A. R. SELDEN.

AUTOMATIC STOKER.

APPLICATION FILED SEPT. 9, 1909.

986,870.

Patented Mar. 14, 1911.

3 SHEETS—SHEET 1.

FIG. 1.

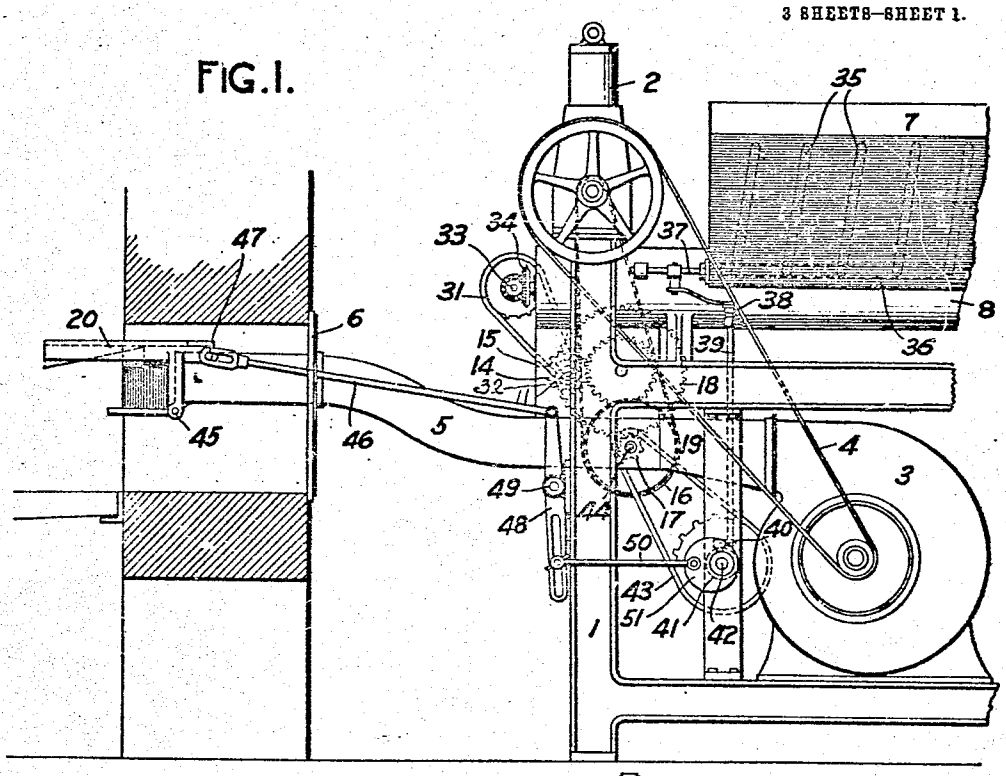
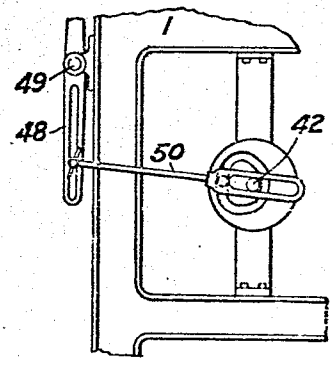


FIG. 1a.



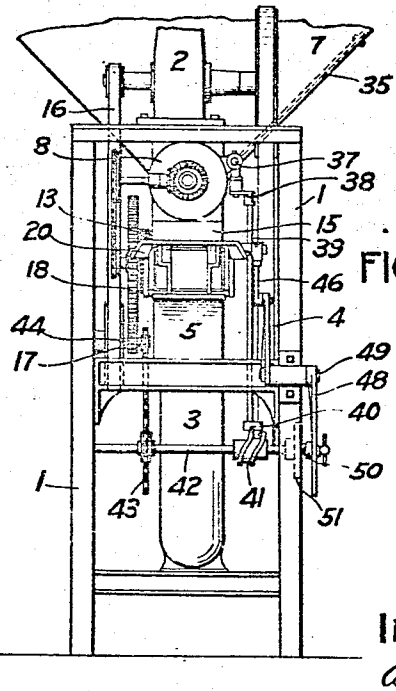


FIG. 2.

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3 SHEETS—SHEET 2.

FIG.3.

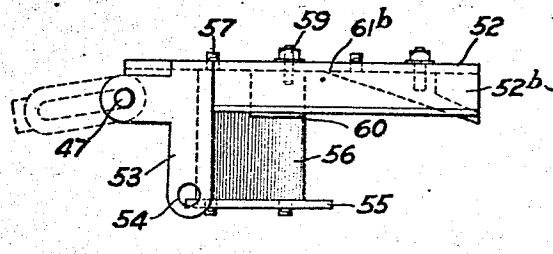


FIG.4.

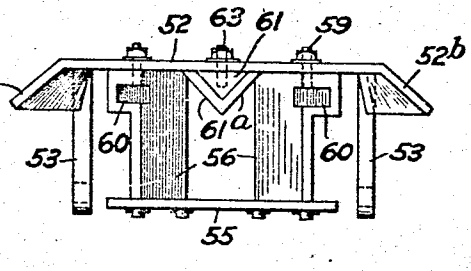


FIG.5.

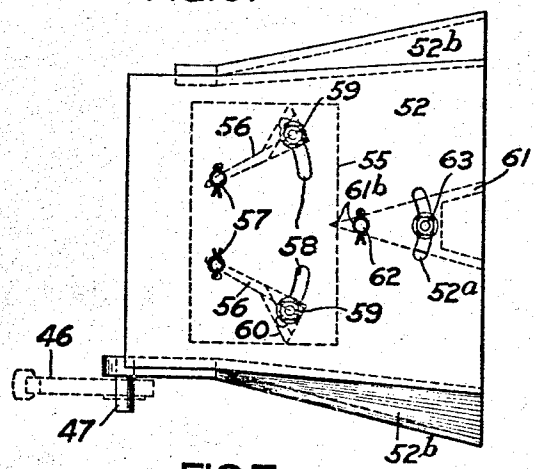


FIG.6.

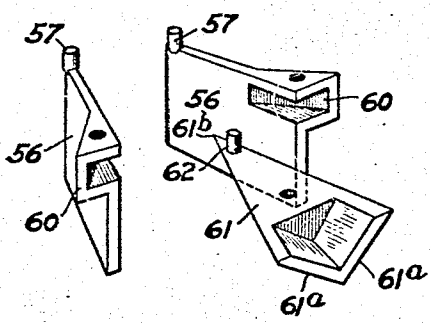


FIG.7.

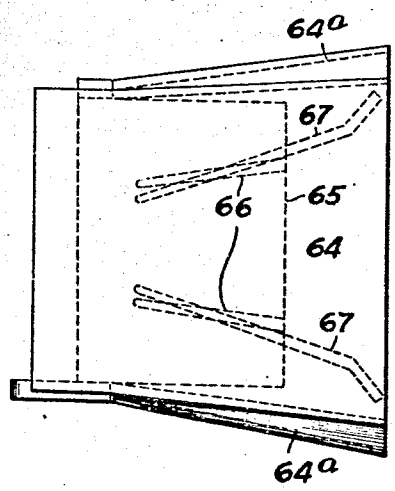


FIG.8.

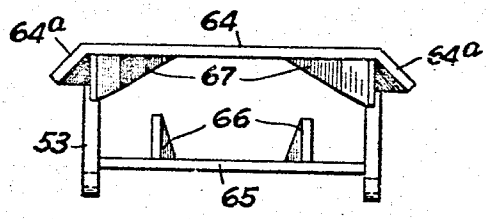
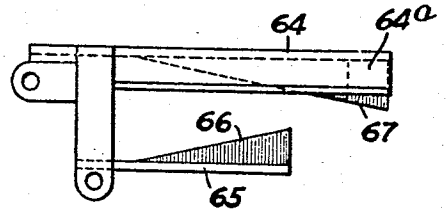


FIG.9.



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3 SHEETS—SHEET 3.

FIG.10.

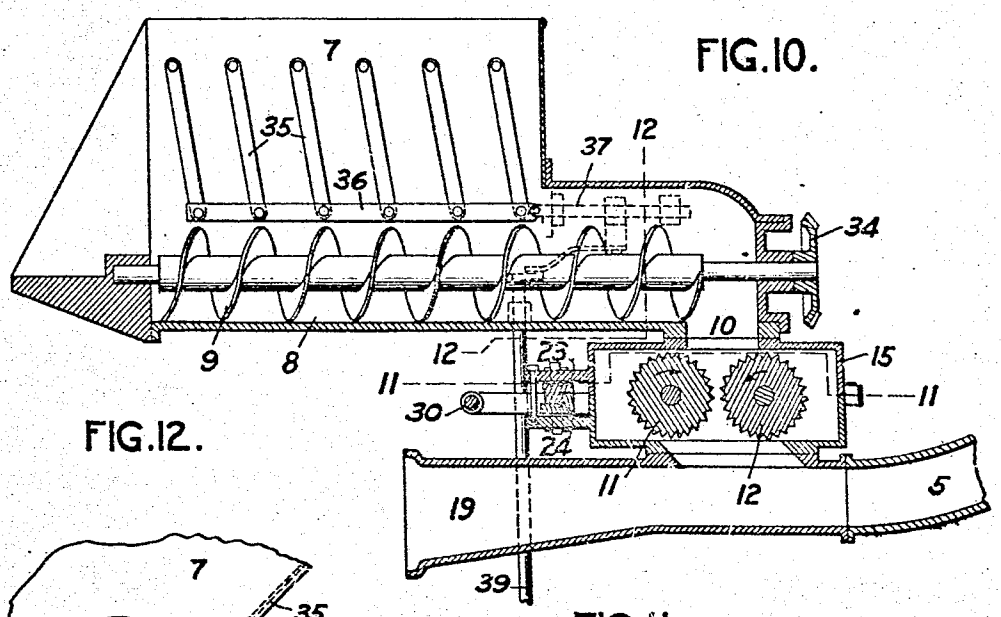


FIG.12.

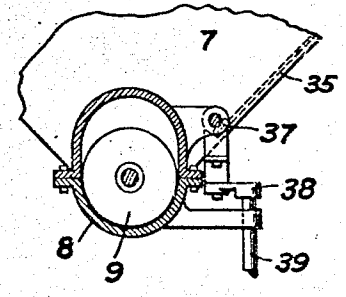


FIG.11.

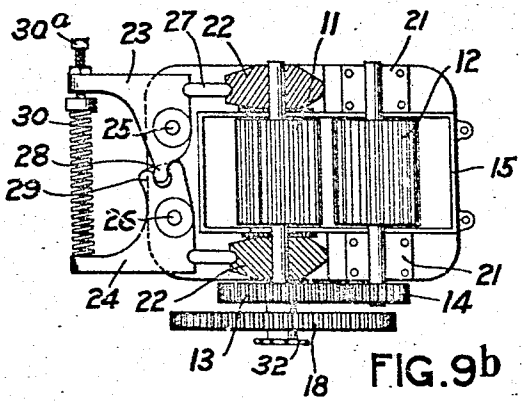
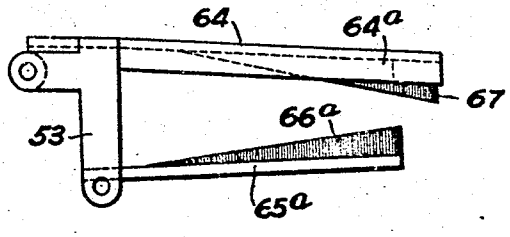
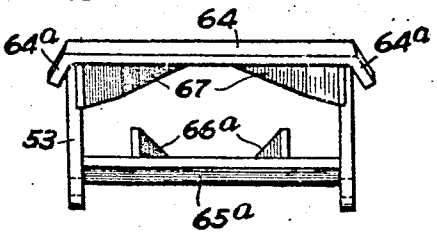


FIG.9a

FIG.9b





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AUTOMATIC STOKER.

986,870. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed September 9, 1909. Serial No. 516,971.

To all whom it may concern:

Be it known that I, ARTHUR R. SELDEN, a citizen of the United States, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Automatic Stokers, of which the following is a specification.

This invention relates to automatic stokers, and particularly to that class in which the fuel is delivered to the furnace by fluid pressure, and distributed over the grates by an automatically operated spreader or distributer.

One object of the invention is to produce a stoker having a distributing device of simple form by which the fuel may be uniformly discharged over the entire surface of the furnace-grate, and another object of the invention is to provide the stoker with simple and effective means for insuring the free flow of the fuel in the fuel hopper.

To the above ends the invention consists in the automatic stoker hereinafter described, as it is defined in the succeeding claims.

In the drawings:—Figure 1 is a side elevation of a device embodying this invention; Fig. 1ª is a partial side elevation showing a modified form of mechanism for operating the distributer; Fig. 2 is a front view of the device of Fig. 1; Fig. 3 is a side elevation of one form of fuel-distributer or spreader; Figs. 4 and 5 are end and plan views of the same, respectively; Fig. 6 is a perspective view of the vanes used on the spreader shown in the preceding three figures; Figs. 7, 8 and 9 are plan, end and side views, respectively, of another form of spreader; Figs. 9ª and 9ᵇ are side and end views of still another form of spreader; Fig. 10 is a central, longitudinal, vertical section of the fuel-granulator or crusher; Fig. 11 is a sectional plan view on the line 11—11 of Fig. 10; and Fig. 12 is a section on the line 12—12 of Fig. 10.

The invention in question is shown in connection with a machine in which the fuel is discharged from the hopper into a screw conveyer, whereby it is delivered to a pipe through which it is discharged by an air blast into the furnace. The frame 1 of the machine rests upon the floor, and supports a motor 2 and blower 3 that are connected by a belt 4. The discharge pipe 5 from the blower extends through the front plate 6 of the furnace, and terminates near the inner face of the front wall. Above the blower 3 is the fuel hopper 7 (Fig. 10) that is mounted on a casing 8, the latter containing a feed screw 9 that is rotated by the motor 2 through suitable connections, and carries fuel toward the forward end of the casing 8. The fuel drops from the screw conveyer through an aperture 10 upon a pair of serrated rolls 11 and 12, which are rotated toward each other, as indicated, and at different speeds by gears 13 and 14 of different radius that mesh together outside their inclosing case 15 (Fig. 11). The gears 13 and 14 are driven by the motor 2 through a belt 16 (Fig. 1), a pinion 17, and a gear 18 (Fig. 11), the latter being carried on the shaft of the roll 11. The differential rotation of the rolls 11 and 12 causes a grinding action as well as a crushing action upon the fuel that falls between them. The general arrangement of the fuel-hopper, the feed-screw, and the crushing-rolls is not claimed as a part of the present invention, since it is disclosed and claimed in the applicant's co-pending application filed December 18, 1908, Serial No. 468,220. The ground fuel falls from between the rolls into the blast pipe 19 that conducts air from the blower to the furnace, and is carried through said pipe by the air-current, which discharges it against the spreader 20 (Fig. 1), which presently will be described. Inasmuch as rock and other substances that are too hard to be crushed by rollers such as those employed in these machines, are frequently contained in the coal and find their way to the rollers, provision must be made for passing them between the rollers. To that end the following mechanism is employed: The roll 12 is rotatably supported in stationary bearings 21, 21, but the roll 11 has bearings 22, 22 (Fig. 11) that are adapted to slide along the frame 15. A pair of bell cranks 23, 24, are pivoted at 25 and 26, respectively, and connected to the bearings 22 by links 27. The bell cranks are made interacting by lugs 28 and 29 that connect their inner ends, and a coiled spring 30 is suspended between their outer ends. When unbreakable material is caught between the rolls 11 and 12, the roll 11 is caused to move toward the rear, thereby swinging the bell cranks 23 and 24 about their pivots and compressing the spring 30. The space between the rolls is thus increased

sufficiently to enable the piece to pass through into the blast pipe, without unduly straining or breaking the mechanism. Thereupon the spring 30 pushes the bell cranks 23 and 24 back to their normal positions, which moves the bearings 22 back also and carries the roll 11 to its proper position with respect to the roll 12. The screw 30^a adjusts the pressure of the spring 30.

The fuel-feed screw 9 is constantly driven by a chain 31 (Fig. 1) that runs over a small sprocket 32 on the shaft of the roll 11, and over a large sprocket on a shaft 33, which in turn is connected with said screw by bevel gears 34.

If the fuel contained in the hopper is fine, and particularly if damp, it is apt to mass together, and to adhere to the sides of the hopper, so that it bridges the opening into the screw-casing 8. A device is therefore provided for breaking the bridge over this opening, and causing the fuel to flow freely. A series of flat strips or bars 35 (Fig. 10) lie close to the inner face of one side of the hopper 7, and are pivoted thereto at their upper ends. The lower ends of said strips are connected by a link 36, and are practically parallel. An operating rod 37 projects from said link through the front end of the hopper (Fig. 12), where it is connected with a crank 38 on the upper end of a vertical shaft 39. The lower end of this shaft has another crank 40 (Fig. 2) carrying at its end a roller that projects into a cam 41 on a horizontal shaft 42, and the latter is driven by a chain 43 from the shaft 44 that carries the pinion 17 (Fig. 1). The rotation of the shaft 42 and the cam 41 rocks the shaft 39 back and forth, and the rod 37 is moved in and out of the hopper 7. This causes the bars 35 to swing along the inner face of the hopper, so that they scrape off the fuel that sticks to it, and also causes the link 36 to move up and down through the opening into the screw-casing 8, stirring the fuel at this point and effectively preventing it from bridging.

The spreader or fuel-distributer 20 is a plate that has vertical vanes that are disposed at various angles to its longitudinal center and which project from its under side into the stream of air and granulated fuel that issues from the end of the pipe 5. The spreader is adapted to oscillate on a horizontal trunnion, and may be tilted to an oblique position of greater or less angularity to the grates, as may be desired. The vertical vanes are so arranged that a part of the fuel impinges against them at all times, and is deflected toward the sides of the grates, but the angle of deflection varies with the angle of inclination of the deflecting plate, being greatest when said plate is in its extreme oblique position and becoming uniformly less as the plate approaches the horizontal. The result is an even distribution over the grates.

The spreader 20 is hung on a trunnion 45 that is preferably carried by the end of the pipe 5, in which case a pitman 46 has a slot connection at one end with a pin 47 on the side of the spreader above said trunnion, and at its other end is connected with a lever 48 that is pivoted on the frame 1 at 49. The lever 48 is rocked in turn by a pitman 50, that forms a connection between said lever and a crank 51 on the constantly driven shaft 42.

Referring first to Figs. 3, 4, 5 and 6, which illustrate one form of the fuel-spreading device, 52 is a plate with arms 53, 53 that are bored at 54 to receive the trunnion 45. A smaller plate 55 is carried by said arms 53 (preferably integral with them) that is parallel with the plate 52. A pair of vertical vanes 56, 56 are secured between said plates 52 and 55. They are represented as angularly adjustable by means of a stud 57 at one end of each (the inner end in position) which enter and are secured within corresponding holes in the plate 52, and a bolt 59 which locks each near its other end in an arcuate slot 58. At its upper, forward end each vane 56 has a shoulder 60 that presents a vertical side extending outwardly and forwardly at an angle from the outer, vertical face of the vane, so that the angle between the portion 60 and the central vertical plane of the plate 52 is greater than the angle between said plane and the main portion of the vane. Another vane 61 is carried by the upper plate 52 at the forward end of the latter at a point that is approximately equidistant from said vertical vanes 56, 56, and which projects downwardly at its outer extremity approximately a distance equal to the depth of the portions 60, 60 of the vanes 56, 56. Geometrically considered, this vane 61 is a triangular pyramid, with two surfaces 61^a, 61^a, that are similar to each other, so that when the vane lies with its third side against the under side of the plate 52, and with the apex 61^b of the vane as its innermost extremity, its said sides 61^a, 61^a taper inwardly from the end of said plate 52, and diverge from each other at the same angle with the vertical, longitudinal plane of said plate 52. The vane 61 may be attached adjustably to the plate 52 as by a pin 62 near the apex of said vane, which enters and is secured within a hole in said plate at its longitudinal center in combination with a bolt 63 that is locked within an arcuate slot 52^a in said plate. Finally, the plate 52 is preferably tapered inwardly on each side, and the tapered wings 52^b, 52^b thus formed on its edges are turned downwardly, according to requirements for grates of different dimensions. The operation of this spreader is as

follows: When the spreader is horizontal, part of the fuel, which is discharged from the feed pipe 5 in a steady stream, at approximately uniform velocity, encounters the lower portions of the diverging vanes 56, 56, and part of it is deflected so that it falls on each side of the spreader, while the central part of the stream is thrown upon the grates directly in front of the door. But as the spreader is moved downwardly into an oblique position, the upper plate 52 concentrates the stream of fuel and brings into it the vanes 60, 60 and 61 which direct the fuel into the corners of the fire box, during the time that the plate is in the lower position. The lower plate 55 prevents the accumulation of fuel at the mouth of the feed pipe. Furthermore, the two parallel plates working together confine the draft sufficiently to insure the delivery of the fuel at the point where it encounters the vanes 60, 60 and 61, and at the same time the open sides permit the air to spread out to all parts of the grate instead of being concentrated upon it with undesirable blow-pipe effect.

The spreader shown in Figs. 7, 8 and 9 is of the same type as that described above, in that it comprises two separated, parallel plates 64 and 65 that rock together as a single, rigid structure, with deflecting vanes between them, some of which encounter the stream of fuel only in certain positions of the spreader. Attached to the lower plate 65 are two diverging vanes 66, 66, in positions corresponding with those of the vanes 56, 56 on the spreader previously described, but differing from them in that here they are tapered inwardly, extending at their highest point only part way to the upper plate 64, instead of all the way as in the other form. Furthermore, in place of the vanes 60, 60 and 61 that project down from the upper plate 52, we have in the form we are now describing two similar vanes that diverge in straight lines as they extend outwardly till near the outer end of the separator where they bend sharply outwardly. The angles of the vanes 66, 66 and 67, 67 to the longitudinal center of the separator may vary according to requirements, and is determined by experiment as the grates vary in dimensions. The sides of the plate 64 are also preferably tapered inwardly, and turned downwardly in wings 64^a, 64^a. In operation, the fuel pours, as before, in a steady, uniform stream, straight through the spreader whenever it is horizontal, except for so much of it as is diverted to the sides by the vanes 66, 66 and 67, 67. And, inasmuch as the vanes 66, 66 and 67, 67 extend, in both cases, through part only of the space separating the plates 64 and 65, the vanes 66, 66 will be withdrawn from the stream, and the vanes 67, 67 made to deflect more of it, as the spreader turns downwardly to its extreme oblique position, and vice versa.

In Figs. 9^a and 9^b we have a construction the same as the modification last described (Figs. 7–9), with the exception of the lower plate 65^a and its vanes 66^a, 66^a, all of which in this last form are carried farther forward than in the other modification (Fig. 9^a), so that the stream is more concentrated as it is discharged from the spreader, though as in both of the other forms the open sides permit the air to expand, and spread out over the fire on both sides of the spreader.

By tapering the vanes from the end of the plates inwardly, their deflecting action on the stream of fuel is gradually increased and decreased, that of the vanes on the upper plate gradually increasing and that of the lower plates gradually decreasing as the spreader moves from its horizontal to its extreme vertical position, and vice versa.

What I claim is:—

1. In a mechanical stoker, the combination with a feed pipe, of means for discharging fuel therefrom by fluid pressure; a hopper for a fuel supply; means for delivering fuel from the hopper to the feed pipe; a plurality of parallel bars suspended pivotally at the inner surface of one side of the hopper and connected at their lower ends with an operating bar; and means for oscillating the frame thus formed; substantially as shown and described.

2. In a mechanical stoker, the combination of a feed pipe, means for discharging fuel therethrough with high velocity, a spreader pivotally mounted at the discharge end of the feed pipe, the spreader comprising upper and lower plates having longitudinally-diverging deflectors on their inner surfaces extending, respectively, downward and upward part-way across the space between the plates, the deflectors on the lower plate having fuel-engaging surfaces of less inclination than the deflectors on the upper plate, and means for oscillating the spreader vertically to throw said deflectors alternately more and less into the path of the fuel.

3. In a mechanical stoker, the combination of a feed pipe, means for discharging fuel therethrough with high velocity, a spreader pivotally mounted at the discharge end of the feed pipe, the spreader comprising upper and lower plates having longitudinally-diverging deflectors on their inner surfaces extending, respectively, downward and upward part-way across the space between the plates, the deflectors on the upper plate tapering in depth toward the feed pipe, the deflectors on the lower plate having fuel-engaging surfaces of less inclination than the deflectors on the upper plate, and means for oscillating the spreader

vertically to throw said deflectors alternately more and less into the path of the fuel.

4. In a mechanical stoker, the combination of means for projecting a definite stream of fuel at high velocity into a furnace in a substantially horizontal direction, an upper spreader-member provided with deflecting-surfaces arranged at a comparatively great angle laterally, with respect to said stream, a lower spreader-member provided with deflecting-surfaces arranged at a less angle in the same direction, and means for oscillating said members vertically to throw them alternately into and out of full operative relation with the stream of fuel.

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Witnesses:
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