Nov. 17, 1931. C. J. HANIMAN 1,832,459

CHAIN GRATE STOKER

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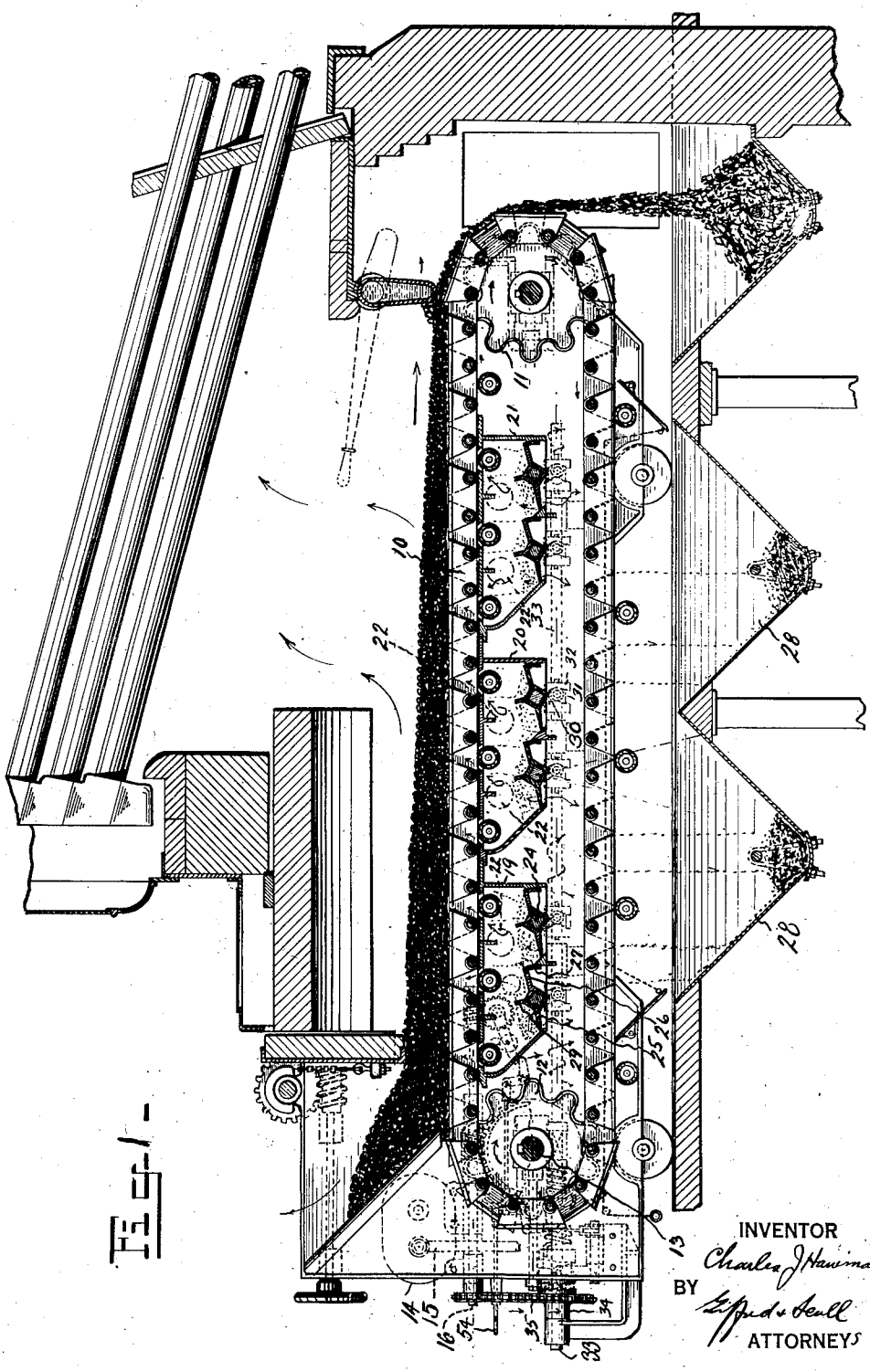
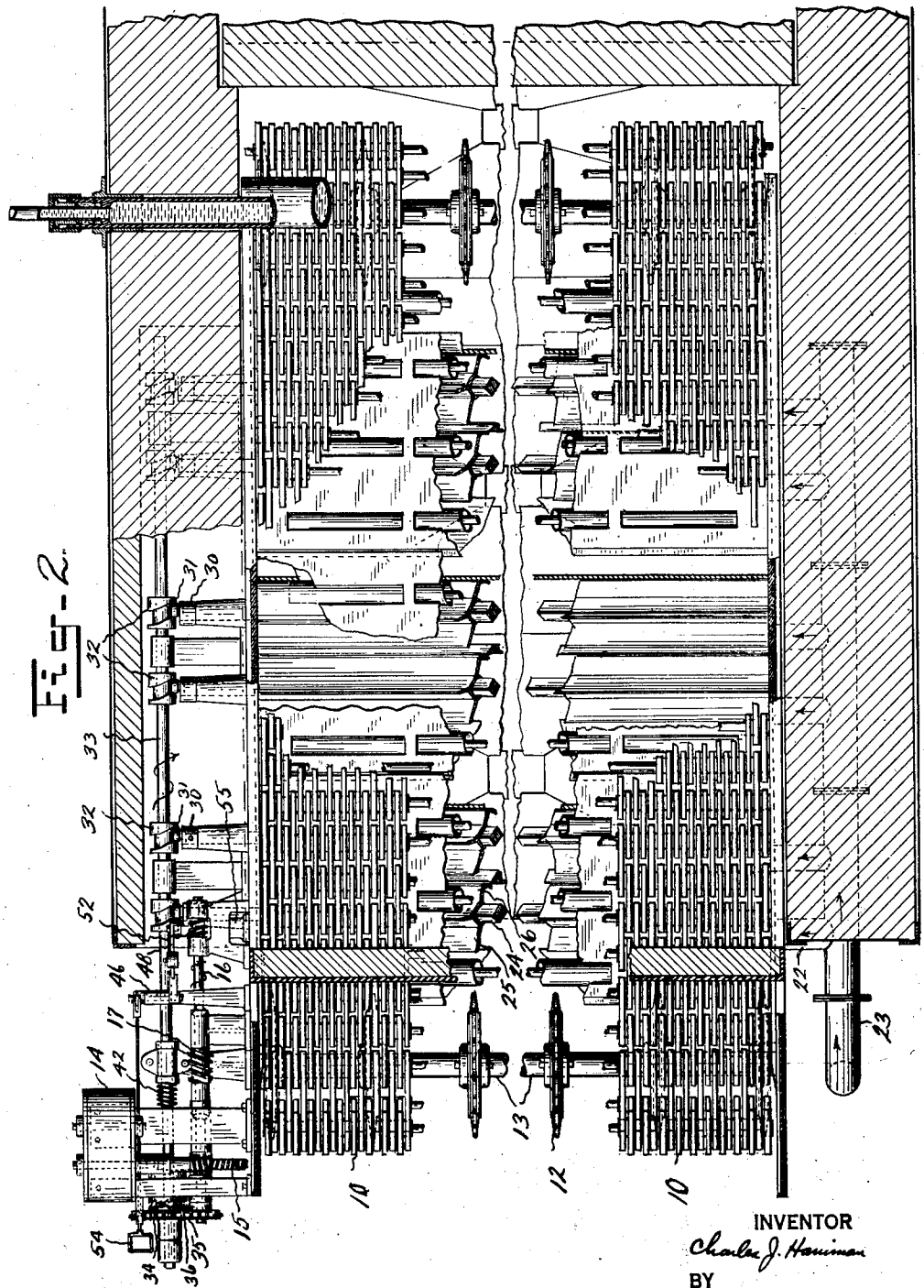


Fig. 1

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CHAIN GRATE STOKER

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CHAIN GRATE STOKER

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Fig. 5

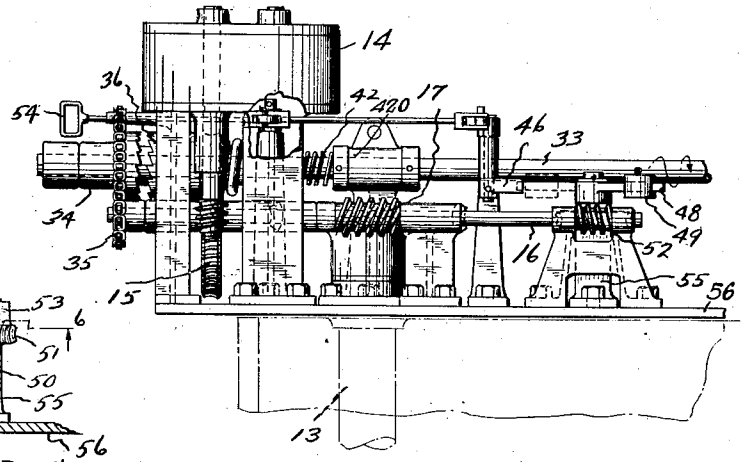


Fig. 7

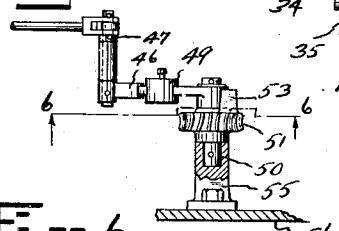


Fig. 6

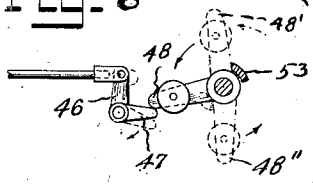


Fig. 4

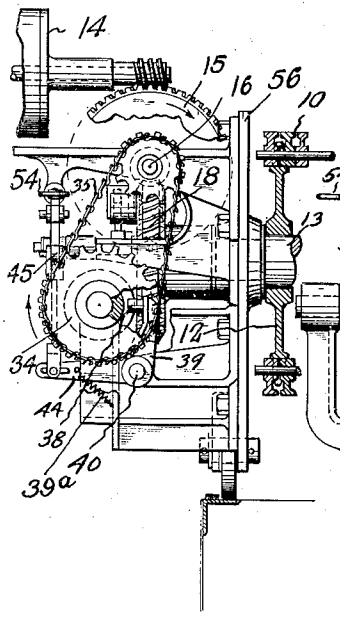


Fig. 3

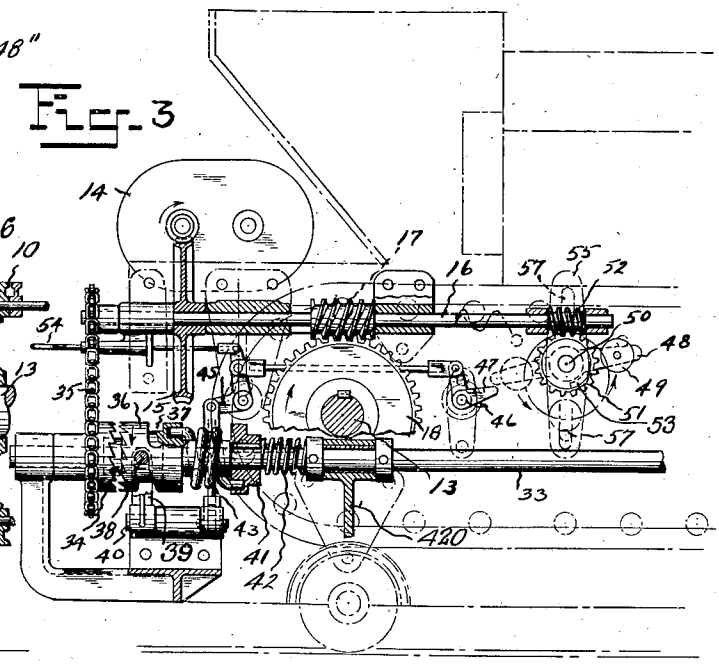
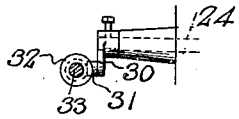


Fig. 1a



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UNITED STATES PATENT OFFICE

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CHAIN GRATE STOKER

Application filed June 25, 1925. Serial No. 39,408.

My present invention relates to chain grate stokers, and particularly to such stokers in which the combustion air is fed to the fuel through air boxes located between the runs of the grate, and will be best understood from the following description and the annexed drawings in which Fig. 1 is a side sectional elevation of a chain grate to which my invention has been applied; Fig. 1ª is a side view of a detail portion of Figs. 1 and 2; Fig. 2 is a fragmentary plan of the chain grate with parts cut away to show the driving mechanism and the draft boxes with the ash handling equipment between the runs of the grate; Fig. 3 is an enlarged side elevation, partly in section, of some of the mechanism shown in Fig. 1; Fig. 4 is an end view of the parts shown in Fig. 3, with some of the parts in section; Fig. 5 is a plan view of the parts shown in Fig. 3; Fig. 6 is a separate view of a detail shown in Fig. 3, being a section taken on line 6—6 of Fig. 7, and Fig. 7 is a plan view of parts shown in Fig. 6.

Like reference characters indicate like parts throughout the drawings.

In the illustrative embodiment shown in the drawings, I have chosen for purposes of illustration a well-known form of chain grate in which the chains 10 of the grate are carried on sprocket wheels 11, 12, the latter being connected to a driven shaft 13, driven by a motor 14 through a worm gear 15 on a shaft 16, the shaft 16 carrying a worm 17 meshing with a worm gear 18 on the shaft 13, so that 14 may be a high-speed motor and through the reduction gearing, the chain 10 will be moved slowly to carry the fuel from the fuel hopper through the combustion chamber. Since the specific form of chain grate is not part of my present invention, further description thereof will be unnecessary to those skilled in the art.

In the form of grate illustrated, air under pressure is supplied to the fuel on the grate through air boxes 19, 20 and 21, the air entering such boxes through ducts 22 connected to an air supply duct 23, all in the usual manner.

The openings through which the air from the air boxes finds its way upward through the chain 10 to the fuel bed also permit siftings from the fuel to fall downward into the air boxes and, unless such siftings are removed, the air boxes would soon become clogged and prevent the inflow of the combustion air.

In the specific form of air box, which I have illustrated, openings are provided in the bottom of each air box extending across the width of the grate, each of these openings being controlled by an oscillating flap valve which is normally closed. Since these flap valves are the same for each opening, it will be understood that a description of one will apply to all of the others.

Above the opening in the air box extends a shaft 24 which preferably is made square and on which is a flap valve having wings 25 and 26 extending from opposite sides of the shaft 24. The wing 25 is formed to rest against a valve seat and, in the illustrative form, the wing 26 is provided with an arc-shaped end 27 which cooperates with an arc-shaped portion of the air box. When the shaft 24 is turned in a clockwise direction in Fig. 1, it will be obvious that the wing 25 will rise from its seat and permit any siftings accumulated above it in the air box to be blown out by the air pressure onto the lower run of the chain 10, such siftings finding their way through the openings in the chain into hoppers 28. By reason of the arc-shaped portion 27, however, the turning of the shaft 24 will not open the valve on that side. This arrangement is provided so that the valve will remain more nearly air tight than if this arc-shaped portion were not provided. Preferably the wing 25 is made slightly larger in area than the wing 26, so that the air pressure in the air box will tend to hold the wing 25 closed on its seat to prevent air leakage and the arc-shaped portions serve to seal the other side of the valve. Furthermore, this arc-shaped portion minimizes the possibility of large pieces of siftings remaining on the valve to prevent its closing. If the wing 26 were made to contact with a valve seat cooperating with its upper portion, it would be possible for some of the siftings to lodge between the wing 26 and such seat when the shaft 24 is

turned counterclockwise to close the opening.

It will be noted that I have provided, in the illustrative embodiment, a pair of openings each controlled by a flap valve such as just described. Preferably, I arrange these valves so that when the shaft 24 is turned clockwise, as seen in Fig. 1, the wing 26 will be sloping in a downward direction, so that siftings collected thereon will slide through the opening at the right-hand side of the air box produced by the tilting of valve on that side. If desired, the valves may be provided with projections 29 which will stir up the accumulated siftings in the air box at each oscillation of the shafts 24. Projection 29 also acts as a web reinforcement to strengthen the air valve longitudinally.

It will be obvious that if the valves controlling the openings from the air boxes remain open for any considerable length of time, there would be a loss of the air under pressure and also a disturbance of the air supply to the fuel. To avoid this, I have provided mechanism by which the valves may be opened automatically but in such a manner that they will remain open for only a short time. Furthermore, I preferably provide mechanism by which these valves are opened automatically at predetermined intervals, the space between such intervals being relatively long and, of course, in accordance with the rapidity of accumulation of siftings in the boxes.

In the illustrative embodiment, each shaft 24 is provided at its end with a lever 30 having a cam roller 31 engaging the groove in a cam 32 connected to a shaft 33, the groove in the cam 32 being arranged so that when the shaft 33 is given a single rotation, the lever 30 will be given one complete oscillation, and consequently the valves opened and closed.

On the end of shaft 33 and loosely mounted thereon, are the cooperating positive clutch members 34 and 36, provided with the usual clutch teeth, member 34 being driven from shaft 16 through chain 35.

Shaft 33 is to be given one rotation only for each cycle, and the following mechanism is provided so that the shaft may be started when desired and stopped at the end of one rotation.

The hub of clutch member 36 is provided with a spiral groove 37. As shown in Fig. 3, this is in the nature of a screw thread, but of slightly less than 360° in length. It will be obvious that, if a pin, as 38, is held in this groove as the member 36 rotates, the member 36 will be given an endwise movement if pin 38 cannot move endwise. It will also be obvious that, so long as pin 38 is in groove 37 in the position shown in Fig. 3, member 36 cannot rotate in the direction of the arrow (the direction in which the constantly running member 34 tends to rotate shaft 33) because pin 38 abuts against one end of groove 37.

Pin 38 is mounted on the end of lever 39, which, in turn, is fastened to shaft 40. The weight of lever 44 attached to shaft 40 (for a purpose to be described later), aided, if desired, by a spring 39a, gives a counter-clockwise (as viewed in Fig. 3) bias to lever 39. This tends to maintain pin 38 in the position shown in Figs. 3 and 4, with pin 38 in groove 37.

Splined to shaft 33 is a driving member 41, the splined connection permitting movement of member 41 axially of shaft 33, while holding it against rotation on shaft 33. The hub of clutch member 36 is extended (with a relatively small diameter inside of spring 43, which spring will be described hereinafter) into contact with driving member 41, spring 42, abutting against a bearing for shaft 33, biasing driving member 41 and clutch member 36 towards the left in Fig. 3, the pin 38 (when in the positions of Figs. 3 and 4) preventing any motion, however, in this direction.

A yielding driving connection between member 36 and member 41 is provided by the helical spring 43, surrounding that part of the hub of member 36 which has the reduced diameter, and having one end entered in a hole in the hub of member 36 and the other end in a hole in member 41. Spring 43 constitutes one of several well-known forms of yielding and shock-absorbing driving connections between rotating parts, which may be used to transmit rotation from member 36 to member 41.

To the shaft 40 is connected a lever 44, which, in turn, is connected to a bell crank 45, connected, in turn, to a bell crank 46, the free end or toe portion 47 of which is arranged to be struck by the end of an arm 48 provided with a weight 49 and freely mounted on a fixed stud 50. The stud 50 is provided with a worm wheel 51, driven by a worm 52 on the shaft 16, the worm wheel 51 having a projection 53 turning in the plane of the arm 48. A handle 54 is connected to the bell crank 45 to permit a manual disengagement of pin 38 from the groove in the clutch member 36 to secure extra ash dumping movement.

With the parts in the position shown in Fig. 3, the rotation of the shaft 16, as the chain grate is in operation, will turn the worm gear 51 counterclockwise in Fig. 3, the projection 53 engaging the arm 48 to lift it to a vertical position. As soon as the arm 48 has reached the position 48′ in Fig. 6, it will fall by gravity to the full-line position in that figure and will strike the arm 47 to turn it to the dotted-line position of Fig. 6. This will rotate the shaft 40 clockwise in Fig. 4 and will withdraw the pin 38 from the groove 37. The spring 42 now moves the clutch member 36 to the left in Fig. 3 to cause the

clutch teeth thereon to engage with the clutch teeth of the member 34 which is being turned through the chain 35 from the shaft 16. The clutch member 36 now begins to turn and transmits its motion through the spring 43 to the member 41 and consequently to the shaft 33, so that the cams 32 begin to rotate to oscillate the shafts 24.

As arm 46, 47 is swung downward by arm 48, the latter passes the former and moves to position 48'' of Fig. 6. Arm 46 is now free to return to its full line position of Fig. 6 and pin 38 is therefore again biased counterclockwise in Fig. 4, by the weight of lever 44 and the pull of spring 39a. The longitudinal movement of member 36 to the left of Fig. 3, and its partial rotation while pin 38 is out of groove 37, has brought the other end of groove 37 opposite pin 38, which now again enters groove 37. As the member 36 continues to turn, the pin 38 acts on the groove to cam the clutch member 36 to the right in Fig. 3 to draw the clutch teeth out of engagement, which occurs when the shaft 33 has made one complete turn and the shaft 33 is again brought to rest with the parts in the position shown in Fig. 3. The complete rotation of the shaft 33 will have caused a complete oscillation of the shafts 24 and a consequent quick opening and closing of the valves in the air boxes. The spring 43 is provided to take up any shock due to the sudden starting of the clutch member 36 when its teeth engage with the clutch member 34.

It is obvious that the intervals between operations of the valves may be varied by varying the interval between movements of the arm 48. This is done by changing the size of the gear 51 by which the arm 48 is rotated. To provide that this gear may be of varying size and yet be held in mesh with its driving worm, I mount it upon a supporting bracket 55 adjustably positioned upon the main frame 56 of the grate. A slot 57 is provided in each arm of the bracket 55 to provide for sliding the bracket 55 vertically when the attaching bolts in slots 57 are loosened. At any change of the worm gear 51, the bracket 55 may be moved vertically on its bolts to accommodate the size of the gear and cause the stud 50 to retain the gear meshing properly with the worm. For instance, a larger gear would necessitate a downward movement of the bracket and would cause a relatively larger time interval between operations of the shaft 33 and of the ash handling valves 25.

The handle 54 provides a convenient means by which the shaft 33 may be coupled to the driving power through clutch 36 to be rotated at the will of the operator if, for any reason, the siftings are accumulating in the air boxes faster than the automatic setting of the parts will take care of. This performs a movement which withdraws the pin 38 from the clutch 36 releasing it to permit a rotation of shaft 33 and a rocking of the shafts 24 with their associated valves to dump ashes from the air boxes.

It will be understood that the arrangement which I have shown is merely illustrative and that the embodiment of my invention may be widely varied.

I claim:

1. In combination, a chain grate, means to drive said grate, a wind box below the upper run of the grate and having an opening through which fuel siftings may be discharged, a valve for said opening, valve-operating means disconnectable from the grate-driving means, and timing means to connect and disconnect said valve-operating means to the grate-driving means at predetermined intervals in the travel of the grate.

2. In combination, a chain grate, means to drive said grate, a wind box below the upper run of the grate and having an opening through which fuel siftings may be discharged, a valve for said opening, valve-operating means disconnectable from the grate-driving means, and timing means to connect and disconnect said valve-operating means to the grate-driving means at predetermined intervals in the travel of the grate, said valve-operating means being arranged to be operated by hand by the operator independent of said timing means.

3. In combination, a chain grate, means to drive said grate, a wind box below the upper run of the grate and having an opening through which fuel siftings may be discharged, a valve for said opening, valve-operating means disconnectable from the grate-driving means, and timing means to connect and disconnect said valve-operating means to the grate-driving means at predetermined intervals in the travel of the grate, said valve-operating means being arranged to give the valve a relatively quick opening and closing motion.

4. In combination, a chain grate, means to drive said grate, a wind box below the upper run of the grate and having an opening through which fuel siftings may be discharged, a valve for said opening, valve-operating means including a clutch between the grate-driving means and the valve, and timing means to operate said clutch at predetermined intervals in the travel of the grate.

5. In combination, a chain grate, means to drive said grate, a wind box below the upper run of the grate and having an opening through which fuel siftings may be discharged, a valve for said opening, valve-operating means including a clutch between the grate-driving means and the valve, and timing means to operate said clutch at pre-

determined intervals in the travel of the grate, said timing means being arranged to open said clutch after the valve has been opened and closed.

6. In combination, a chain grate, means to drive said grate, a wind box below the upper run of the grate and having an opening through which fuel siftings may be discharged, a valve to control said opening, and means independent of the grate to open and close said valve at predetermined intervals and in quick time relative to the rate of travel of said chain grate.

7. In combination, a chain grate, a wind box below the upper run of the grate, a flap valve forming part of the bottom of the wind box pivoted between its edges, and arranged with one edge resting on a valve seat and the other edge having an arc-shaped portion cooperating with an arc-shaped portion of the wind box, whereby, when the valve is oscillated on its pivot, siftings may fall from the wind box at one side of the valve only, and means to oscillate said valve.

8. In combination, a chain grate, a wind box below the upper run of the grate, a pair of flap valves forming part of the bottom of the wind box, each of said valves comprising a flat plate pivoted between its edges and having one of its edges engaging a valve seat and its other edge arc-shaped and cooperating with an arc-shaped portion of the wind box to seal the last-named edge when the valve is oscillated to move the first-named edge from its seat, one of said valves being arranged to dump siftings collected thereon into the opening controlled by the other of said valves, when the valves are oscillated to open position, and means to oscillate said valves.

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