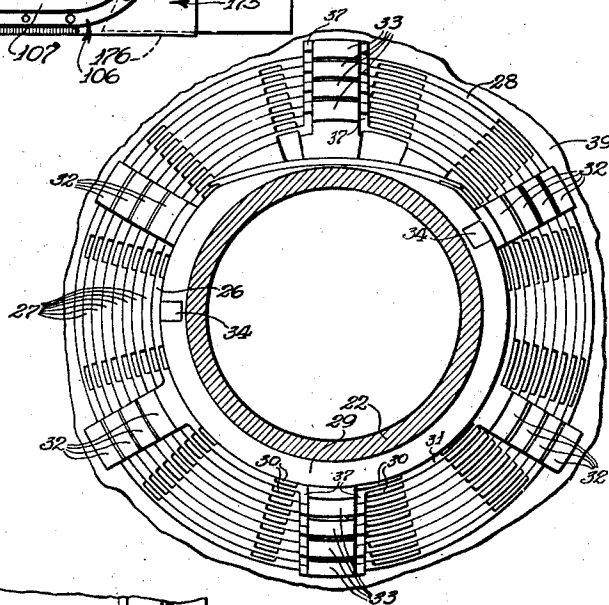
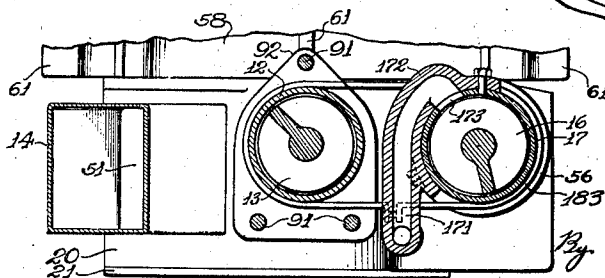


Fig. 8



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Fig. 9

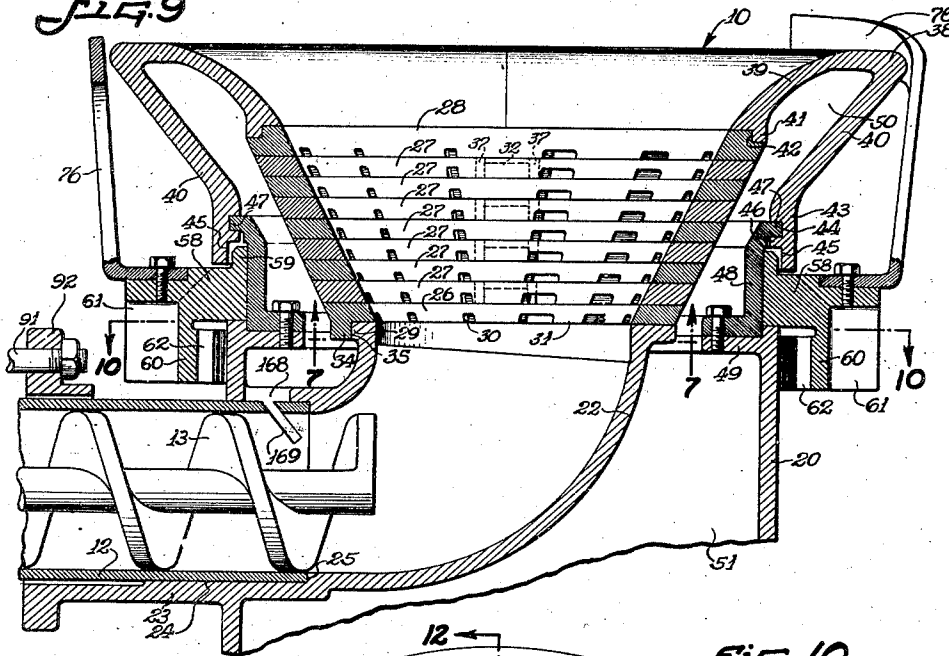
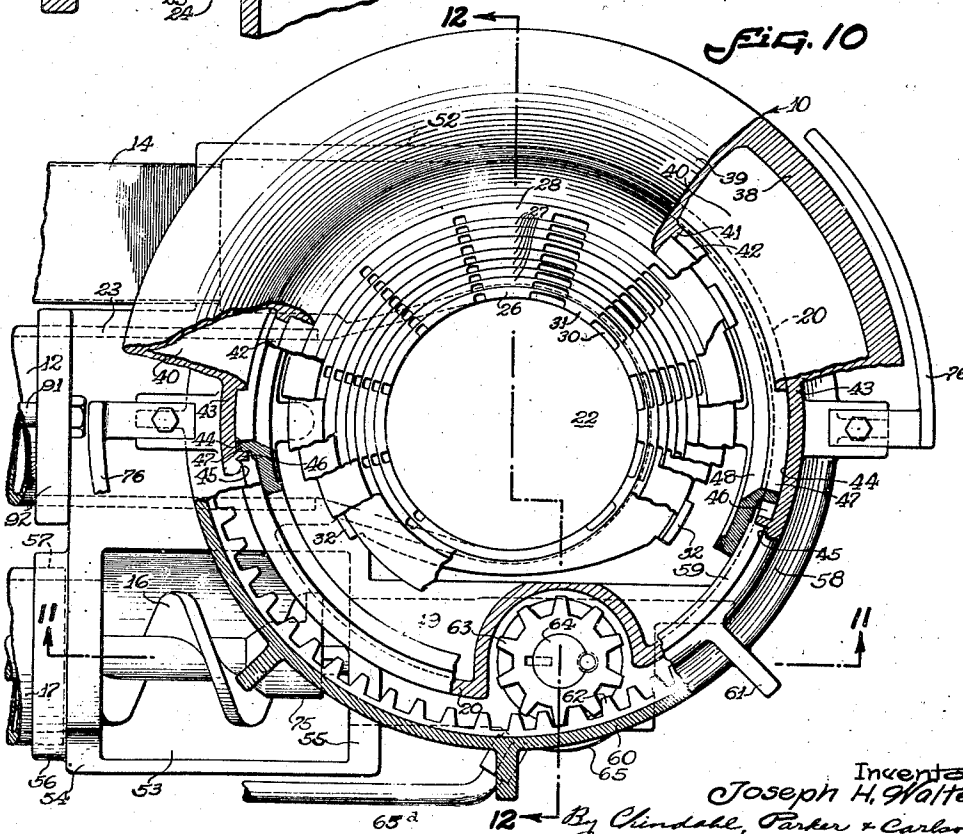


Fig. 10



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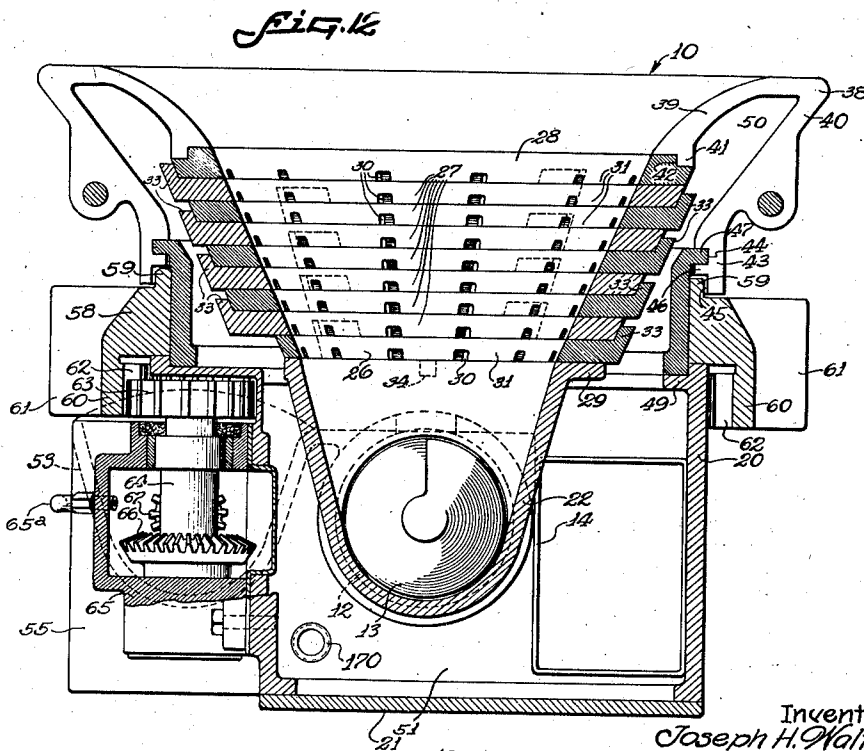
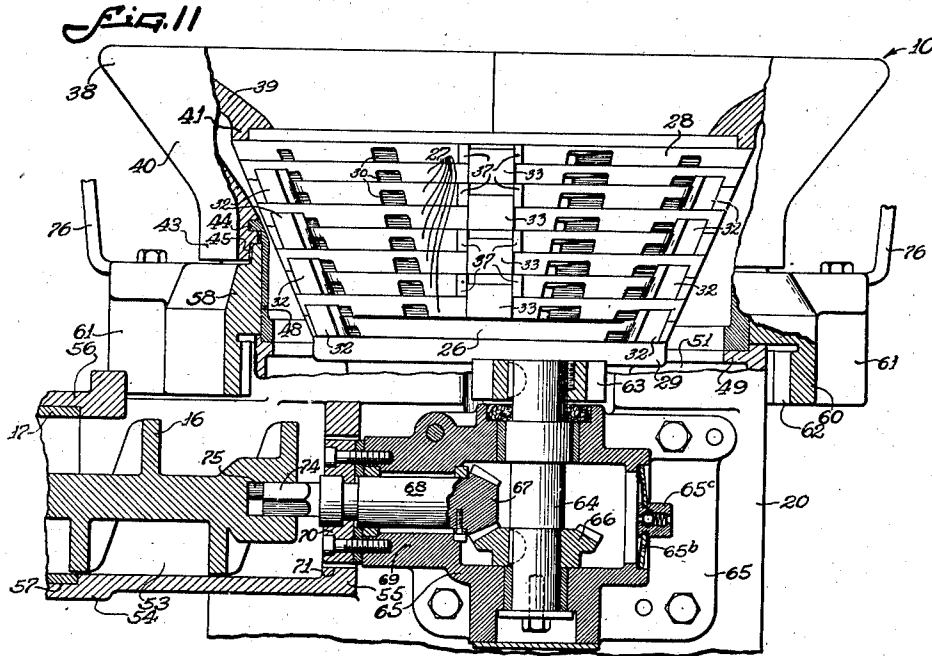
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,116,774

MECHANICAL STOKER

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by mesne assignments to The Steel Products
Engineering Company, Springfield, Ohio, a cor-
poration of Ohio

Application November 25, 1932, Serial No. 644,247

1 Claim. (Cl. 110—45)

The present invention relates to improvements in mechanical stokers.

One of the important objects of the invention is to provide a new and improved mechanical stoker of the underfeed type having a burner retort in which air under pressure is supplied in such a manner that the unburned fuel in the bed is evenly distributed.

A more specific object is to provide a novel mechanical stoker of the underfeed type having a burner retort with air and fuel supply ducts opening to one side and with air inlet openings relatively small in size and in aggregate area in the side located adjacent the ducts and relatively large in size and in aggregate area in the side located remotely of the ducts, whereby increased combustion tends to occur in the region of the last mentioned openings to compensate for any excess distribution of fuel otherwise tending to occur.

Further objects and advantages will become apparent as the description proceeds.

In the accompanying drawings,

Figure 1 is a plan view of a stoker embodying the features of the invention.

Fig. 2 is a longitudinal vertical sectional view taken substantially along line 2—2 of Fig. 1.

Fig. 3 is a longitudinal vertical sectional view taken substantially along line 3—3 of Fig. 1.

Fig. 4 is a perspective view of a shear plate forming a closure for the hopper base.

Fig. 5 is a horizontal sectional view of the transmission in the stoker drive taken along line 5—5 of Fig. 2.

Fig. 6 is a left end elevational view of the stoker.

Fig. 7 is a fragmentary horizontal sectional view looking upwardly along line 7—7 of Fig. 9.

Fig. 8 is a fragmentary detail sectional view taken substantially along line 8—8 of Fig. 2.

Fig. 9 is a vertical sectional view of the burner retort taken along line 9—9 of Fig. 1.

Fig. 10 is a fragmentary plan view of the retort partially broken away and sectioned along line 10—10 of Fig. 9.

Fig. 11 is a vertical sectional view taken along line 11—11 of Fig. 10.

Fig. 12 is a transverse vertical sectional view taken along line 12—12 of Fig. 10.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form dis-

closed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, the specific stoker selected for illustration of the invention is of the underfeed type, and comprises in general a burner retort 10 opening upwardly and adapted to be suitably located in a combustion chamber (not shown), a vertical hopper 11 mounted externally of the combustion chamber and adapted to be supplied with the fuel to be burned, a fuel passage preferably in the form of a cylindrical duct 12 connecting the base of the hopper to the underside of the retort, and power-driven fuel feeding means, preferably in the form of a rotary screw conveyor 13, for advancing the fuel from the hopper through the duct into the retort as required. Air of combustion under pressure is adapted to be supplied to the retort 10 through a conduit 14 from any suitable source, such for example as a power-driven centrifugal blower 15. Ashes and other residual matter of combustion from the retort 10 are adapted to be removed automatically as quickly as produced by means of a power-driven ash remover, preferably in the form of a rotary screw conveyor 16 operating in a conveyor duct 17.

While in some aspects of the invention the burner retort 10 (see Figs. 9 to 12) may be provided in any desired form, preferably it is generally circular in shape, and adapted to be mounted in a combustion chamber of similar shape (not shown in detail, but represented diagrammatically in Fig. 3 by the wall 18). The periphery of the retort 10 is separated from the wall 18 to provide an annular space 19 which constitutes a pit adapted to receive ashes and any other residual products of combustion overflowing from the top.

In its preferred form, the retort 10 comprises a hollow generally cylindrical base wall 20 closed at the bottom by a cover plate 21. An upwardly opening fuel chamber 22 is located within the wall 20, and has a circular outlet coaxial with and in the same plane as the upper edge of the wall. The fuel chamber 22 converges in size and curves downwardly and laterally and is integral with the inner end of a horizontal sleeve 23 formed with and opening through one side of the base wall 20. The sleeve 23 is formed inwardly from its outer end with a counterbore 24 terminating in a square annular shoulder 25 inside of the wall 20, and is adapted snugly to receive the discharge end of the fuel duct 12 with the lat-

ter secured tightly against the shoulder. The fuel conveyor 13 terminates in the horizontal inlet of the chamber 22, and in operation causes the entering fuel as fed to force the bed of fuel in the chamber gradually upwardly.

Mounted on the fuel chamber 22 is a tuyère structure, the interior of which constitutes an upward continuation of the fuel chamber 22. The tuyère structure comprises a bottom tuyère ring 26, a plurality of intermediate tuyère rings 27 nested on the bottom ring, and a top tuyère ring 28 resting on the uppermost of the intermediate rings, the rings being of gradually increasing diameter upwardly. Preferably, the rings 26, 27 and 28 are flat in form, with the bottom ring 26 resting squarely on an outer marginal flange 29 on the upper end of the fuel chamber 22, and with each of the other rings 27 and 28 resting respectively upon the ring next below.

A plurality of spaced radial slots 30 defining intervening seating pads 31 are formed in the underside of each of the rings 26, 27 and 28, and preferably each has vertical radial sides and a root surface flared upwardly at both ends so as to define air inlet passages of varying cross-section when the rings are in nested relation. The slots 30 may be of any suitable width and spaced in any desired manner. In the present instance, the slots 30 in each ring are relatively small but equal in width in the half located forwardly or adjacent the duct 12, and relatively large but equal in width in the half located rearwardly or remotely of the duct, and are arranged in uniformly angular spaced relation about the periphery. I have found that by this difference in size of the port areas of the slots 30, a superior fuel bed is obtained in that the unburned fuel is evenly distributed, by reason of the fact that the increased combustion at the rear due to the presence of more air compensates for any excess distribution otherwise tending to occur. Preferably, all of the rings 26 to 28 are provided with slots 30 having the same angular spacing, and with the widths of the pads 31 increasing progressively upwardly so that the corresponding slots of the respective rings are of equal widths, and are nested in such a manner that the slots and pads are located in generally vertical tiers.

Each of the tuyère rings 26 and 27 is formed with a plurality of peripherally spaced upstanding lugs on the outer edge which snugly receive and center the tuyère ring next above. In the present instance, three uniformly spaced lugs 32, 32 and 33 are provided, with the intermediate lugs 33 of successive rings being located alternately at diametrically opposed points. The bottom ring 26 has two spaced depending lugs 34 extending into notches 35 formed in the flange 29. Formed on each of the rings 27 and 28 between the lugs 32 and diametrically opposite the lug 33, and adapted to interfit with the lug 33 of the ring 26 or 27 immediately underneath so as to lock all of the rings against rotation are two closely spaced laterally extending lugs 37.

Mounted on the upper tuyère ring 28 is a hollow tuyère back 38 having inner and outer walls 39 and 40. Preferably, the tuyère back 38 is split into two ring sections which are bolted together when assembled. The inner wall 39 has a peripheral flange 41 fitting into an annular groove 42 in the outer periphery of the ring 28, and flares sharply, upwardly and outwardly, toward the furnace wall 18. The outer wall 40 extends substantially below the wall 39, and converges uniformly toward its lower end 43 which is cylindrical in form. Two inner peripheral grooves 44 and 45, defining an annular inner rib 46, are formed in the end 43 of the wall 40. The groove 44 receives an outer peripheral flange 47 on the upper end of a base ring 48 which is mounted on and bolted to an inwardly extending annular flange 49 on the upper edge of the base wall 20.

The tuyère structure defines an annular air space 50 for supplying air under pressure through the inlet passages 30 into the fuel chamber 22. The bottom of the annular space 50 opens between the flanges 29 and 49 into a large plenum chamber 51 defined by the base wall 20. One side of the wall 20 is formed with a tangentially extending duct 52 alongside the sleeve 23, and in communication at its inner end with the plenum chamber 51. The duct 52 is preferably rectangular in form, and is connected to the discharge end of the air supply conduit 14.

Ashes and other residual matter of combustion 20 are forced outwardly over the edge of the tuyère back 38 into the ash pit 19 between the retort 10 and the furnace wall 18. To provide means for automatically removing the ashes, the side of the sleeve 23 opposite the duct 52, and the base wall 20 are formed integral with an upwardly opening ash collecting chamber 53, preferably in the form of a trough having front and rear end walls 54 and 55. The front end wall 54 has an outwardly extending sleeve 56 with a counterbore 57 receiving the inlet end of the ash duct 17. The receiving end of the ash conveyor 16 extends from the duct 17 into the trough 53, and the base of the latter conforms generally to the cylindrical contour of the conveyor.

To direct the ashes into the trough 53, an ash ring 58 is mounted on the upper edge of the wall 20 for rotation about the base ring 48. While the ring 58 has a fairly close fit with the base ring 48, it can be turned with very little power since the rest of the retort is stationary, and since in the event of any temperature increase the tolerance is correspondingly increased through expansion. The ash ring 58 has an annular flange 59 along its inner periphery extending upwardly into the groove 45 into overlapping relation with the lower end of the wall 40 of the tuyère back 38, and a second annular flange 60 at its outer periphery depending about the base wall 20 so as to guard the bearing surfaces against the entry of ashes or other foreign matter. Formed on the outer periphery of the ring 58 are a plurality of uniformly spaced radial vanes 61 for moving ashes collecting about the retort 10 into the trough 53.

The ash ring 58 may be driven by any suitable means, and in the present instance is adapted to be driven continuously in one direction from the ash conveyor 16. Thus, the flange 60 is formed with an internal gear 62 which is constantly in mesh with a pinion 63 fixed on the upper end of a shaft 64. This shaft 64 is journaled in a transmission casing 65 (see Figs. 11 and 12) bolted to one side of the base wall 20 which together with the bottom tuyère ring 26 is flattened to locate the pinion 63 inside the ash ring 58. Fixed on the shaft 64 is a bevel gear 66 which meshes with a bevel gear 67 integral with a shaft 68 extending through a bearing sleeve 69 on one end of the casing 65. A packing collar 70 secured to the end of the sleeve 69 prevents the entry of foreign matter along the shaft 68 into the casing 65, and is located in an opening 71 in the rear end wall 55 of the trough 53. The shaft 68 has a square end 74 fitting in and

having a driving connection with a socket 75 in the end of the ash conveyor 16.

The casing 65 is fully sealed at all points against the entry of foreign matter, and may be filled with a suitable lubricant through a supply tube 65^a normally extending to the exterior of the furnace. One wall of the casing 65 comprises a circular disk 65^b which is provided with a pressure relief valve 65^c for preventing overloading with the lubricant or grease.

Means is provided for breaking off clinkers at the edge of the retort 10 without spilling unburned coal into the ash pit 19. This means comprises two sweep arms 76 which are mounted in diametrically opposed relation on the ash ring 58 for rotary movement therewith, and which extend upwardly almost to the edge of the tuyere back 38 and then rearwardly relatively to the direction of rotation and upwardly at a slight angle to above the retort 10. While two sweep arms 76 are shown, it will be understood that only one may be used if desired. The arms 76 thus act to break off the clinkers by lifting them, thereby returning unburned coal into the fire pot instead of cascading same into the ash pit 19.

The fuel hopper 11 (see Figs. 1 to 3) comprises a base 77 having a vertical rear wall 78, an inclined forward wall 79, and oppositely inclined side walls 80 and 81 defining an upwardly opening generally V-shaped trough 82. Two depending brackets 83 and 84, on opposite ends of the base 77, rest on a foundation 85 to support the hopper 11 and its attachments. The front bracket 83 is integral with and extends forwardly of the front wall 79, and is formed with an elongated cylindrical bearing 86 in alignment with the apex of the trough 82. An external horizontal sleeve 87 formed on the rear wall 78 and to which the fuel duct 12 is connected defines an outlet opening 88 also in alignment with the trough 82. The fuel conveyor 13 extends along the hopper trough 82 through the outlet opening 88 into the duct 12, and the apex of the trough conforms generally to the cylindrical contour of the conveyor vane. The forward end of the conveyor 13 extends into and is guided and supported in the bearing 86.

To secure the hopper base 77 in rigid assembly with the retort 10, the fuel duct 12 extends at its inlet end into a counterbore 89 against a peripheral end shoulder 90 in the sleeve 87, and is clamped between the shoulders 25 and 90 by means of three peripherally spaced tie rods 91 engaging with ears 92 on the ends of the sleeves 23 and 87.

To afford convenient and ready access to the interior of the hopper base 77 where the conveyor 13 enters the outlet opening 88, an opening 93 is formed partly in the top of the sleeve 87 and partly in the wall 78 at the juncture. That part of the opening 93 in the wall 78 may be viewed as an enlargement of the outlet opening 88. An angular plate 94 is removably secured against the wall 78 and the top of the sleeve 87 to close the opening 93, and preferably has an inward projection 95 to preserve the cylindrical contour of the outlet opening 88 and to define an upper shearing edge coacting with the vane of the conveyor 13. It will be evident that any obstructions coming between the shearing edge and the conveyor vane and tending to stall the conveyor can quickly be removed through the opening 93 without emptying the hopper.

The superstructure of the hopper 11 comprises an outwardly inclined front wall 96, a vertical rear wall 97 extending substantially above the

front wall, and vertical sides 98 and 99 with upper inclined edges. While the hopper walls may be joined in any suitable manner, preferably, the front and rear walls 96 and 97 have vertical side flanges 100 overlying the side walls 98 and 99, and the latter have side flanges 101 in the upper portion of their rear edges engaging the inside of the rear wall. The top of the hopper 11 constitutes the supply opening 102, and is inclined, with one edge lower as at the front wall 96, for the convenience of the attendant in throwing in the fuel.

Stokers are installed under widely varying conditions. In some instances, it might be extremely inconvenient to charge fuel into the hopper 11 from the front end of the stoker. One of the features of the invention therefore resides in so constructing the hopper 11 that in assembling the upper portion with the base 77, the top opening 102 and particularly the lower edge thereof may be orientated to best adapt it to the installation for which the stoker is intended.

Thus, the top of the hopper base 77 is square in shape so that the upper portion of the hopper may be orientated thereon as desired in any one of four different positions. The upper edge of the base 77 is formed on all sides with a marginal external flange 103. Each of the upper walls 96 to 99 of the hopper 11 is formed along its lower edge with an inwardly facing groove 104 adapted to receive the contiguous section of the flange 103. Preferably, the groove 104 is defined by striking the lower marginal portion of each wall first outwardly, then downwardly and then inwardly. In assembling the hopper 11, three of the upper walls, namely the walls 97, 98 and 99, are joined together into an integral structure, and are then positioned on the base 77 by sliding the grooves 104 of the two extreme walls 98 and 99 longitudinally onto two spaced sections of the flange 103 until the intermediate section of the flange interfits with the groove of the intermediate wall 97. Then, the remaining wall, namely the wall 96, is secured to the walls 98 and 99, with its groove 104 receiving the remaining section of the flange 103. The hopper top may thus be located in any one of four different positions. In the position shown, the lowest wall 96 constitutes a straight continuation of the inclined base wall 79.

The fuel and ash conveyors 13 and 16 are adapted to be driven from a common source of power, such as an electric motor 105, through a transmission mechanism 106. In its preferred form, the mechanism 106 comprises a closed casing 107 having a removable rear cover section 108. As a means of support, the cover section 108 is provided externally with a generally circular flange 109 which constitutes a clutch housing, and which is removably mounted at its outer peripheral margin on the supporting bracket 83 coaxially with the fuel conveyor 13 and bearing 86. A mounting plate 110 is interposed between the flange 109 and the bracket 83, and the parts are securely bolted together.

The mounting plate 110 extends substantially above the casing 107, and constitutes a primary support for the motor 105. Thus, the motor 105 is mounted directly on a horizontal supporting base plate 111, of which one end is pivotally secured to the plate 110, and the other end is connected through a depending adjusting screw 112 with an ear 113 on the top of the casing 107. A cover 114 for the motor 105 is mounted on the plate 110. It will be evident that through angu-

lar adjustment of the plate 111, the motor 105 can be located accurately in position to place the proper tension on the drive belt.

The transmission mechanism 106 comprises a power inlet shaft 115 which extends through and is journaled in a tubular enlargement 116 on the front of the casing 107. One end of the shaft 115 extends externally of the casing 107 for operative connection to the motor 105. In the present instance, two sheaves 117 and 118, each with two V-grooves of different diameters, are secured respectively to the motor shaft 119 and the shaft 115, and are connected by a V-belt 120 with side driving surfaces and interchangeably related to one or the other of the sets of aligned grooves to provide two selective speeds.

An outlet or driven shaft 121 (see Fig. 5) extends below and transversely of the inlet shaft 115 through the casing 107. Of the shaft 121, the rear end is rotatably journaled in a bearing 122 in the rear cover section 108, and extends to the exterior for operative connection with the fuel conveyor 13, and the front end is journaled in a bearing 123 in the front wall of the casing 107. The front end of the shaft 121 normally is enclosed in a cap 124 removably secured to the front of the casing 107, and engages an end thrust bearing 125 disposed against the front wall of the cap. Upon removal of the cap 124, a hand tool (not shown) may be applied to a squared section 126 of the exposed end of the shaft 121 to turn it and the fuel conveyor 13 manually as may be necessitated on occasion.

A second outlet or driven shaft 127 parallel to the shaft 121 extends through the casing 107. Of the shaft 127, the rear end is journaled in a bearing 128 in the cover section 108, and extends to the exterior thereof for operative connection with the ash conveyor 16, and the front end extends through and has a driving connection with a sleeve 129 journaled in a bearing 130 in the front wall of the casing 107. The rear end of the outlet shaft 127 is formed with a transverse bore 131, and extends into a socket 132 in one end of an extension shaft 133, wherein it is secured for a driving connection by means of a pin 134 extending loosely through the bore. Similarly, the other end of the extension shaft 133 has a transverse bore 135, and extends into a socket 136 in the forward end of the shaft of the ash conveyor 16 to which it is operatively connected by means of a pin 137 extending loosely through the bore. The front end of the shaft 127 and sleeve 129 assembly also extends to the exterior of the casing 107, but normally is enclosed by a removable cap 138.

Rigid with the inlet shaft 115 is a worm 139 which meshes with a worm wheel 140 keyed to an elongated sleeve 141 rotatable on the outlet shaft 121. A gear 142 also keyed to the sleeve 141 meshes with a gear 143 keyed to the sleeve 129, thus completing the drive connection from the inlet shaft 115 to the outlet shaft 127. The gearing just described affords two substantial speed reductions. Preferably the outlet shaft 127 also constitutes a countershaft in the drive for the outlet shaft 121. To this end, a small gear 144 keyed to the shaft 127 meshes with a relatively larger gear 145 keyed to the shaft 121. An anti-friction bearing 146 is interposed between the cover section 108 and the gear 144 to take the end thrust of the shaft 127.

To provide means for connecting the shaft 121 to the fuel conveyor 13, a clutch sleeve 147 in the housing 109 is non-rotatably splined for axial

movement on the rear end of the shaft 121, and is formed with a peripheral groove 148 and with two diametrically opposed clutch dogs or elements 149 on its rear face. A coupling 150 having a square end 151 in driving engagement in a socket 152 on the forward end of the fuel conveyor 13, is provided on its forward end with two diametrically opposed clutch dogs or elements 153 adapted to coact with the elements 149. The side faces of the coacting elements 149 and 153 are undercut as shown so that the rotative force will tend to hold the elements tightly in engagement when in use. It will be evident that upon engagement of the clutch elements 149 and 153, the drive connection from the inlet shaft 115 to the outlet shaft 121 will be completed.

The means for actuating the clutch sleeve 147 comprises a yoke 154 fixed to a vertical rock shaft 155 rotatably mounted in spaced lugs 156 in the housing 109, and operatively engaging in the groove 148. A hand lever 157 is pivotally secured to the upper end of the shaft 155, and is adapted to rock the shaft selectively to engage or disengage the clutch elements 149 and 153. The free end of the lever 157 is adapted to be pivotally lowered to one side or the other of a lug 158 on a horizontal plate 159 integral with the cover section 108 so as to lock the clutch sleeve 147 in either position of adjustment.

By reason of the gear reduction between the outlet shaft 127 and the shaft 121, the ash conveyor 16 is always driven at a greater speed than the coal conveyor 13. Hence, the immediate and complete removal of ashes without any likelihood of clogging and regardless of the rate of fuel supply is assured. Upon opening the clutch 149, 153 in the drive for the fuel conveyor 13, the ash conveyor 16 and the blower 15 still can be driven to complete combustion of the fuel in the retort 10 even though the supply of additional fuel is discontinued.

Preferably, the drive connection between the sleeve 129 and the shaft 127 is automatically separable upon the application of an excessive force. In the present instance, this connection is shown as a shear pin 160. Since both conveyors 13 and 16 are driven from the shaft 127, it will be evident that the single shear pin 160 serves to protect the gear transmission mechanism 106 and also the motor 105 in the event that either or both of the fuel and ash conveyors become obstructed.

The blower 15, which constitutes the source of air under pressure for supporting combustion, is not disclosed in detail since per se it forms no part of the invention, and generally comprises a housing 162 which is mounted on a bracket 163 bolted to one end of the transmission casing 107, a rotor 164 driven directly from the shaft of the motor 105, and a damper 165 adjustable to vary the supply of air. A suitable blower is shown in the patent to May No. 1,834,959. A suitable guard 166 for the drives from the motor 105 to the transmission 106 and the rotor 164 is mounted on one side of the housing 162. The air conduit 14 (see Fig. 1) opens tangentially from the lower portion of the housing 162. Preferably, the conduit 14 is substantially straight, rectangular in cross-section, and in the same horizontal plane as the fuel and ash ducts 12 and 17. A clean-out cover 167 may be provided in one side of the conduit 14.

Since the air of combustion from the blower 15 is supplied to the retort 10 under pressure, 75

it is possible in the event of a poor draft that the pressure in the combustion chamber may build up very substantially and tend to force obnoxious gases through the fire pot 22, the fuel duct 12 and the fuel hopper 11 into the atmosphere. The pressure may also tend to force such gases outwardly through the ash duct 17. To obviate this serious difficulty, particularly where there is a poor or inadequate furnace stack (not shown), air pressure is maintained in the fuel and ash ducts 12 and 17, by connecting same through by-passes with the air supply, sufficiently high to resist the internal furnace pressure. In the case of the fuel duct 12, the by-pass comprises an opening 168 formed in the top of the sleeve 23 inside the wall 20. A slot 169 is formed in the top of the discharge end of the fuel duct 12 in communication with the opening 168 so as to connect the interior of the duct with the plenum chamber 51. The slot 169 is inclined inwardly toward the fire pot 22 so as to direct the jet of air toward the latter to build up kinetic as well as static resistance to the furnace pressure. The by-pass for the ash remover comprises a by-pass line 170 communicating at one end with the plenum chamber 51, and connected at the other end to the ash duct 17. In the preferred form, the discharge end of the line 170 is connected to a passage 171 formed in a bracket 172 secured to the ash duct 17. A slot 173 formed in the duct 17 at an angle inwardly and toward the fire pot 22 communicates with the inner end of the passage 171 to complete the connection.

The ash duct 17 is connected at its discharge end to ash receiving means comprising one or more receptacles. Preferably, two receptacles 174 and 175, arranged in series, with the second adapted to receive the overflow from the first, are provided, and constitute in effect a continuation of the ash duct 17.

Each of the ash receptacles 174 and 175 is rectangular in form, and comprises a floor 176, a top wall 177, end walls 178 and 179 and an inner side wall 180. Of the first receptacle 174, one end wall 179 is secured to the rear of the bracket 84 under the hopper base 77, and the other end wall 178 is connected to the ash duct 17 by means of a flanged ring 181. Preferably,

the ring 181 is formed with a counterbore 182 receiving the end of the duct 17 so that the duct is held in place by the endwise lock applied by the tie rods 91. As an additional means of support, the duct 17 may be strapped to the fuel duct 12 by a metal band 183. The second receptacle 175 is located at one side of the hopper base 77, and is secured thereto and to a flange 184 joining the brackets 83 and 84. Connecting the adjacent end walls 179 and 178 of the receptacles is a short duct 185 which is formed on one side of a bracket 186 secured to the hopper base 77. The ash conveyor 16 extends from the duct 17 through the first receptacle 174 and the duct 185 into the second receptacle 175 where the screw vane terminates. The shaft extension 133 extends through the forward wall 179 of the receptacle 175 for connection to the conveyor 16 as described. A cap 187 on the wall 179 about the shaft 133 and filled with mineral wool serves to prevent the escape of ashes.

The outer sides of both ash receptacles are open to receive removable ash cans 188 and 189 of similar shape. It will be evident that when the ash can 188 becomes filled, the ashes therein form a passage above the conveyor 16 through which additional ashes are carried into the second receptacle 175. Upon removing the ash can 188 to empty same, the second ash can 189 which may be partially filled can be substituted therefore in the receptacle 174.

If desired, each ash receptacle may have a hinged cover 190 secured to the outer edge of the top wall 177 to facilitate removal or insertion of the ash can.

I claim as my invention:

In a stoker, in combination, a fire pot, a base wall defining a plenum chamber about said fire pot, a fuel supply duct opening through one side of said wall to said fire pot, an air supply duct opening to the same side of said plenum chamber, a nest of tuyère rings mounted on said pot, said tuyère rings defining a plurality of peripherally spaced air ports in communication with said chamber and opening to said fire pot, the ports in the side of said rings adjacent said ducts being smaller in effective area than the ports in the other side of said rings.

JOSEPH HENRY WALTER.