

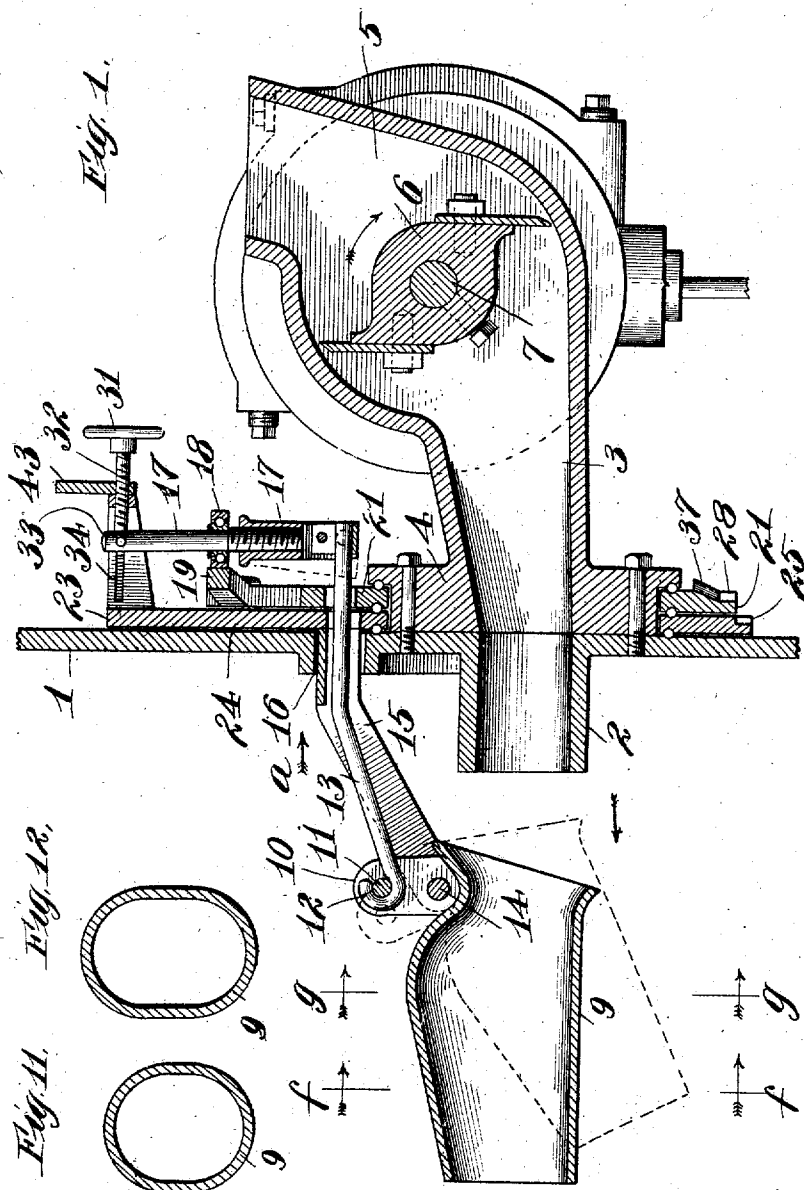
No. 888,787.

PATENTED MAY 26, 1908.

C. W. CROSBY.
METHOD OF STOKING FURNACES.

APPLICATION FILED JULY 21, 1908.

5 SHEETS—SHEET 1.



Witnesses:

J. A. Paulsen
Leon E. Stroh

Inventor:

Clarence W. Crosby,

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Att'y

No. 888,787.

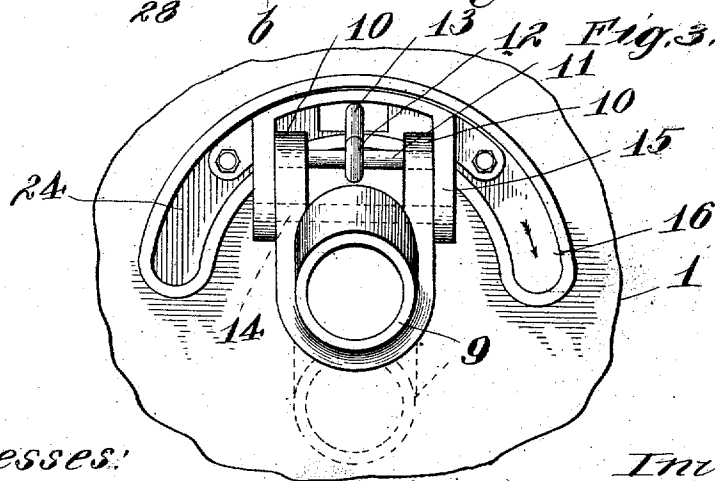
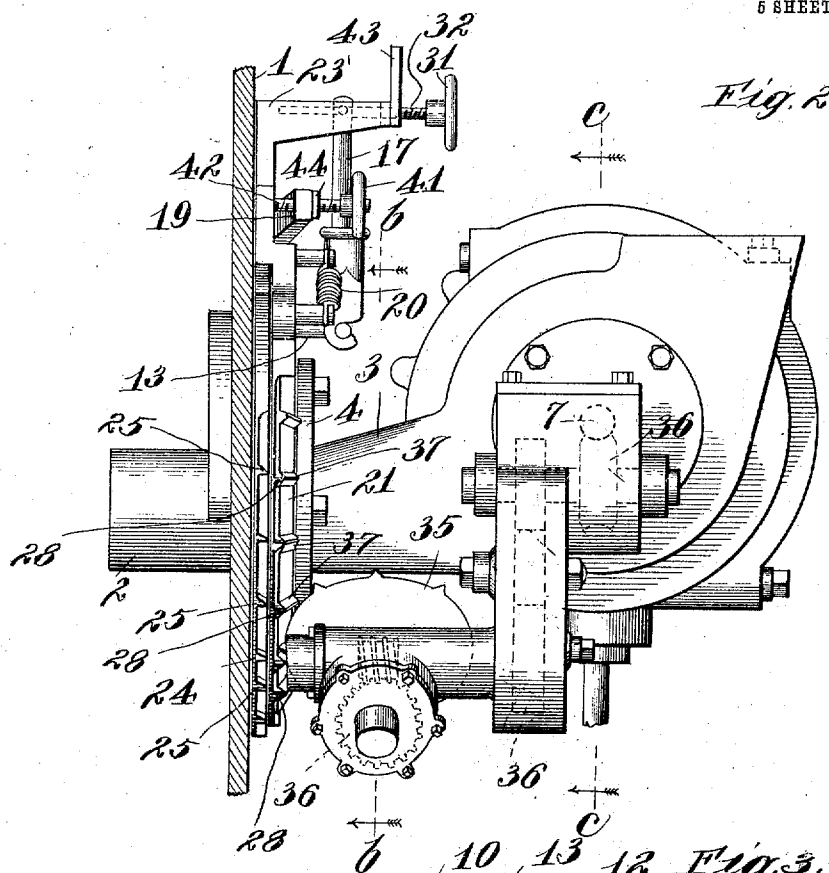
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5 SHEETS—SHEET 2.



Witnesses:

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5 SHEETS—SHEET 3.

Fig. 4.

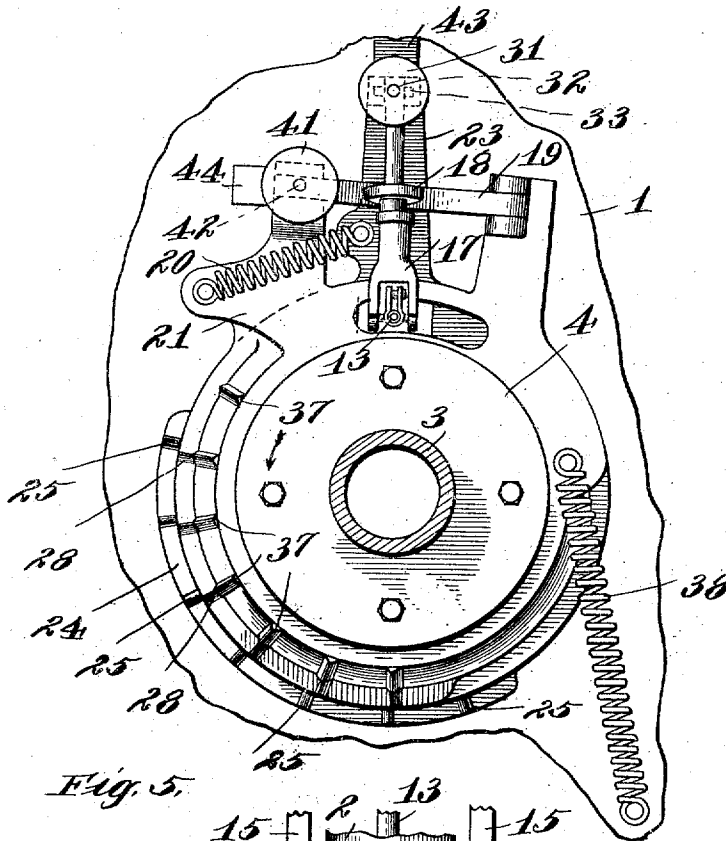
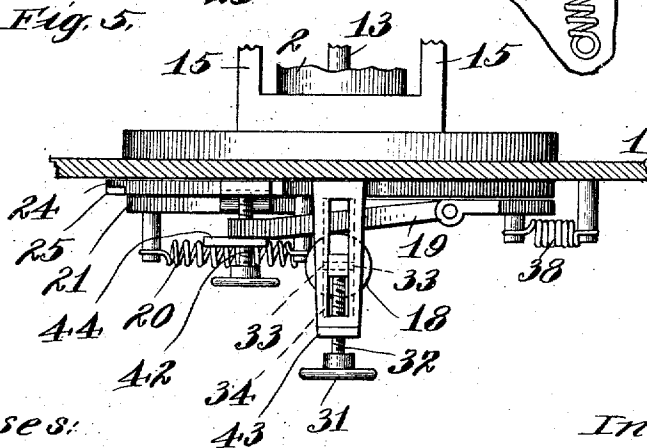


Fig. 5.



Witnesses:

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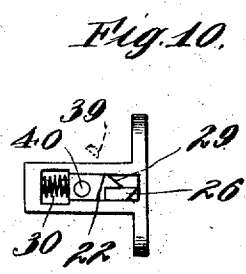
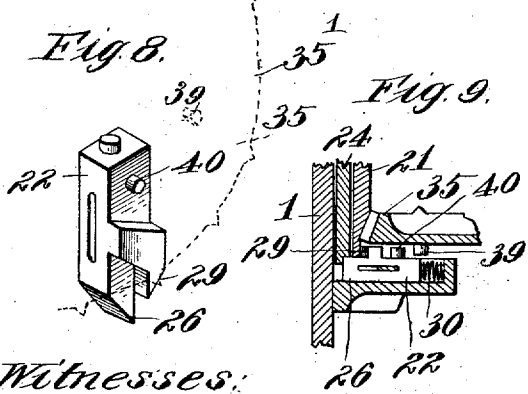
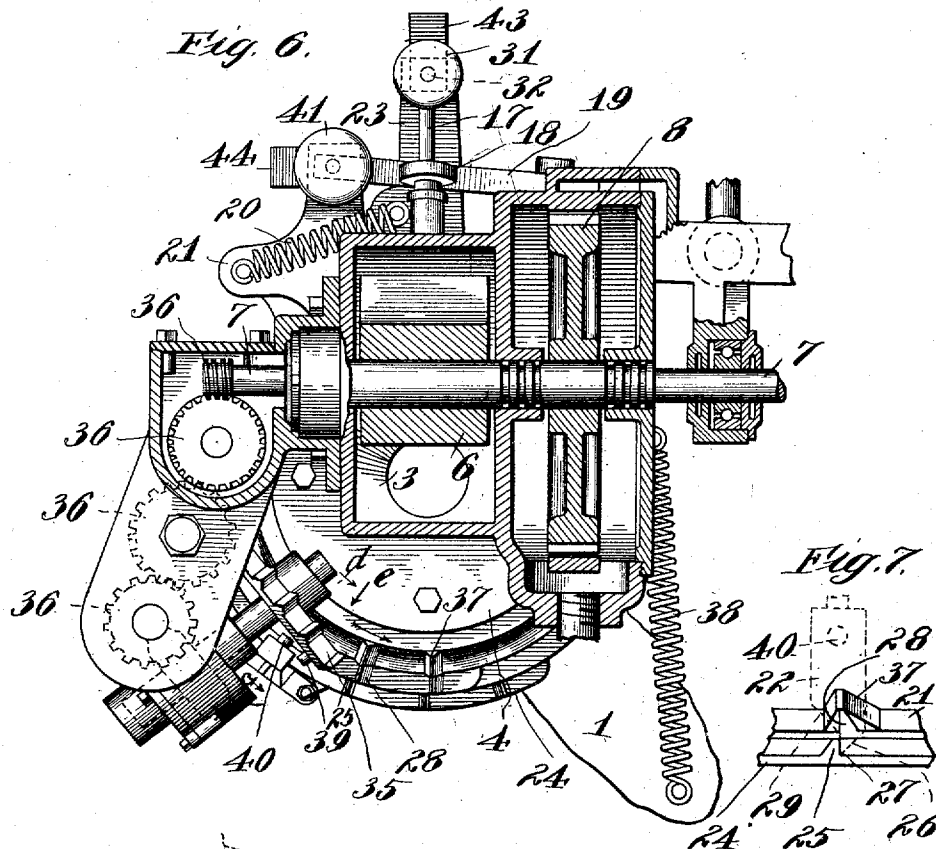
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METHOD OF STOKING FURNACES.

APPLICATION FILED JULY 21, 1906.

5 SHEETS—SHEET 4.



Witnesses:
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5 SHEETS—SHEET 5.

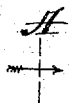


Fig. 13.

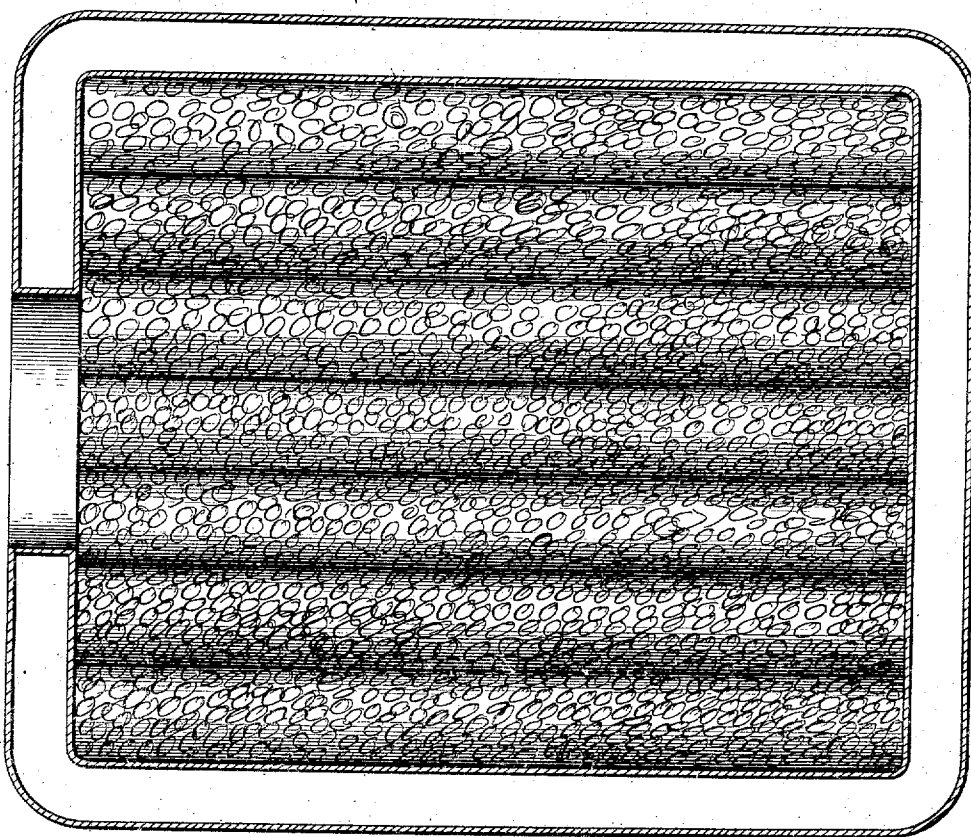
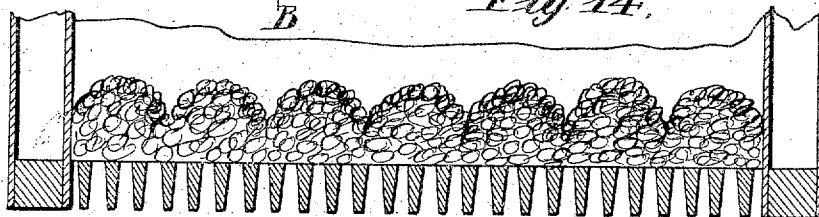


Fig. 14.



Witnesses:

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UNITED STATES PATENT OFFICE.

CLARENCE W. CROSBY, OF CHICAGO, ILLINOIS, ASSIGNOR TO INTERNATIONAL STOKER COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF SOUTH DAKOTA.

METHOD OF STOKING FURNACES.

No. 888,787.

Specification of Letters Patent.

Patented May 26, 1908.

Application filed July 21, 1906. Serial No. 327,245.

To all whom it may concern:

Be it known that I, CLARENCE W. CROSBY, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Methods of Stoking Furnaces, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to furnaces, and has for its object the provision of an improved method for stoking the same, or, in other words, of feeding fuel thereto, and wherein the fuel is "over-fed" rather than "under-fed."

In practicing my invention, I place rows of fuel successively side by side, preferably without materially overlapping each other, whereby the fuel may be injected into the fire box without materially disturbing the flame-structure, which may continue its heating function properly, and whereby, in the preferred embodiment of the invention, weak lines are formed in the fire that are parallel with each other, whereby weak spots in the fuel bed in the process of combustion, are not likely to be formed at irregularly disposed locations.

In accordance with the preferred practice of the invention, the rows of fuel are so far apart that ridges are formed with valleys between, which valleys afford the weak lines in the structure of the fuel bed, for the purpose hitherto stated. By the formation of ridges in the fire box, the finer particles of the fuel may find lodgment upon the tops of the ridges and the looser and larger particles thereof may roll to the bottom of the ridges where the looser fire bed structure is located.

In practicing my invention, I employ mechanism that casts streams of subdivided coal in the fire box, these streams of coal being spread abreast, preferably longitudinally of the fire box. After the coal has fallen, it lies in rows upon the bed of fuel, and as these rows may be comparatively thin, they may be deposited upon the bed of fuel without breaking up the formation of the burning bed of fuel. I desirably employ a device which disposes these rows of fresh fuel upon the burning bed of fuel, and after the predetermined number of rows of green fuel have been placed upon the burning bed, the distributor of the green fuel is quickly re-

turned to an initial position, whereafter the operation previously described may be continued. By this arrangement, no green fuel is immediately deposited upon a row of green fuel last placed, but rather is disposed upon or near the first row of the series of rows of green fuel, which by this time may have formed a part of the burning bed of fuel. In the formation of each row, I also desirably impart to the distributor a gradual movement as the fuel is being deposited and a quick return movement to another initial position, so that green fuel is not likely to be placed upon other green fuel just laid. I desirably employ a distributor which is moved to dispose a plurality of rows of fuel upon a burning bed of fuel and is caused to return to an initial position suddenly, and which distributor is moved gradually so as to lay the fuel along its course in the different rows, one by one, and quickly return to another initial position with reference to this operation, for the purposes stated.

In the preferred practice of the invention, the fuel is not thrown with such force as to disturb the fuel bed structure, though I do not wish to be limited to this aspect of the preferred form of the invention. That feature of my invention whereby rows of green fuel are placed abreast on the previously formed bed of fuel, is important.

My invention will be more fully hereinafter set forth in connection with the accompanying drawings, showing the preferred mechanism for practicing the process of my invention, in which—

Figure 1 is a sectional elevation of the preferred form of the apparatus. Fig. 2 is a side elevation of the structure shown in Fig. 1. Fig. 3 is a view in the direction of arrow *a* of Fig. 1, of certain parts of the structure. Fig. 4 is a view on line *b b* of Fig. 2, certain of the parts, however, being omitted. Fig. 5 is a plan view of a part of the mechanism. Fig. 6 is a view on line *c c* of Fig. 2. Fig. 7 is a detail of a part of the mechanism entering into the structure. Fig. 8 is a view on a larger scale, of a compound dog or detent entering into the construction. Fig. 9 is a sectional view of a part of the structure on line *d* of Fig. 6, showing the location of the compound dog or detent. Fig. 10 is a view in the direction of arrow *e* of Fig. 6, showing the compound dog and certain parts immediately associated therewith. Fig. 11 is a

sectional view on line *f* of Fig. 1. Fig. 12 is a sectional view on line *g* of Fig. 1. Fig. 13 is a plan view illustrating the formation of the fuel layers. Fig. 14 is a sectional view illustrating the formation of the fuel layers.

Like parts are indicated by similar characters of reference throughout the different figures.

The device employed for the practice of my invention may, if desired, be disposed upon the door 1 of a fire box, which door is provided with an inset throat 2 through which the fuel is discharged into the interior of the fire box, and which throat communicates with the throat 3 of a fuel injector, this throat 3 being flanged at 4, whereby it may be attached to the door 1. The throat 3 communicates with the receiving chamber 5, into the top of which green fuel (preferably coal subdivided to a sufficient extent so that it may be properly fed and distributed) is disposed. Within the receiving chamber 5 there is disposed an injector 6 of any suitable construction, whose operating shaft 7 may be driven by any suitable form of motor, such as the turbine construction illustrated clearly in Fig. 6, the blade wheel 8 of which is keyed to the driving shaft 7. Inasmuch as any suitable mechanism may be employed for operating the injector and inasmuch as any suitable injector may be employed for discharging the fuel into the furnace or fire box, I will not further describe these parts that I have embodied in the preferred form of my invention.

I provide a fuel distributor or fuel guide 9 in front of the throat 2, so that the fuel that finds swift exit from the throat 2 is guided and distributed according to the method of operation of the device 9. This distributor is desirably substantially circular at its ends and of the shapes in cross-section at the lines *f* and *g* and elsewhere in cross-section of substantially the shapes shown in Figs. 11 and 12. The lower portion of the distributor 9, when occupying the position illustrated in Fig. 1, is substantially semi-cylindrical with an axis that may preferably, if desired, be made coincident with the axis of the throat 2 with said distributor in one of its positions. The upper portion of the distributor 9 above the horizontal plane (considering the structure in the position shown in Fig. 1) is so shaped as to cooperate with the lower portion of the distributor properly to distribute the coal in the fire box when the proper movements are imparted to said distributor. The distributor is so shaped upon its interior, that the fuel will not have such violent contact therewith as to overcome the proper emission thereof from the distributor, while the upper portion of the distributor causes the injected fuel to be directed sufficiently downward for the purpose of the stoking operation.

In forming each row of fuel in the fire box, I employ mechanism that gradually moves the distributor in a plane coincident with the row of fuel that is to be laid, whereafter the distributor is quickly restored, the restoring movement being preferably effected while the distributor takes its position for forming the next row of fuel. The gradual movement of the distributor is preferably in a downward direction, so that the formation of the rows of green fuel commence at the front or further end of the fire box and terminate at the back end of the fire box, that end of the fire box contiguous to the distributor (using locomotive parlance). The quick return motion of the distributor is effected after the row is finished at the back end of the fire box. I do not wish to be limited, however, to this particular method of controlling the operation of the distributor. In addition to this up and down movement of the distributor, I partially rotate the distributor so that the part above the plane of the axis of the distributor in the position the distributor occupies as shown in Fig. 1, is moved throughout an arc that is suited to the width of the fire box. In the embodiment of the apparatus illustrated, this portion of the distributor 9 is moved throughout an arc that approximates one hundred and twenty degrees. The distributing spout 9 is so shaped that in addition to its capacity to form the rows of green fuel longitudinally of the fire box, it nevertheless can be caused to assume the different rotary positions to enable the location of the streams of fuel abreast of each other throughout the width of the fire box. The shape of this distributor is also such that at its end near the throat 2 it will gather the flying particles of fuel, and where it is bulged the most, the fuel will be properly engaged and discharged from the spout without having such violent contact therewith as to prevent its deposit at the proper and selected portions of the fuel bed, notwithstanding the angular position of said spout with reference to the throat 2. In order that this operation of the distributing spout 9 may be effected, I desirably employ the operating mechanism illustrated. The distributor or spout 9 has two ears 10 that are rigid with respect thereto and which are jointed by a shaft or wrist 11 that is engaged by a bearing 12 carried by an operating arm 13 that is moved in and out or reciprocated by means of the mechanism to be described, whereby the distributor 9 is rotated upon a shaft 14 that is supported at the lower free ends of a bracket construction 15, whereby the distributor 9 is moved in the formation of each of the different rows of green fuel. The bracket construction 15 is adapted to be reciprocated or moved back and forth in a direction transverse to the lengths of the rows of fuel, whereby these rows of fuel may be formed side by side, as hitherto stated.

In order that the operating mechanism may be disposed upon the exterior of the fire box, I provide a curved slot 16 whose center is coincident with the axis of the throat 2. The bracket formation 15 and the link 13 project through this slot 16. The link 13 is linked to an operating bar 17 provided with a roller 18 which may be constructed and mounted as illustrated particularly in Fig. 1, this roller 18 being adapted to ride upon a run-way 19, whose direction is oblique or slanting with respect to the furnace door, whereby the link 13 is reciprocated for the purposes stated. The descent of the distributing spout 9 is gradual and its elevation is sudden, to which end the roller 18 rides down on the inclined track 19 toward the furnace door 1 and is brought suddenly to the high point of the track 19 after it has finished its downward journey upon said track. In order that this result may be accomplished, I employ a spring or other suitable agency 20 which is placed under stress or tension by the rotation of the ring 21 in a counter-clockwise direction by mechanism to be set forth. When the roller 18 has reached the lower limit of its travel, said spring is placed under sufficient tension suddenly to restore the roller to the other end of the track, but during the time that the spring is being placed under this tension, a compound dog or detent 22 is effective to prevent the operation of the spring and the rotation of the ring 24 until the roller has reached the low part of the track 19, as stated. The high end of the spring 20 is anchored to an extension 23 of a ring 24 (to which the bracket 15 is secured), the ring carrying a series of locking lugs 25, and the lower end of said spring 20 is anchored to the ring 21, which latter ring is gradually rotated a predetermined distance in one direction and is restored to its initial position by movement in a reverse direction, as will appear. While the ring 21 is moved gradually in one direction, the spring 20 effects an intermittent movement of the ring 24 in the same direction, and this movement of the ring 24 is made intermittent because of the compound dog 22, the lower member 26 of which is in engagement with the vertical side 27 of a lug 25, while the spring 20 is having its tension increased, the engagement of the parts 25, 26 being broken when an incline 28 traveling with the ring 21 is brought under the incline 29 of the compound dog, whereby said dog is elevated against the force of a spring 30, whereupon there is nothing to limit the action of the spring 20, which then moves the ring 24 a step. After this escape of the compound dog from the engaging lug 25, the spring 30 forces the descent of the dog 22, whereby the nose 26 is brought into the path of the surface 27 of the next lug 25, whereupon, the lower end of the spring 20 continuing to rotate

with the ring 21, said spring is again placed under tension preparatory to the time when the next ensuing surface 28 will ride under the surface 29 to again relieve the spring 20 of its impediment (25), whereupon the ring 24 is suddenly rotated another step again to restore the distributor to its raised position by causing the roller 18 to ascend the incline 19.

It will be seen particularly by reference to Figs. 1 and 5 that the elements 13, 17 and 18 are mounted upon the inner ring 24 so that each time the said inner ring is moved a step the roller 18 is moved to the high end of the track 19, the track 19 moving underneath the roller 18, whereby the said roller is caused to roll upon the track, due to the weight of the distributing spout 9 acting through the intermediation of the connections 10, 11, 12, 13 and 17. It will thus be seen how the spout 9 is moved gradually in one direction by the riding action of the roller 18 upon the track 19 and how it is moved rapidly in the reverse direction by the action of the spring 20. The extreme positions occupied by the distributing spout 9 in forming each row of fuel, are determined by means of a hand regulator 31 which has a threaded stem 32 that may be moved in and out and which engages at its inner end the upper end of operating bar 17. By means of the regulating mechanism 31, 32, the pins 33 (carried at the upper end of the bar 17) are moved to the selected position in the sustaining slots 34, said pins 33 thus constituting a shiftable trunnion support.

The ring 21 is caused to rotate in a counter-clockwise direction through the same angle that the ring 24 rotates through, the rotation of the ring 21 being gradual while the rotation of the ring 24 is step-by-step, the purpose of which rotation of the ring 21 is to cause the bodily movement of the link 13 and bracket 15 throughout a range of travel commensurate with the width of the fire box, whereby the entire fire box has layers of green fuel distributed thereover longitudinally thereof, the groove 16 permitting of this movement of the parts 13, 15, etc.

Any suitable means may be employed for effecting the rotation of the ring 21. I have shown a gear wheel 35 driven by means of intermediate gearing 36 that is interposed between the wheel 35 and the shaft 7. This gear wheel 35 coöperates with a limited number of teeth 37 provided upon the ring 21, whereby said ring is rotated gradually, the number of teeth 37 being suited to the number of rows of fuel that are to be laid in each cycle of operations of the mechanism, and, in order that the distributing spout may be quickly restored to its initial position (regarding now its movement in distributing rows of fuel across the fire box) I so form the gear wheel 35 that when it has performed its

office in rotating the ring 21 the required extent, it will escape the teeth 37, whereupon the spring 38 which is anchored at one end to the ring 21 and at the other end to the door of the furnace, restores the ring 21 by moving it in a clockwise direction, by which time the gear wheel 35 has been brought into position to reengage the teeth 37 to initiate another cycle of operations.

It will be seen that the spring 38 has its tension increased as the ring 21 is rotated in a counter-clockwise direction in order that it may be prepared to perform its function when the wheel 35 escapes the teeth 37, and for the purpose of this escapement, there may be a comparatively wide gap 35' between two adjacent teeth of the wheel 35, this space enabling the teeth 37 to pass by said wheel when the spring 38 is to operate. In order that the ring 24 may at the same time be restored to its normal position through the action of the spring 38 and the intermediation of the spring 20, the pin 39 (carried by the wheel 35) engages the pin 40 upon the compound dog, whereby said dog is raised against the action of the spring 30.

The degree of inclination of the track 19 may be determined by the adjusting device 41, whose stem 42 works through the free end of the track 19, as indicated most clearly in Fig. 2. By regulating the degree of inclination of the track 19, the length of the row of fuel that is cast into the box is determined. Suitable locking bars 43, 44 are employed to maintain the stems of the devices 31, 41 in the positions to which they are rotated.

By way of a short résumé, it will be seen that the track 19 carried by the outer ring 21, governs the elevation and depression of the distributing spout 9 in the formation of the different rows of fuel, while the inner ring 24, by its intermittent movements, effects the movement of the bracket 15 carrying the distributing spout 9 in a curved path, whereby said spout is positioned to enable it to form the different rows of fuel in the fire box, the axis of rotation of the support 15 coinciding with the axis of the distributing spout 9 when said spout occupies the position illustrated in full lines in Fig. 1, these axes always occupying, in the preferred apparatus of the invention, the same plane.

By reason of the compound movements imparted to the distributing spout 9 by the devices 13 and 15, the exit opening of said spout is directed to form the different rows of fuel and the spout itself is, looking down on it, pointed toward the different parts of the fire box, as the shaft 14 upon which the spout 9 may rotate is itself bodily rotated about an axis that is coincident with the axes of the throat 2 and of the spout—when said spout occupies the position shown in full lines in Fig. 1. In other words, the

mounting 14 for the spout is moved from side to side and desirably in a curvilinear path, though I do not wish to be limited to the precise direction in which the said mounting is moved. It will be seen that the axis of rotation of the mounting 14 is coincident with the path followed by the fuel as it is injected into the distributing spout 9.

The apparatus herein disclosed is claimed in my copending application Serial No. 327,244, filed July 21, 1906.

It will be seen that by the process hitherto outlined, a plurality of rows of fuel may be distributed longitudinally of the fire bed or box, as indicated in Fig. 13, and that this fuel may be disposed in decided ridges, as indicated in Fig. 14, if the rows are spaced sufficiently apart. By reference to Fig. 14 in particular, it will be seen that weakened lines of the fuel bed are located in the valleys between the ridges of fuel and that the danger of blow holes and promiscuously disposed openings in the fuel bed structure is eliminated to a very practical extent by the method herein set forth. Other advantages consequent to the practice of my invention, have been dwelt upon and need not be here repeated.

Except as indicated in certain of the claims, I do not limit myself to a process the result of which is the distribution of rows of fuel that are distinct from each other after they are laid.

I do not wish to be limited to the precise details of practicing my improved method herein set forth, but,

Having thus described my invention, I claim as new and desire to secure by Letters-Patent:—

1. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel adjacent to the first row, and continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed.

2. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel adjacent to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, and spacing said rows of fuel such distances apart that they become of ridge formation with depressions or valleys between.

3. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to de-

posit in like manner a row of fuel adjacent to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, and forming the said rows of fuel by commencing at the same ends of the rows, whereby green fuel will not be deposited upon most freshly laid green fuel.

4. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel adjacent to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, spacing said rows of fuel such distances apart that they become of ridge formation with depressions or valleys between, and forming the said rows of fuel by commencing at the same ends of the rows, whereby green fuel will not be deposited upon most freshly laid green fuel.

5. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel adjacent to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, and commencing each series of rows at the same side of the fire bed, whereby the first row of one series of rows is not laid upon the last row of the preceding series of rows of fuel.

6. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel adjacent to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, spacing said rows of fuel such distances apart that they become of ridge formation with depressions or valleys between, and connecting each series of rows at the same side of the fire bed, whereby the first row of one series of rows is not laid upon the last row of the preceding series of rows of fuel.

7. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel adjacent to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, commencing each series of rows at the same side of the fire bed, whereby the first row of one series of rows is not laid upon the last row of the preceding series of rows of fuel, and forming the said rows of fuel by commencing at the same ends of the rows,

whereby green fuel will not be deposited upon most freshly laid green fuel.

8. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel adjacent to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, spacing said rows of fuel such distances apart that they become of ridge formation with depressions or valleys between, commencing each series of rows at the same side of the fire bed, whereby the first row of one series of rows is not laid upon the last row of the preceding series of rows of fuel, and forming the said rows of fuel by commencing at the same ends of the rows, whereby green fuel will not be deposited upon most freshly laid green fuel.

9. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel substantially parallel to the first row, and continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed.

10. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel substantially parallel to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, and spacing said rows of fuel such distances apart that they become of ridge formation with depressions or valleys between.

11. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel substantially parallel to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, and forming the said rows of fuel by commencing at the same ends of the rows, whereby green fuel will not be deposited upon most freshly laid green fuel.

12. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel substantially parallel to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, spacing said rows of fuel such distances apart that they become

of ridge formation with depressions or valleys between, and forming the said rows of fuel by commencing at the same ends of the rows, whereby green fuel will not be deposited upon most freshly laid green fuel.

13. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel substantially parallel to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, forming said rows of green fuel successively, and commencing each series of rows at the same side of the fire bed, whereby the first row of one series of rows is not laid upon the last row of the preceding series of rows of fuel.

14. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel substantially parallel to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, spacing said rows of fuel such distances apart that they become of ridge formation with depressions or valleys between, forming said rows of green fuel successively, and commencing each series of rows at the same side of the fire bed, whereby the first row of one series of rows is not laid upon the last row of the preceding series of rows of fuel.

15. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel,

changing the direction of the stream to deposit in like manner a row of fuel substantially parallel to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, forming said rows of green fuel successively, commencing each series of rows at the same side of the fire bed, whereby the first row of one series of rows is not laid upon the last row of the preceding series of rows of fuel, and forming the said rows of fuel by commencing at the same ends of the rows, whereby green fuel will not be deposited upon most freshly laid green fuel.

16. The method of stoking furnaces, which consists in introducing a stream of fuel into the fire box in a line from the rear to the front of the fire box to form a row of fuel, changing the direction of the stream to deposit in like manner a row of fuel substantially parallel to the first row, continuing the operation until a longitudinal series of rows of fuel is laid over the fire bed, spacing said rows of fuel such distances apart that they become of ridge formation with depressions or valleys between, forming said rows of green fuel successively, commencing each series of rows at the same side of the fire bed, whereby the first row of one series of rows is not laid upon the last row of the preceding series of rows of fuel, and forming the said rows of fuel by commencing at the same ends of the rows, whereby green fuel will not be deposited upon most freshly laid green fuel.

In witness whereof, I hereunto subscribe my name this 19th day of June A. D., 1906.

CLARENCE W. CROSBY.

Witnesses:

G. L. CRAGG,
LEON E. STROH.