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3 SHEETS—SHEET 1.



23 ⁴ Inventor:
 Enoch P. Stevens
 By Anthony Bette Keller Attys

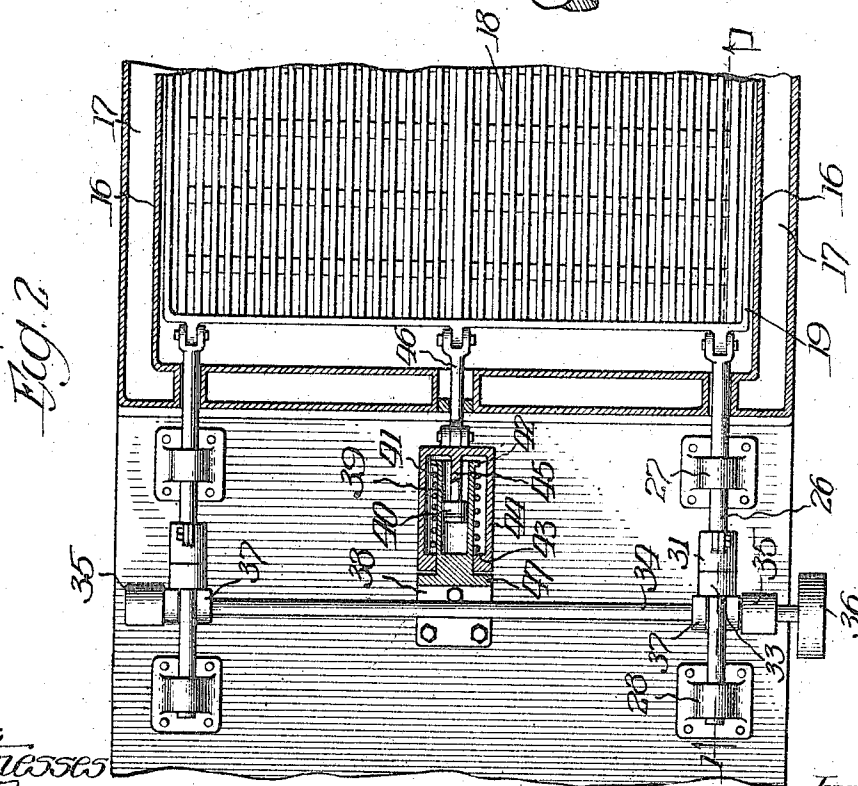
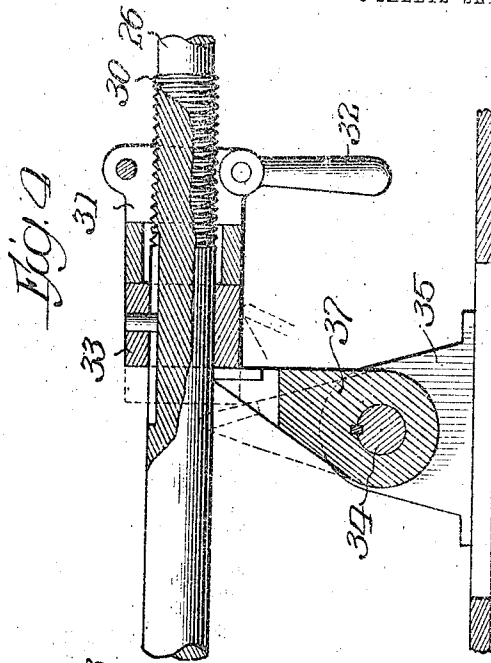
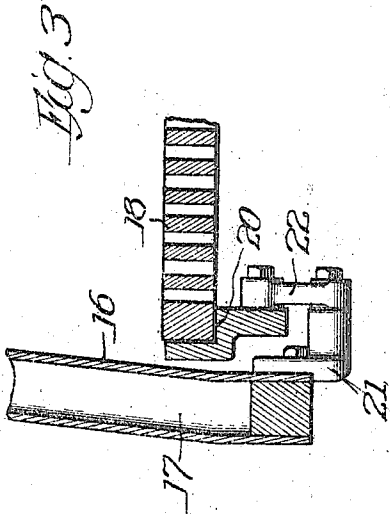
E. P. STEVENS.
STOKER.

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3 SHEETS—SHEET 2.



Witnesses
H. B. Barrett
Henry M. Murphy.

Inventor
E. P. Stevens

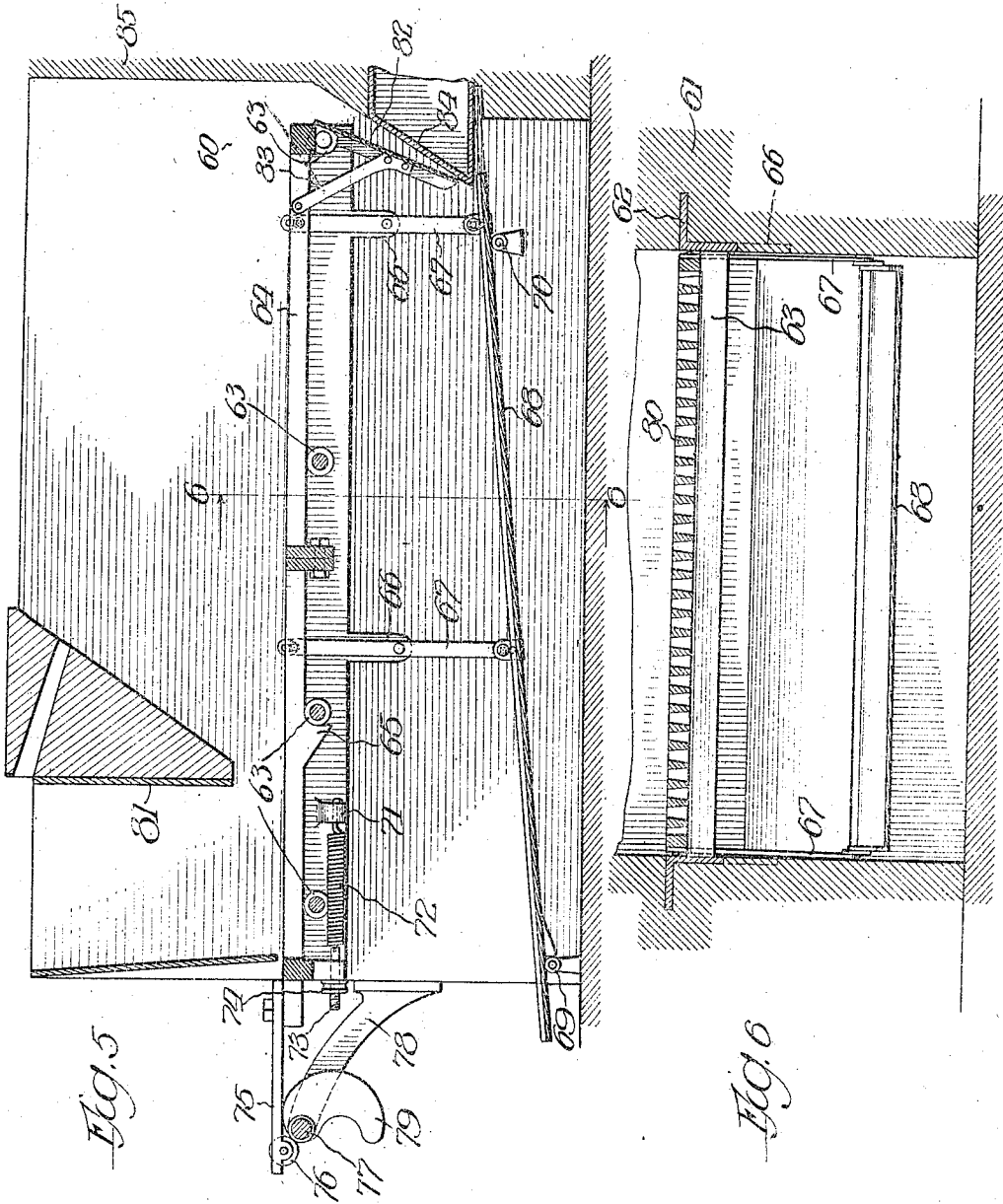
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3 SHEETS—SHEET 3.



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S. Barrett
Henry H. Murphy.

Inventor:
Enoch P. Stevens
By Smith, Belk & Haller
Attys.

UNITED STATES PATENT OFFICE.

ENOCH P. STEVENS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-FOURTH TO JOSEPH HARRINGTON, OF RIVERSIDE, ILLINOIS.

STOKER.

1,127,940.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ENOCH P. STEVENS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Stokers, of which the following is a specification.

My invention relates to automatic stokers, and refers particularly to that class of stokers in which the fuel is automatically advanced through the fire box of the furnace.

The object of my invention is to provide simple and efficient mechanism by which the body of fuel is advanced along the grate, and this result I accomplish by providing means for reciprocating the grate as a whole. This reciprocation is gradual in one direction and rapid in the opposite direction, with the result that the inertia of the fuel itself is utilized to advance the fuel over the grate surface.

As an auxiliary object of my invention, I also provide means for automatically delivering the ashes from an ash pan while the body of fuel is being moved over the grate surface.

My invention is particularly useful in locomotive fire boxes, but may also be advantageously used in stationary furnaces.

These and other advantages of my invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section through the fire box of a locomotive, showing my improved stoker in position. This view is taken on the line 1—1 of Fig. 2. Fig. 2 is a plan and partial horizontal section of a portion of the grate shown in Fig. 1 and the actuating mechanism therefor. Fig. 3 is a fragmentary vertical transverse section taken on the line 3—3 of Fig. 1. Fig. 4 is a fragmentary enlarged side elevation and partial sectional view of the cam mechanism and its associated parts for actuating the grate. Fig. 5 is a vertical longitudinal section through the fire box of a stationary furnace, showing a modified form of construction. Fig. 6 is a vertical transverse section taken on the line 6—6 of Fig. 5.

Referring first to Figs. 1 to 4, inclusive, I will describe the form of stoker which is

particularly applicable for use in locomotive fire boxes. The fire box 10 is provided with the front wall or flue-sheet 11, in connection with which is formed the water-leg 12. The rear wall 13 of the fire box has the water-leg 14, and has passing therethrough the fire door 15. The side sheets 16 of the fire box 10 have on their outer sides the water-legs 17.

The grate bars 18 are supported in a grate frame 19, of rectangular shape, as best shown in Fig. 2. Around its edge this grate frame 19 is offset, forming the shouldered support 20 for the grate bars 18, as clearly shown in Figs. 1 and 3.

Attached to the side sheets 16 of the fire box are the two brackets 21, which are preferably placed opposite to each other on the two sides of the fire box. Attached to each of the brackets 21 is the link or toggle 22, which is pivotally attached to the grate frame 19. Toward the front end of the fire box 10 the brackets 23 are attached to the side sheets 16, and these brackets serve to pivotally support the plate 24 having the reinforced or enlarged edges 25, 25. This plate is also pivotally attached to the front end of the grate frame 19.

Pivotally attached to the rear end of the grate frame 19 are the two propelling shafts 26, each of which passes through the bearing guides 27 and 28, which are suitably attached to the floor 29. Each of the shafts 26 is provided with a threaded portion 30 on which is mounted the correspondingly threaded adjusting block 31 having thereon the handle 32. The adjusting block 31 engages the bearing block 33, which has feathered connection with the shaft 26. It will be readily understood that the position of the bearing block 33 on the shaft 26 may be adjusted by rotating the adjusting block 31. The main driving shaft 34 extends in a transverse direction and is carried in the bearings 35. This driving shaft 34 is rotated by any suitable mechanism, as for example, a belt engaging the pulley 36 on the end of the shaft 34. Rigidly mounted on the shaft 34 are the cams 37, which are adapted to engage the bearing blocks 33 carried by the shafts 26.

Bolted to the floor 29 is the bracket 38, which is integral with the cylinder 39 within which the piston 40 operates. The cylinder

39 is inclosed by a spring 41 bearing on one end against the flange 42 of the cylinder 39 and on the other end against the inwardly extending flange 43 of the sleeve 44. This sleeve 44 is provided with the piston rod 45 attached to the piston 40. The link 46 connects the sleeve 44 with the rear end of the grate frame 19. It will be clear that the tendency of the spring 41 is to move the sleeve 44 and the grate frame 19 to the rear until the flange 43 of the sleeve 44 engages the flange 47 of the bracket 38.

In order to supply fuel, such as coal, to the grate bars 18, I provide the conduit 48 having the open portion 49 adjacent to the grate surface. The conveyer 50 passes through the conduit 48 and serves to bring the fuel into position at the rear end of the grate. This feeding mechanism for the fuel forms no part of my present invention.

Having thus described the construction of the parts shown in Figs. 1 to 4, inclusive, the operation of the same may now be readily understood: The driving shaft 34 is constantly rotated in a clockwise direction. When the cams 37 engage the bearing blocks 33, the latter, together with the shafts 26 and the grate frame 19, are forced forward. This movement continues until the cams 37 have rotated sufficiently so that they become disengaged from the bearing blocks 33. When this happens, the spring 41 becomes effective and rapidly moves the grate to the rear. Toward the rear end of the movement of the grate frame and its associated parts motion is eased by the action of the dash-pot constituted by the cylinder 39 and the piston 40. The rearward movement of the various parts then continues slowly until the flange 43 of the sleeve 44 engages the surface 47 of the bracket 31. As the grate frame moves forward by the action of the cams 37, it will be evident that it is rocked on the links 22 and the plate 24, and the bed of fuel resting on the grate bars 18 is, of course, carried forward with the grate. When the rapid movement to the rear takes place the inertia of the fuel causes it to maintain its position and the grate is moved back from under the fuel. As this reciprocatory movement takes place, slowly in one direction and rapidly in the other, the fuel is gradually advanced over the grate toward the front end of the furnace. The ashes pass over the front end of the grate and fall through the space 51 between the front end of the grate and the water-leg 12. The air which is introduced below the grate passes upwardly through the bed of fuel in the usual manner. It is prevented from passing in front of the front end of the grate by means of the partition 52 and the plate 24.

A second embodiment of my invention is illustrated in Figs. 5 and 6. The fire box

60 is provided in its side walls 61 with the angle irons 62. Extending transversely of the fire box and between these angle irons are the rollers 63, which serve to support the grate frame 64. This grate frame is provided on its two sides with the downwardly projecting abutment members 65 adapted to engage one of the cross rollers 63. The angle irons 62 mounted in the side walls 61 are provided with the downward extensions 66. To these extensions 66 are pivotally fastened the levers 67, which, at their upper ends, have slotted connection with the grate frame and at their lower ends have slotted connection with the ash pan 68, the latter being supported on the transverse rollers 69 and 70.

Formed integral or suitably attached to the angle irons 62 are the lugs 71, to each of which is attached one end of the spring 72, the opposite ends of each of these springs being suitably attached to the grate frame 64 by means of the threaded rod 73 and the adjusting nut 74. Attached to the grate frame 64 is the plate 75 bearing thereon the roller 76. The driving shaft 77 is carried in brackets 78 mounted on the main framework of the furnace. This driving shaft carries a cam 79 adapted to engage the roller 76.

Fuel is supplied to the grate bars 80 carried by the grate frame 64 through the hopper 81. At the inner end of the grate frame 64 the metallic curtain 82 is fastened to the grate frame by means of the braces 83, the function of this curtain being to prevent the short-circuiting of air from that portion of the fire box below the grate to the portion of the fire box above the grate, as will be further explained hereafter. When the grate frame is in its normal position, as indicated in Fig. 5, the lower end of the curtain 82 abuts against the sloping surface 84 in the fire box wall 85.

Having thus described the construction of the various parts used in this modification of my invention, its operation may now be readily understood.

The driving shaft 79 is rotated in a contra-clockwise direction, and the cam 79 on this driving shaft engages the roller 76 and gradually moves the grate frame 64 to the left from the position indicated in Fig. 5. If desired, I may employ several cams 79 to engage a corresponding number of rollers 76 in order to insure evenness in the movement of the grate frame. As this movement of the grate frame to the left takes place the ash pan 68 is correspondingly moved to the right. When the roller 76 is freed from its engagement with the cam 79 the spring or springs 72 become effective and rapidly move the grate frame 64 to the right until the abutment members 65 engage the transverse roller 63 against which these abut-

ment members are adapted to come. The result of this sudden stoppage in the movement of the grate frame 64 is to cause the bed of fuel to continue its movement to the right over the grate bars for a short distance by reason of its own inertia. In this manner the fuel is progressively moved by a series of steps along the grate bars and is gradually consumed. A small quantity of ash falls between the grate bars themselves, but a great majority of the ash passes over the end of the grate onto the sloping surface 84. When the grate frame 64 is moved to the left the curtain 82 (which is for the purpose of preventing short-circuiting of the air) is removed from the sloping surface 84 and the ashes are allowed to pass onto the ash pan 68 along which they are advanced in the same manner that the fuel is advanced over the grate bars 80, since as the grate frame 64 moves in one direction the ash pan 68 moves in the opposite direction.

It will be apparent to those skilled in the art that many modifications of the stokers which I have described could be made without departing from the spirit or scope of my invention.

What I claim is:

1. In an automatic stoker, the combination of a fire box having therein a bodily movable grate, means for supplying fuel to said grate, and means for moving said grate as a whole rapidly and abruptly changing its velocity, whereby the fuel on the grate will be advanced thereover by the inertia of said fuel, substantially as described.
2. In a device for feeding fuel along a grate, the combination of a grate bodily reciprocable in a furnace, and mechanism for overcoming the friction of the fuel on the grate as a whole comprising a device for slowly moving the grate bodily in one direction, spring mechanism for rapidly moving the grate bodily in the reverse direction, and a device for abruptly stopping said reverse movement, whereby the fuel is advanced through the furnace by the inertia of said fuel.
3. In a device for feeding fuel along a grate, the combination of a grate bodily reciprocable in a furnace, and mechanism for overcoming the friction of the fuel on the grate as a whole comprising a device for slowly moving the grate bodily in one direction, spring mechanism for rapidly moving the grate bodily in the reverse direction with the fuel, and a device for abruptly stopping said reverse movement, whereby the fuel continues to move upon the grate in the direction of said reverse movement by its inertia.
4. In a stoker, the combination of a bodily reciprocable grate, and mechanism for producing a relative movement between the grate and the fuel thereon comprising a device for slowly moving the grate bodily in one direction, mechanism for quickly moving the grate bodily in a reverse direction, and devices for suddenly stopping the motion of the grate in said reverse direction.
5. In a stoker, the combination of a grate bodily reciprocable in a furnace, means for supplying fuel to one end of the grate, and mechanism for moving the fuel through the furnace toward the other end of the grate comprising a device for slowly moving the grate toward the fuel-supplying means, mechanism for quickly moving the grate in the reverse direction, and stopping mechanism for limiting the motion of the grate in the said reverse direction, whereby the fuel on the grate by its inertia continues to move away from said fuel-supplying means when the grate is stopped.
6. In an automatic stoker, the combination of a fire box having therein a bodily movable grate, means for supplying fuel to said grate, a bodily movable reciprocating ash pan below said grate, and means for simultaneously moving said grate in one direction and said ash pan in the opposite direction, substantially as described.
7. In an automatic stoker, the combination of a fire box having therein a bodily movable grate, means for supplying fuel to said grate, a bodily movable reciprocating ash pan below said grate, means for gradually moving said grate in one direction, means for rapidly moving said grate in the opposite direction, and means for moving said ash pan synchronously with said grate, substantially as described.
8. In an automatic stoker, the combination of a fire-box, a reciprocating grate, a reciprocating ash pan below the grate, means for supplying fuel to the grate, and means for moving and stopping the grate and ash pan to move the fuel and ashes by their inertia upon the grate and ash pan respectively.
9. In an automatic stoker, the combination of a reciprocating grate, a reciprocating ash pan below the grate, operating connections between the grate and ash pan, mechanism for simultaneously moving the grate and ash pan, and devices for producing an abrupt change in velocity of said grate and ash pan.
10. In an automatic stoker, the combination of a reciprocating grate, a reciprocating ash pan below the grate, operating connections between the grate and ash pan, and mechanism for simultaneously moving the grate and ash pan in opposite directions.
11. In an automatic stoker, the combination of a fire-box, a reciprocating grate, means for supplying fuel to the grate, spring means for moving the grate as a whole, and mechanism for producing an abrupt change

in velocity of said grate as a whole to move the fuel on the grate by the inertia of said fuel.

12. In an automatic stoker, the combination of a grate, spring mechanism for moving the grate as a whole, and devices for abruptly stopping said grate as a whole.

13. In an automatic stoker, the combination of a reciprocating grate, a reciprocating ash pan below the grate, operating connections between the grate and ash pan, spring mechanism for simultaneously moving the grate and ash pan, and devices for producing an abrupt change in velocity of said grate and ash pan.

14. In an automatic stoker, the combination of a reciprocating grate, a reciprocating ash pan below the grate, operating connections between the grate and ash pan, and spring mechanism for simultaneously moving the grate and ash pan in opposite directions.

15. In an automatic stoker, the combination of a grate comprising a single structure consisting of a framework and a plurality of grate bars, means for supplying fuel to said grate, spring mechanism for moving said structure as a whole, and devices for producing an abrupt change in velocity of said structure as a whole to move the fuel on the grate by the inertia of said fuel.

16. In an automatic stoker, the combination of a reciprocating grate, a reciprocating ash pan below the grate, mechanism for moving the grate and ash pan, and devices for producing an abrupt change in velocity of said grate and ash pan.

17. In an automatic stoker, the combination of a reciprocating grate, a reciprocating ash pan below the grate, spring mechanism for moving the grate and ash pan, and devices for producing an abrupt change in velocity of said grate and ash pan.

18. In an automatic stoker, the combination of a reciprocating grate, a reciprocating ash pan below the grate, and mechanism for moving the grate and ash pan in opposite directions.

19. In an automatic stoker, the combination of a reciprocating grate, a reciprocating ash pan below the grate, and spring mechanism for moving the grate and ash pan in opposite directions.

20. The combination with a bodily mov-

able grate, of means to move the grate as a whole in the plane thereof to acquire momentum in fuel on the grate, and means to quickly produce relative movement of the grate with respect to fuel thereon in a direction reverse to the movement of the fuel with a suddenness sufficient to break the bond between the fuel and the grate, whereby the fuel may travel on the grate by reason of the momentum of the fuel.

21. The combination with a grate bodily movable through a furnace, of means to move the grate as a whole in the plane thereof, and means to quickly produce relative movement of the grate with respect to the fuel by quickly changing the velocity of motion of the grate as a whole with a suddenness to break the bond between the fuel and the grate, whereby the fuel may travel on the grate in the direction of fuel feed through the furnace by reason of the inertia of the fuel.

22. The combination with a grate bodily movable with fuel thereon through a furnace in the direction of feed of the fuel, of means to produce quick relative movement of the grate as a whole with respect to the fuel thereon with a suddenness sufficient to break the bond between the fuel and the grate, whereby the fuel may travel on the grate.

23. The combination with a grate bodily movable with fuel thereon through a furnace in the direction of feed of the fuel, of means to successively produce quick relative movements of the grate as a whole with respect to fuel thereon with a suddenness sufficient to break the bond between the fuel and the grate whereby the fuel may travel on the grate with a step by step movement.

24. The combination with a grate bodily movable as a whole with fuel thereon through a furnace in the direction of feed of the fuel, of means to change the velocity of the grate with a suddenness sufficient to break the bond between the fuel and the grate and thereby quickly produce relative movement of the grate with respect to the fuel, whereby the fuel may travel on the grate.

ENOCH P. STEVENS.

Witnesses:

T. D. BUTLER,
L. E. HANNEN.