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STOKER

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Fig. 1

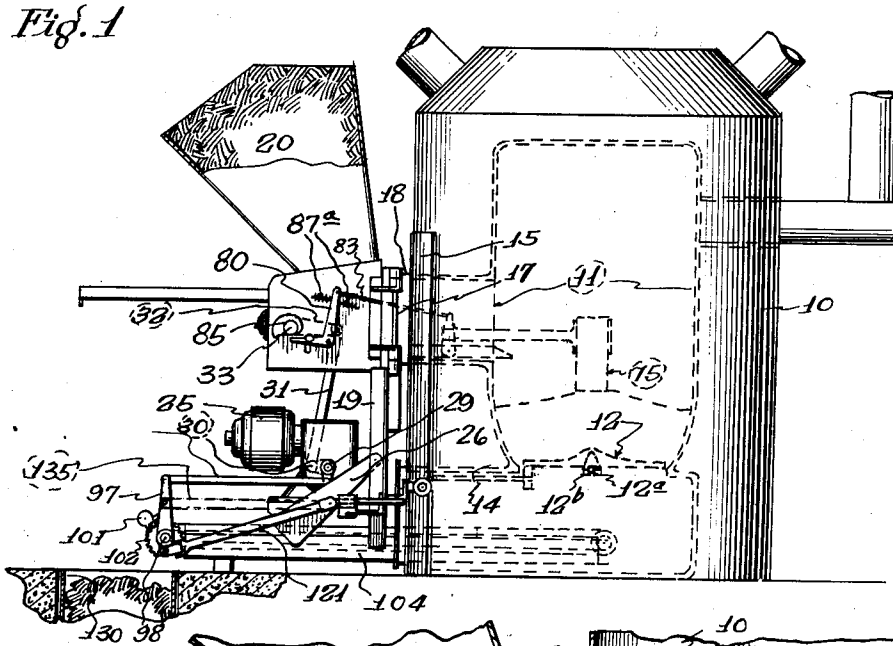
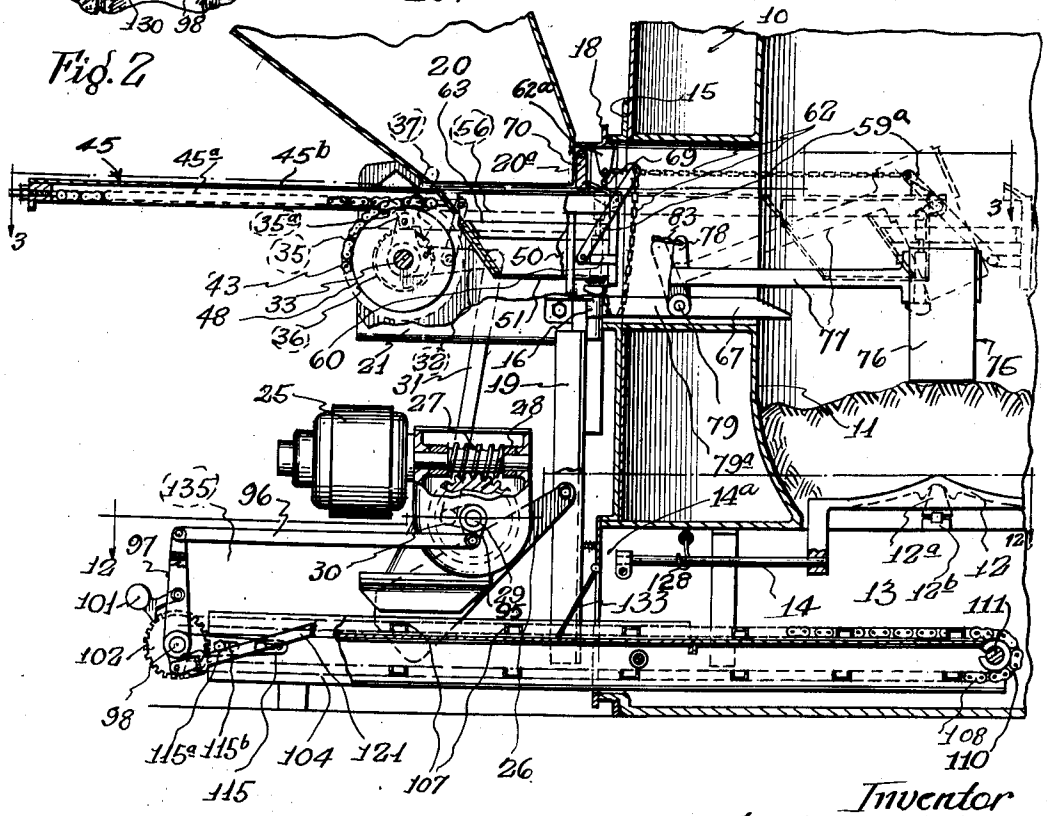


Fig. 2



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Fig. 3

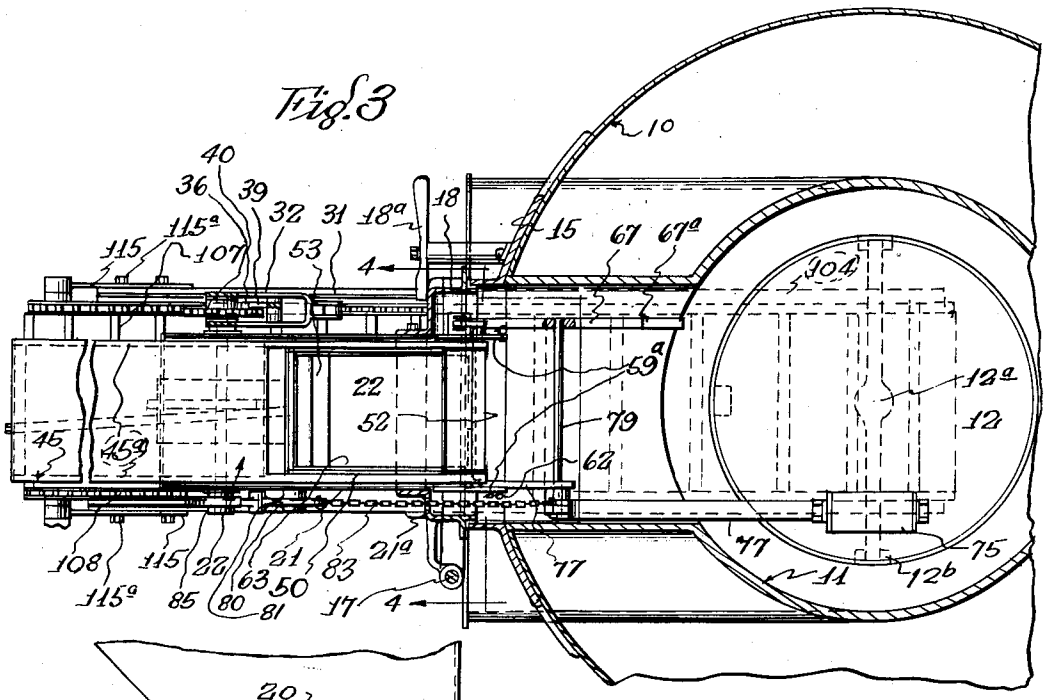


Fig. 4

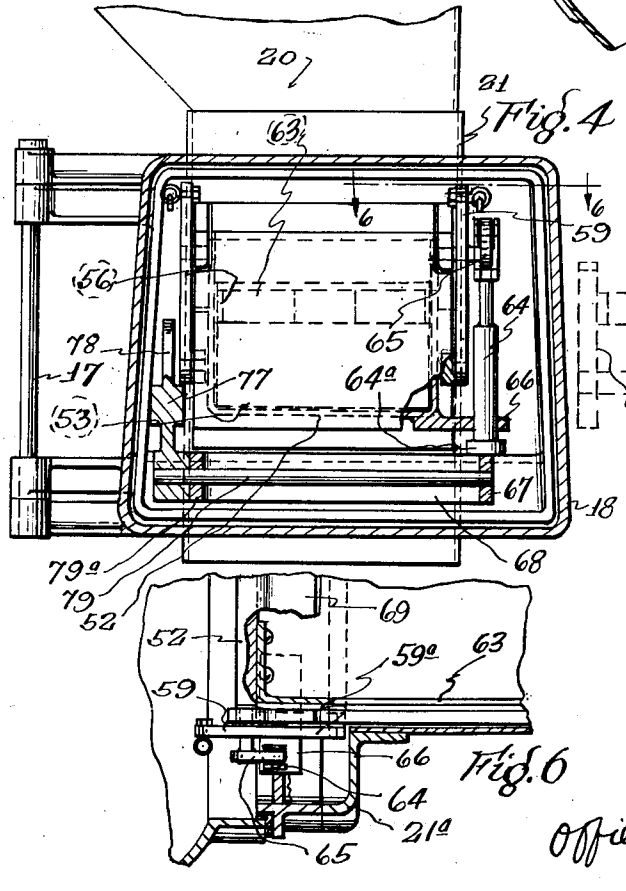


Fig. 5

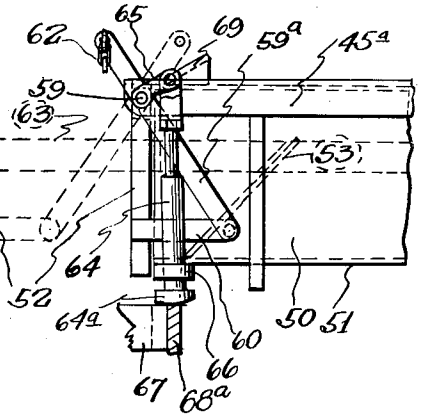


Fig. 6

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Fig. 7

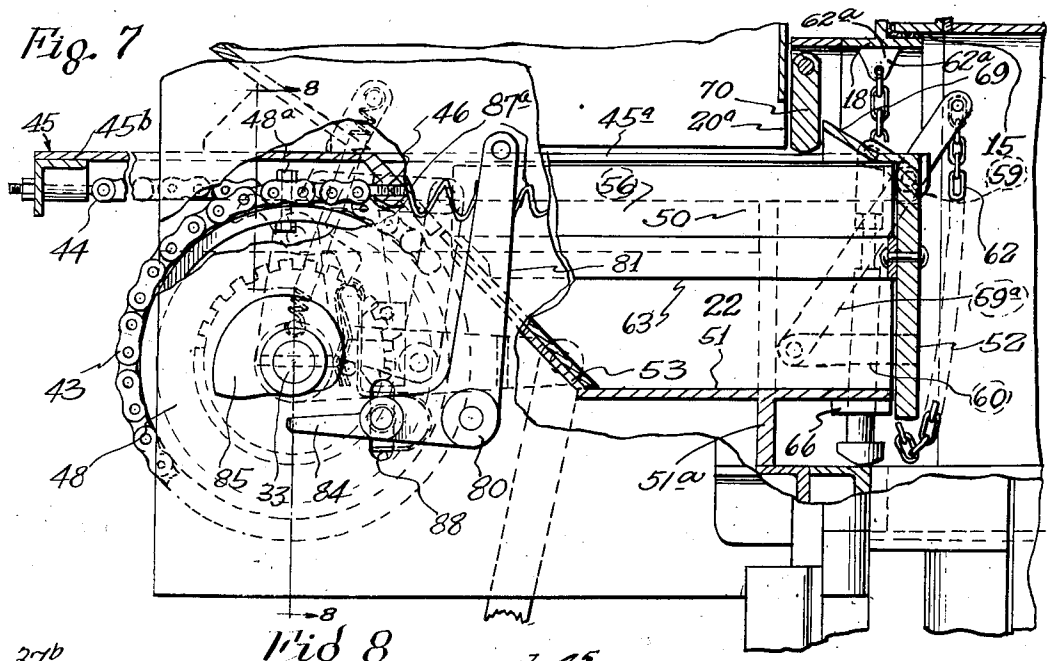


Fig 8

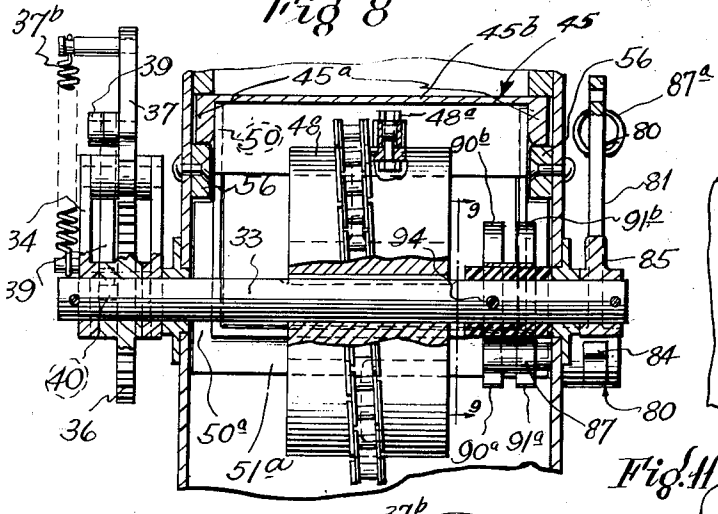


Fig. 9

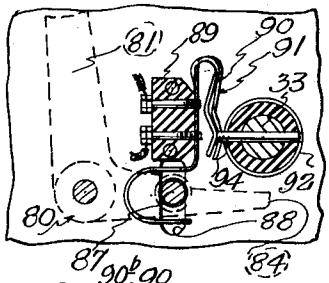


Fig. 10

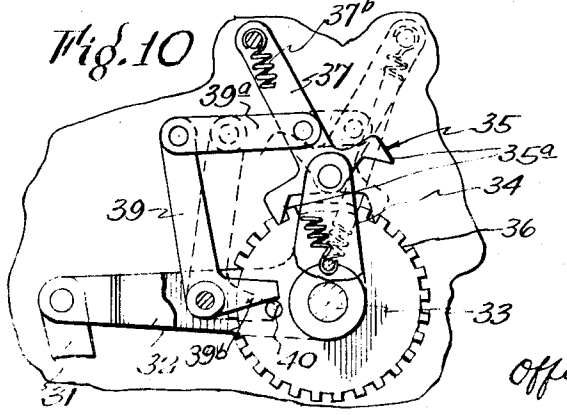
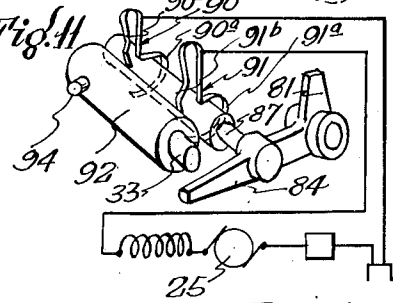


Fig. 11



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Fig. 13

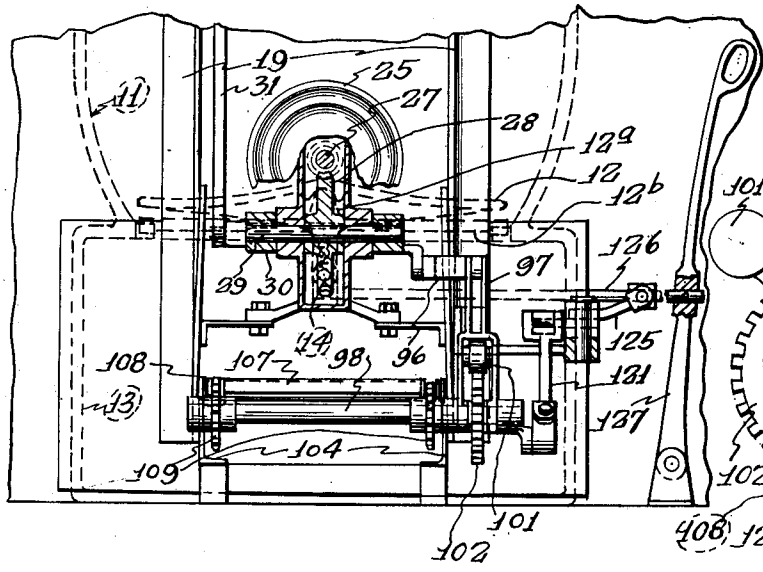


Fig. 14

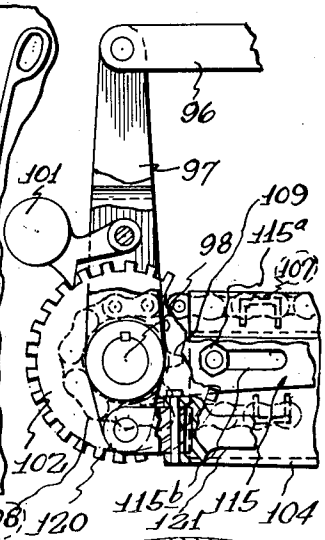
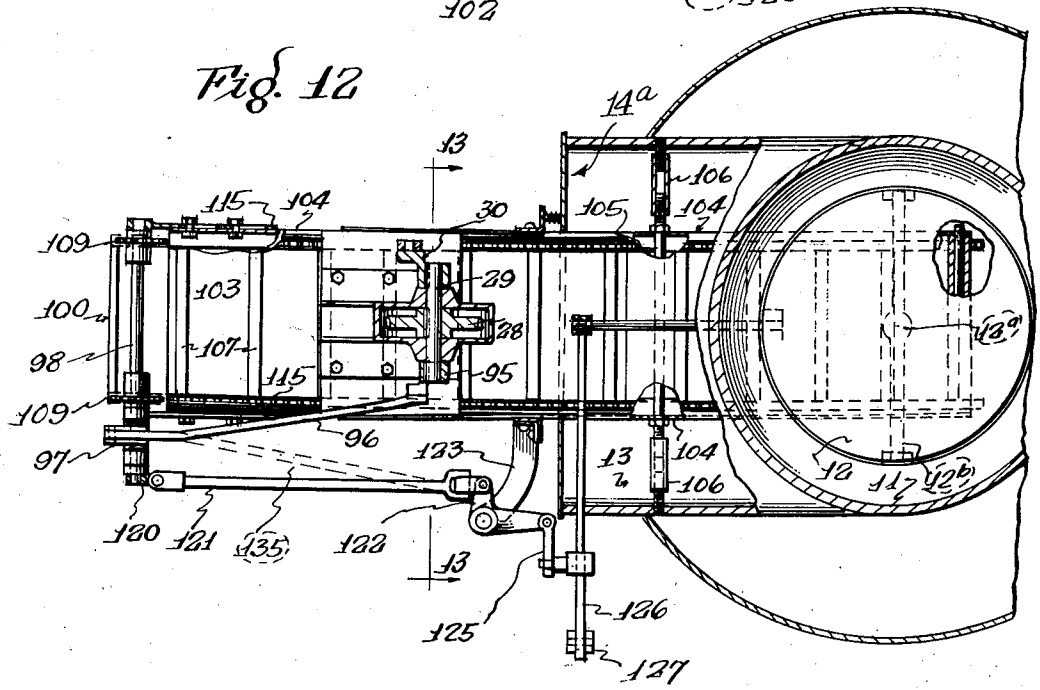


Fig. 12



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Fig. 15

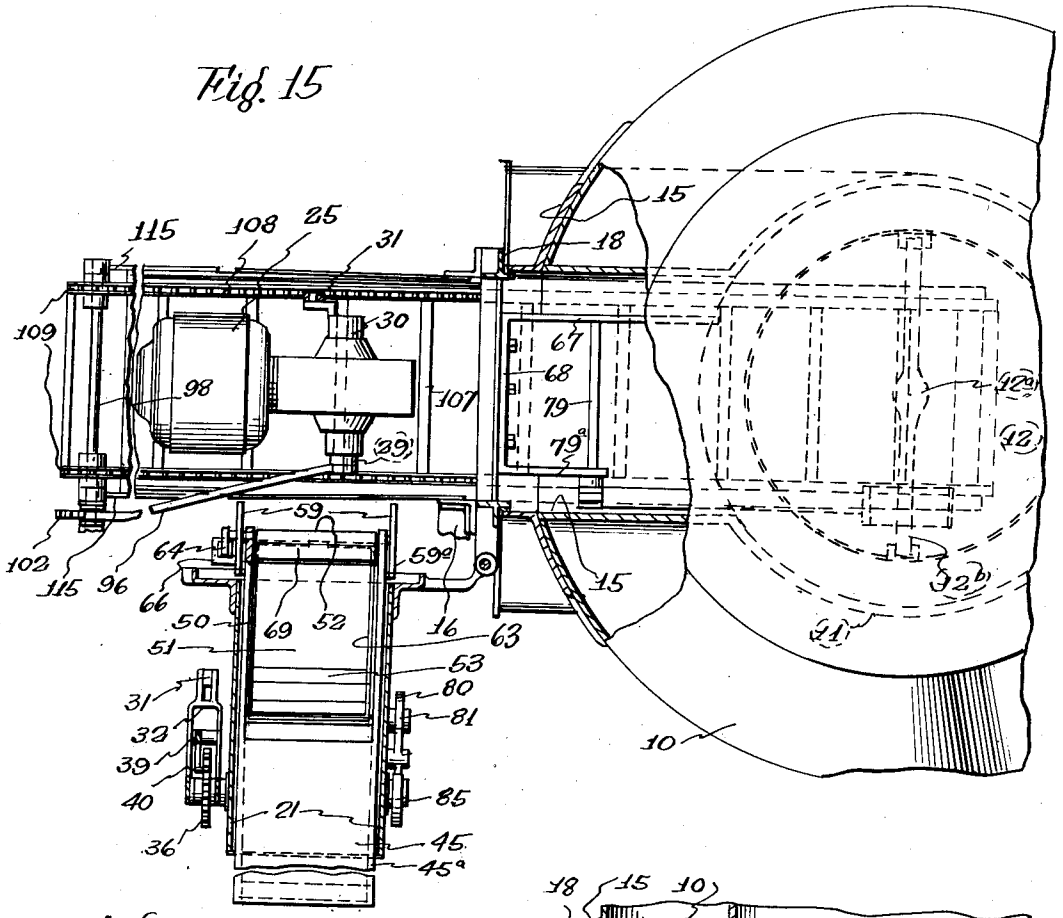
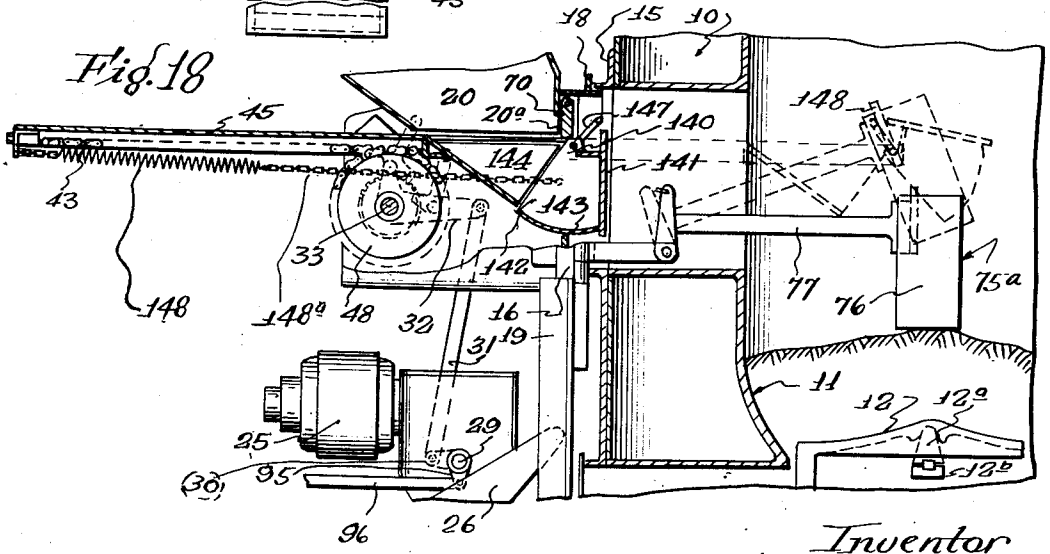


Fig. 18



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Fig. 16

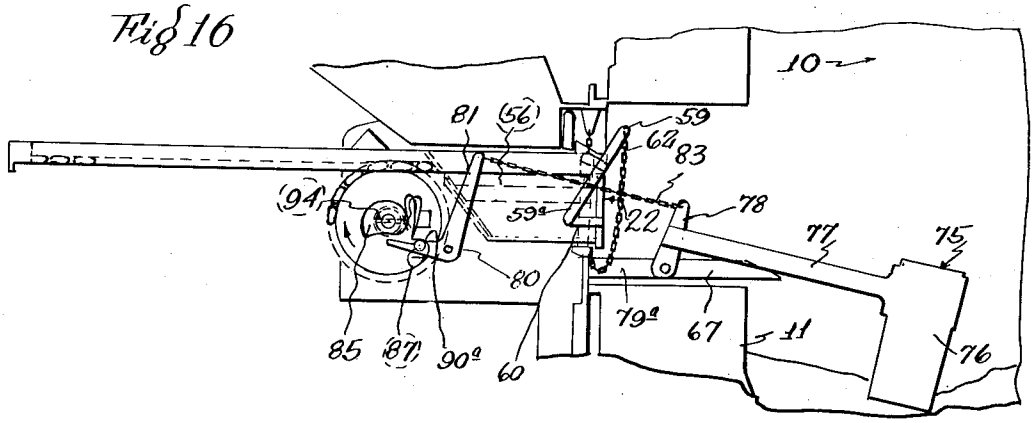
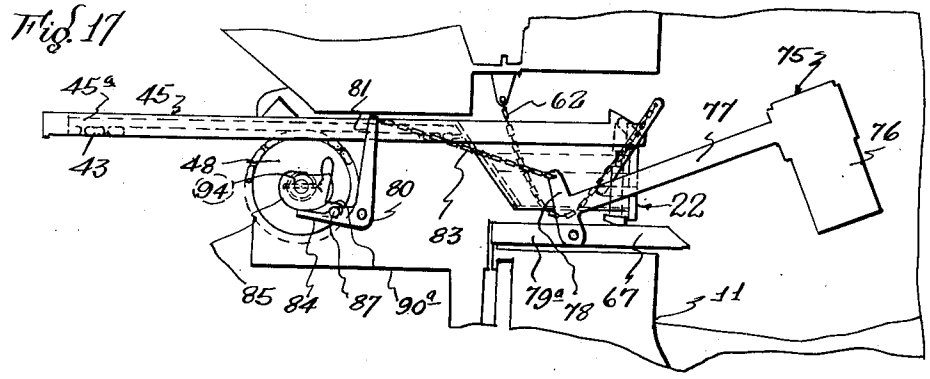


Fig. 17



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UNITED STATES PATENT OFFICE

1,984,852

STOKER

Frederick W. Vodoz, Wilmette, Ill.

Application April 25, 1930, Serial No. 447,154

10 Claims. (Cl. 110—101)

This invention relates to improvements in automatic stoking devices for furnaces and the like and has for its principal object to provide an improved form of stoker automatically responsive to variations in the volume of fuel in the fire box both for adding new fuel and for shaking down the fire.

More specifically, my present invention relates to the overfeed volume-responsive type of stoker such as broadly disclosed in my prior-filed application bearing Serial No. 318,662, filed Nov. 12, 1928, but includes simplified and improved feeding and controlling means which are particularly adapted for handling coke and also includes an improved form of ash disposing means. Other and more detailed features of improvement will appear from time to time from the following description.

The invention may best be understood by reference to the accompanying drawings, in which

Fig. 1 is a side view of a furnace of the ordinary household type to which my invention has been applied.

Fig. 2 is an enlarged fragmentary view of the device shown in Fig. 1, but with parts broken away to show details of the operating mechanism, and with the feeding ram in retracted position.

Fig. 3 is a section taken on line 3—3 of Fig. 2 showing details of the fuel feeding ram.

Fig. 4 is an enlarged detail section taken on line 4—4 of Fig. 3.

Fig. 5 is a detail side view of the front portion of the fuel feeding ram.

Fig. 6 is a detail section taken on line 6—6 of Fig. 4.

Fig. 7 is an enlarged side view of the ram casing with parts broken away to show details of the feed control and operating means therefor.

Fig. 8 is a section taken on line 8—8 of Fig. 7.

Fig. 9 is a detail section of the contact switch forming part of the electric control circuit taken on line 9—9 of Fig. 8.

Fig. 10 is a detail view of the ratchet feeding mechanism.

Fig. 11 is a wiring diagram of the electric control circuit including the contact switch shown in Fig. 9.

Fig. 12 is a section taken on line 12—12 of Fig. 2 showing the details of the shaking mechanism and ash conveyor.

Fig. 13 is a section taken on line 13—13 of Fig. 12.

Fig. 14 is an enlarged detail of the conveyor feeding device.

Fig. 15 is a view similar to Fig. 3, but showing the feeding mechanism swung bodily on its hinged mounting away from the door of the furnace so as to permit hand firing of the furnace, or access to the enclosed parts of the feeding mechanism for inspection or repair.

Figs. 16 and 17 are diagrammatic views of the feeding mechanism showing the feed controlling devices in position to start the ram forward, and in partially advanced position, respectively.

Fig. 18 is a view showing a modified form of feeding ram.

Referring now to details of the device illustrated in the drawings and embodying one form in which my invention may be utilized, 10 indicates a hot air furnace of the ordinary household type including a fire box 11, grate 12, and ash pit 13, all of the usual construction.

In the form shown the grate 12 is of the oscillating mushroom type supported at the center on an upright finger 12*a* carried on a cross support 12*b* and normally shaken down by rotating the grate by means of a suitable rod 14. It will be understood that this specific type of furnace is utilized merely as a means of illustrating my invention, and that my improved device can, with slight modifications, be applied to a wide variety of coal or coke burning furnaces adapted either for domestic use or in steam generating plants or the like.

In the form shown, my improved stoking device is constructed as an attachment to be applied as a unit to the furnace, but it can be built as an integral unit if so desired. An auxiliary door frame 18 is secured to the outer face of the ordinary door of the fuel supply opening or fire door 15, and is also connected by vertical supports 19, 19 to the shaking mechanism and ash conveyor, which are mounted in and in front of the ash pit opening 14*a*, as will hereinafter more fully appear.

The main portion of the feeding means comprises a coal hopper 20, supported on a ram casing 21, having lateral supports 16, 16 which are hinged on pin 17 at one side of the auxiliary door frame 18. The ram casing is flanged at 21*a* and is held in closed position by a swinging latch 18*a* or the like.

The ram casing 21 has a ram indicated generally at 22 reciprocably mounted therein, said ram forming a compartment for a single charge of fuel, fed downwardly thereinto from the hopper 20. Said ram is arranged to dump said charge when the ram is extended into the fire box to a predetermined position over the fire, as will now be described.

The means for actuating the feeding ram comprises an electric motor 25, herein supported on a suitable bracket 26 connected to the upright supports 19, 19 below the ram casing, provided with gear reduction mechanism such as worm 27 and worm gear 28 and driving transverse shaft 29. A crank arm 30 on said shaft is connected by an upright pitman 31 to an oscillating arm 32 disposed on one side of the piston casing. Said arm is loosely pivoted on a shaft 33 extending transversely through the casing 21, and is provided with a reversible pawl and ratchet connection for rotating said shaft.

In the form shown, the arm 32 is provided with an upright extension 34, on which is pivoted a double pawl 35 arranged so that one or the other end 35*a*, 35*a* of said pawl may engage a ratchet wheel 36 fixed on shaft 33. Said pawl is provided with an upright tumbling lever 37, adapted to rock the pawl toward one side or the other. A spring 37*b* is connected from the end of the tumbling lever 37 to a point below the axis of rotation of said pawl so as to tend to hold one end of said pawl downwardly against the ratchet wheel 36, until the tumbling lever is positively moved against the tension of said spring to the opposite side of the dead center line established by said spring and the axis of rotation of the pawl, whereupon the position of the pawl is reversed and will drive the shaft in the opposite direction by oscillation of the arm 32.

The position of the tumbling lever 37 is automatically controlled by a tripping arm 39, pivoted on arm 32 adjacent the ratchet wheel 36 and having a link 39*a* connected with said lever 37. A pin 40 is mounted on one side of the ratchet wheel and is arranged to engage an extension 39*b* on said tripping arm whenever the ram has reached its extreme limit of movement either on the inward or outward stroke. The tripping arm is thus automatically rocked in such manner as to move the tumbling lever 37 over dead center, and in turn reverse the position of the pawl 35 so as to reverse the direction of rotation of the shaft 33.

The shaft 33 is connected to the ram 22 through a flexible chain 43 or the like having one end 44 secured to the rear end of a guide extension 45 on the ram 22 and the other end secured to a bracket 46 at the front end of said extension. The intermediate portion of said chain is wound around a drum 48 fixed on the feed shaft 33, said chain also being preferably fixed on said drum as by a pin 48*a*.

The guide extension 45 connects at its forward or inner end with a box-like structure forming a fuel compartment, which is defined by two side walls, 50, 50, a bottom wall 51, a front wall 52 and an inclined rear wall 53. The term "front" as applied to the compartment refers to its discharge end. The side and bottom walls 50 and 51 are rigid with side rails 45*a*, 45*a* of the guide extension 45, which ride on horizontal guides 56, 56 fixed on the inner wall of the ram casing 21, as seen in Figure 8. The ram 22, including the guide extension and the fuel compartment just described, is reciprocably movable as a unit, and arranged so as to cause the fuel to be discharged from the compartment when the ram is moved forwardly to a point removed from the margin of the fire box, and preferably over the center of the fire.

The front wall 52 of the fuel compartment is rigidly connected to the rear wall 53 by a pair of horizontally disposed braces 63, 63 disposed adjacent the side walls 50, 50. A lever 59*a* is pivotally mounted on pin 59 at the outer side of each of the side rails 45*a*, as shown in Figs. 2 and 5. The lower ends of levers 59*a* are connected to said front wall by brackets 60, 60 extending rearwardly from the sides of said front wall. A flexible member such as a chain 62 is connected between the upper end of each lever 59*a* and a fixed point as for instance brackets 62*a*, 62*a* rigid with the auxiliary door frame 18.

When the ram is in retracted position, the front wall 52 completely closes the front end of the fuel compartment, and levers 59*a* are inclined downwardly and rearwardly, as shown in full lines in Figs. 2 and 5. When the ram is moved forward to dumping position at the end of its stroke, the chain 62 becomes taut and rocks the lower ends of levers 59*a* forwardly so as to push the front wall 52 and rear wall 53 forwardly as a unit in the compartment, to a position indicated in dotted lines in Figs. 2 and 5, and thus the charge of fuel is positively ejected from the front end of said compartment.

The front and rear walls 52 and 53 of the fuel compartment are returned to closed position during the retractive movement of the ram by means of a plunger 64, pivotally connected to an arm 65 extending rearwardly from the left hand lever 59*a*, and guided for vertical movement in a bracket 66 extending from the adjacent margin of the bottom wall 51, as best shown in Figs. 4 and 5. The plunger 64 has a shoe 64*a* at its lower end which rides on a rail 67 which is mounted on bracket 68 secured rigidly to a cross piece 68*a* at the bottom of the auxiliary door frame 18, and extends horizontally toward the fire box just below the path of movement of the ram. The front wall 52 is maintained in a closed position as long as the shoe 64*a* rides on the rail 67, but during the forward movement of the ram, the shoe passes beyond the end of said rail in time to be released when the chain 62 becomes taut to positively move the front wall forwardly as has just been described. During the retractive movement of the ram, however, the plunger engages the inclined end portion 67*a* of rail 67, and while riding up said incline, the lever 59*a* is moved into its initial position, and thus automatically the front wall 52 to closed position.

While the ram is being moved forwardly, the horizontal plate 45*b* of guide extension 45 passes across the discharge opening of the hopper 20 to close the same until the fuel compartment is returned to reloading position beneath said hopper.

In the preferred form shown, the front wall 52 of the ram is provided with a hood or cowl 69, which extends rearwardly and upwardly to engage a hinged gate 70 depending from the front edge of the hopper 20 just above the path of movement of the ram, as is best seen in Figs. 2 and 7. The front hopper wall is cut away to leave an opening 20*a* opposite said gate. The arrangement is such that larger pieces of fuel may project above the top of the ram compartment and while being fed forwardly will swing the gate forwardly so as to permit said fuel to pass readily into the fire box, and thus eliminate the tendency of crowding, or shearing of the fuel. When the ram returns to its initial loading position, the gate 70 will resume its vertical position, either by gravity, or by positive engagement by the hood or cowl 69.

In connection with the door opening 15 I provide means for controlling the draft around the ram 22 which herein consists of flanged plates

50a, 51a formed integrally with the bottom and side walls 50 and 51, and arranged to close the space around the frame 18 over door opening 15 when the ram is in retracted position, as is best shown in Figures 7 and 8.

Referring now to the control means responsive to variations in the volume of the fire, whereby the ram is automatically actuated by the motor 25, I provide a weighted contact member 75, herein consisting of a piece of fire brick 76, mounted in upright position on an arm 77 extending into the fire box so that the lower end of the fire brick may rest on the top of the fire, preferably adjacent the center thereof. The arm 77 is pivotally supported as by a vertically disposed lever 78 on which it is fixed, and which in turn is pivoted on a shaft 79 bearing in bracket 79a, which bracket is formed integral with the bracket 68 and the rail 67, but is disposed opposite said rail, as is clearly seen in Fig. 15.

A bell crank lever 80 is pivotally mounted at one side of the ram casing 21, and has an upwardly extending arm 81 connected to the lever 78 by means of a flexible chain 83 or the like, passing through an aperture in the ram casing flange 21a. Another arm 84 of the bell crank lever 80 extends beyond the adjacent side of the ram casing which has a cam 85 mounted thereon in cooperative relation with the lever arm 84, as will presently appear.

The lever arm 84 also carries thereon a pin 87 suitably insulated therefrom which extends through a slot 88 in the ram casing. Mounted on the inner face of the ram casing is a bracket 89 of suitable insulating material having two contact members 90 and 91 mounted thereon. These two contact members each have two spring loop contacts. One pair of loop contacts 90a and 91a extend into position above and below the pin 87 carried by bell crank lever 80 so as to be engaged thereby and close the motor operating circuit in certain positions of said bell crank lever, as will hereinafter appear.

The pin 87 is normally supported in a position intermediate the upper and lower bends of contacts 90a and 91a by spring 87a which yieldingly support the arm 81.

The second pair of spring loop contacts 90b and 91b are adapted to extend into engagement with a metallic sleeve 92 mounted on, but insulated from, the transverse feed shaft 33. The motor operating circuit is closed by contact with said sleeve, excepting when interrupted at one point of rotation of said shaft 33 by means of an insulated pin 94 projecting from said sleeve.

The cycles of operation of the fuel feeding mechanism may now be described. So long as there is a sufficient volume of fuel in the fire box, the weighted contact member 75 will be supported on the top of the fuel as shown in full lines in Figs. 2, 7 and 9. In this position, the weight of arm 84 of bell crank lever 80 is sufficient to separate the pin 87 from the contacts 90a and 91a, and the insulated pin 94 breaks the circuit between contacts 90b and 91b. The motor is therefore inoperative so long as the contact member 75 is supported at a predetermined height on the fuel bed.

When the volume of fuel is diminished by combustion so that the contact member 75 drops to a predetermined level, as indicated in the diagram in Fig. 16, the chain 83 is put under tension, and rocks the bell crank lever 80 to move the arm 84 upwardly. The pin 87 now engages with the upper part of both contacts 90a and 91a to close the circuit. The motor 25 operates the feed ratchet mechanism in such manner as to feed the ram inwardly toward the fire, the ratchet mechanism having been previously left in position for inward feeding movement at the end of the preceding cycle of feeding movement of the ram, as will presently appear.

The cam 85 on feed shaft 33 is arranged to engage the end of arm 84 and depress it shortly after the ram has started its inward travel, as indicated in Fig. 17. In this position, the contact member 75 is positively elevated a considerable distance above the top of the fuel bed, thus permitting the fuel to be deposited on the top of the fire without interfering with said contact member.

During this movement of the arm 84 it will be observed that the depressing of arm 84 causes the contact between pin 87 and contacts 90a and 91a to be temporarily broken, but by this time the shaft 33 has been rotated to a point where insulating pin 94 is no longer effective, and the motor circuit is then completed through contacts 90a and 90b, to continue the feeding movement of the ram.

When the ram has been moved forwardly to a point near the end of its stroke, the chains 62, 62 become taut, and as the ram continues its final forward movement, the front wall 52 and rear wall 53 are moved bodily forward at a greater rate of movement than the ram, owing to the operation of levers 59, 59 by chains 62, 62 and the charge of fuel in the ram is discharged from the front of the bottom wall 51 of the ram while the rear wall 53 acts as an ejector in pushing the fuel forwardly along said bottom wall. In Fig. 2, the dotted lines indicate the extreme forward position of the ram, with the front and rear walls of the fuel compartment in fully extended dumping position, and the contact member 75 also elevated above the fire.

When the ram reaches the end of its forward stroke, the insulating pin 94 has completed one full revolution so as to break the circuit between contacts 90b and 91b, but by this time, the arm 84 is depressed by cam 85 so as to engage pin 87 with contacts 90a and 91a, and thus maintains the motor circuit during the reversal of the feeding mechanism.

The movement of the ram is automatically reversed at the end of its stroke by the pin 40 on ratchet wheel 36, which is so arranged as to rotate through an arc of 360° for each reciprocable movement of the piston. Said pin thus causes the ratchet mechanism and the feed shaft 33 driven thereby to reverse automatically at the proper time by rocking the tumbling lever 37 over dead center (see Fig. 10) and causing retraction of the ram.

During the retracting movement of the ram, the front and rear walls 52 and 53 of the fuel compartment are automatically returned to closed position, by engagement of plunger 64 with rail 67, as has already been described. Any fuel which may have been lodged on the bottom wall 51 behind the rear wall 53 will be pushed rearwardly through the opening at the rear end of the fuel compartment.

When the ram approaches its initial or fully retracted position the cam 85 is returned to a position where the contact member may drop slowly by its own weight until it rests upon the top of the fire. In the event that sufficient fuel has been fed by the single charge, the contact member will be supported so high that the pin

87 on lever 84 will not engage the contacts 90*a* and 91*a* after cam 85 passes off lever 84. The retracting or reverse movement of the piston movement will therefore continue only through the circuit established between sleeve 92 and contacts 90*b* and 91*b* and will be broken when insulating pin 94 raises the contact 90*b* from said sleeve. Just before the motor circuit is finally broken, however, the pin 40 of the ratchet reversing mechanism operates automatically to set the ratchet in forward feeding position, ready for the next cycle of operation.

In the event that the fuel has not been restored to proper predetermined height as determined when the contact member is lowered at the end of the stroke, the pin 87 on lever 80 will close the motor circuit, and instead of being discontinued at the end of the retractive movement, the cycle of operation above described will be again repeated, until sufficient fuel has been supplied.

Referring now to the means for shaking down the fire and conveying the ashes from the ash pit, such means is actuated by the motor 25 during the same periods that the motor is operating the fuel charging means. The transverse shaft 29 which carries the crank arm 30 for operating the upright pitman 31, also has a crank arm 95 at the opposite end connected to a horizontal pitman 96 which extends rearwardly to a lever 97 loosely mounted on a transverse shaft 98 at the rear end of a conveyor frame 100. This lever arm carries a pawl 101 which engages with the ratchet wheel 102 fixed on shaft 98 for driving an endless belt conveyor 103 mounted on said conveyor frame. In the form shown, the conveyor frame includes side rails 104, 104 and extends into the ash pit with its forward end disposed beneath the grate 12. Any suitable means may be provided for positioning the conveyor frame in place, and in the form shown a pair of struts 105, 105 are connected between the side walls of the fire box and the side rails 104, 104 of the frame, and adjusted by means of turn buckles 106, 106.

A belt conveyor 103 comprises a plurality of slats or conveyor bars 107 which are connected to endless chains 108, 108 at opposite sides of the conveyor frame, said chains being trained over sprocket wheels 109, 109 fixed on the drive shaft 98 at the outer end of the conveyor, and sprocket wheels 110, 110 fixed on a shaft 111 on the inner end of said conveyor.

Adjustment of the tension of the conveyor may be provided by means of extensible bearing brackets 115, 115 for the feed shaft 98 which brackets are adjustable longitudinally of the side rails 104, 104 by bolts 115*a* fixed to said side rails and working in longitudinal slots 115*b* formed in said bearing brackets.

The mechanism for shaking down the fire is best shown in Figures 12 and 13. A crank arm 120 is fixed on the end of the conveyor feed shaft 98 and is connected by pitman 121 to one arm of a bell crank lever 122 pivoted for horizontal movement on a bracket 123 extending at one side of the conveyor frame. The opposite arm of the bell crank lever 122 is connected by a link 125 to a horizontally disposed rod 126 which extends between an upright manual shaking lever 127 and the bar 14 which is connected to the grate 12. Said bar is flexibly supported as by a hook 128 so as to permit said bar to be rocked laterally and thus cause the grate to be oscillated slightly about its center support in the manner usually employed for shaking down a grate of this type. The operation of the shaking rod 14 through the bell crank lever 122 therefore serves to shake down the fire in substantially the same manner as when operated through the upright manual shaking lever 127.

It will now be understood that whenever the fuel feeding means is actuated, the fire is simultaneously shaken down and the conveyor 103 is operated so as to remove the ashes from beneath the grate and discharge them at the outer end thereof.

Any suitable means may be provided for collecting the ashes, in the form shown, a receptacle 130 being sunk in the floor beneath the outer end of said conveyor in position to receive the ashes as they are discharged over the outer end of the conveyor.

The draft through the ash pit opening 14*a* is controlled by a door 133 which may be hinged to the upper margin of the opening and arranged so that its lower edge will rest on the top of the conveyor when closed, as shown in Fig. 2.

In Fig. 15, it will be seen that the feeding mechanism including the hopper 20, piston 22 and piston casing 21 may be swung bodily on hinge pin 17 away from the auxiliary door frame 18 so as to permit hand firing of the furnace if desired, and also to permit access to the inner end of the ram, or the contact member 75, for inspection, adjustment or repair. In order to swing the mechanism as described, it is only necessary to disconnect temporarily the upright pitman 31 from oscillating arm 32, and disconnect chain 83 from the bell crank lever 80. It will be observed, that the contact member is supported on the auxiliary frame 18, so is not affected by the hinged movement of the feeding mechanism.

In the modified form of ram shown in Figure 18, the parts are similar to those previously disclosed, excepting that the ram compartment comprises a hinged section 140 at the front end of the ram having front, side and bottom walls, 141, 142 and 143 respectively all rigidly connected together, and suspended from the side rails 45*b*, 45*b* along the upper sides of the ram. The rear of the fuel compartment comprises an inclined chute 144 communicating with the hopper and opening into the pivoted section 140 of the ram, as shown. A tripping lever 147 is connected at one side of the pivoted portion extending above the same. This tripping lever is adapted to engage a suitable stop 148 carried by the contact member 75*a* when the ram is moved to its extreme forward position, as indicated by dotted lines in this figure. It will be understood, of course, that when the ram is being moved forwardly, the contact member 75*a* is automatically moved to raised position above the fire, as has previously been described. Thus when the tripping lever 147 engages the stop 148 on the contact member 75*a* the pivoted portion 140 will be swung forwardly and upwardly on its hinged mounting so as to discharge the fuel by gravity from both the pivoted portion and the rear inclined portion of the fuel compartment.

When the ram is returned, the pivoted portion 140 will be returned to closed position as by spring 148 and wire 148*a*, assisted by gravity.

I claim:

1. In a furnace, a fire box, fuel feeding means, including a reciprocating fuel compartment having rigidly fixed side and bottom walls, and movable front and rear walls, and means operative at a predetermined position of forward feeding

movement of said fuel compartment for extending said front and rear walls longitudinally to positively discharge fuel from said compartment at a point remote from the margin of said fire box.

2. In a furnace, a fire box, fuel feeding means, including a reciprocating fuel compartment having rigidly fixed side and bottom walls and movable front and rear walls and means operative at a predetermined position of forward feeding movement of said fuel compartment for extending said front and rear walls longitudinally to positively discharge fuel from said compartment at a point remote from the margin of said fire box, and means operative upon retractive movement of said fuel compartment for returning said front and rear walls to close the front and rear ends of said compartment.

3. In a furnace, a fire box, fuel feeding means, including a supporting frame and a reciprocating fuel compartment movable over the fuel bed in said fire box including relatively fixed side and bottom walls and an endwise movable closure for the front wall, and means acting at a predetermined position of forward movement of said fuel compartment for moving said front wall forwardly to provide an unobstructed front opening for the discharge of fuel from said compartment.

4. In a furnace, a fire box, fuel feeding means including a frame, a fuel hopper thereon having a vertically opening discharge passage, a reciprocating fuel compartment movable under said discharge passage in one position to receive fuel deposited by gravity therefrom, means for moving said compartment forwardly and to discharge the fuel therefrom in said fire box, said hopper also having an opening of substantial height in its wall adjacent the firing opening contiguous to said fuel compartment, whereby lumps of fuel projecting above the top of said compartment may pass through said opening during the forward reciprocation of said compartment.

5. In a furnace, a fire box, fuel feeding means including a frame, a fuel hopper thereon having a vertically opening discharge passage, a reciprocating fuel compartment movable under said discharge passage in one position to receive fuel deposited by gravity therefrom, means for moving said compartment forwardly and to discharge the fuel therefrom in said fire box, said hopper also having an opening of substantial height in its wall adjacent the firing opening contiguous to said fuel compartment, whereby lumps of fuel projecting above the top of said compartment may pass through said opening during the forward reciprocation of said compartment, and a gate hinged adjacent the forward margin of last named opening and free to swing forwardly when engaged by the excess fuel in said compartment.

6. In a furnace, a fire box, fuel feeding means including a frame, a fuel hopper thereon having a vertically opening discharge passage, a reciprocating fuel compartment movable under said discharge passage in one position to receive fuel deposited by gravity therefrom, means for moving said compartment forwardly and to discharge the fuel therefrom in said fire box, said hopper also having an opening of substantial height in its wall adjacent the firing opening contiguous to said fuel compartment, whereby lumps of fuel projecting above the top of said compartment may pass through said opening during the forward reciprocation of said compartment, and a gate hinged adjacent the forward margin of said last named passage and free to swing forwardly when engaged by the excess fuel in said compartment, and means carried by said compartment for engaging said gate and closing said last named passage during the retractive movement of said compartment.

7. In combination with a furnace having a fire box, fuel feeding means comprising a reciprocating compartment movable over the fuel bed in said fire box, means for causing the fuel to discharge by gravity from said compartment at a point remote from the margin of said fire box, means for actuating said compartment, fuel feeding control means for said actuating means including a contact member responsive to variations in the level of the fire bed and normally adapted to engage the top of the fire bed below the point of discharge of fuel from said fuel compartment, and means operating in timed relation with the movement of said fuel compartment for elevating said contact member during the forward feeding movement of said compartment.

8. In combination with a furnace having a fire box, a fuel feeding means including a reciprocating fuel compartment having rigidly fixed side and bottom walls and a movable rear wall, and means operative at a predetermined position of forward feeding of said fuel compartment for extending said rear wall longitudinally to positively discharge fuel from said compartment at a point remote from the margin of said fire box.

9. In combination with a furnace having a fire box, a fuel feeding means including a reciprocating fuel compartment having rigidly fixed side and bottom walls and a movable rear wall, means operative at a predetermined position of forward feeding movement of said fuel compartment for extending said rear wall longitudinally within said compartment to positively discharge fuel from the latter at a point remote from the margin of said fire box, and means operative upon retractive movement of said fuel compartment for returning said rear wall to its initial position within said compartment.

10. In combination with a furnace having a fire box, fuel feeding means comprising a reciprocating compartment movable over the fuel bed in said fire box, means for causing the fuel to discharge by gravity from said compartment at a point remote from the margin of said fire box, means for actuating said compartment, fuel feeding control means for said actuating means including a contact member responsive to variations in the level of the fire bed and normally adapted to engage the top of the fire bed below the point of discharge of fuel from said fuel compartment, said control means being arranged to limit the height of the fuel fed to the fuel bed to a level substantially below the path of movement of said fuel compartment.

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