

J. HARRINGTON.
FURNACE.

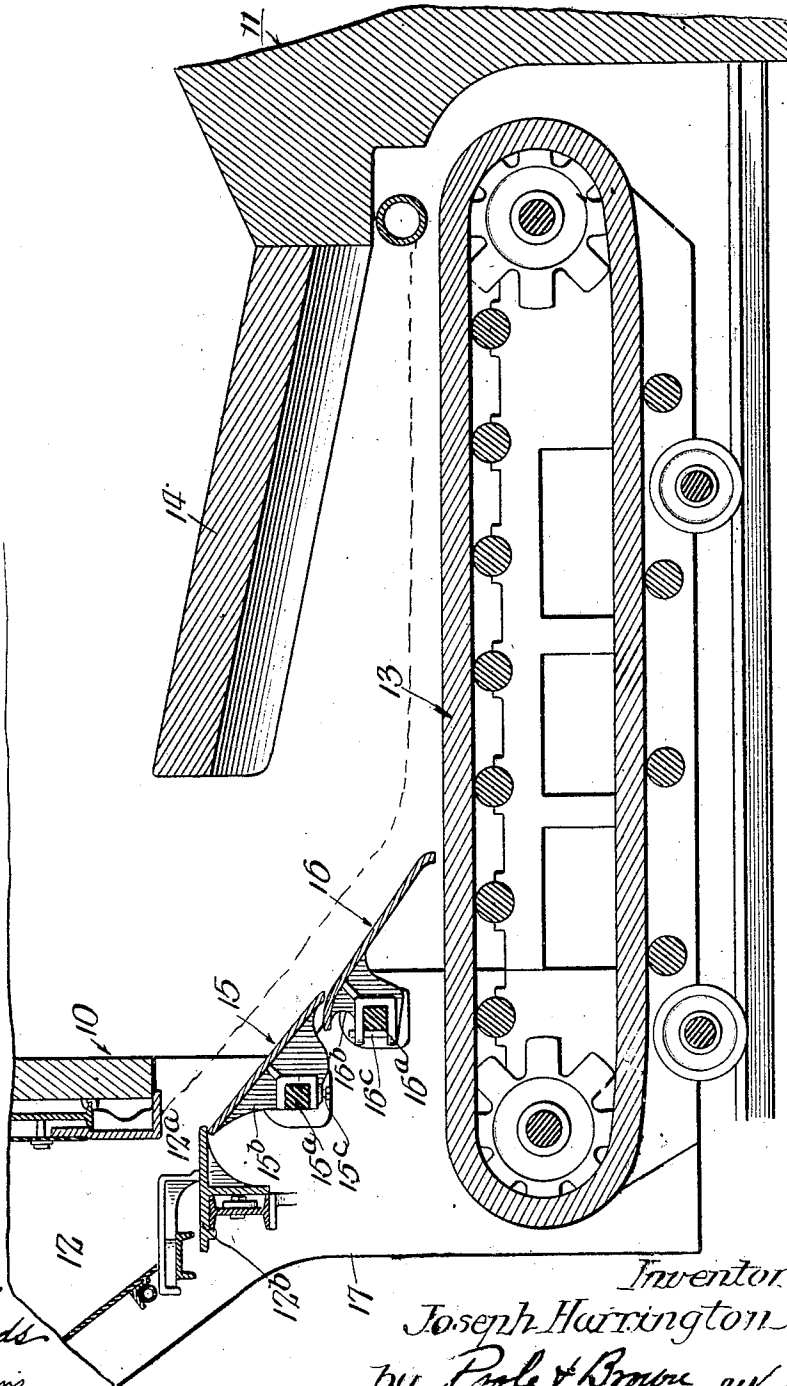
APPLICATION FILED AUG. 3, 1911.

1,065,359.

Patented June 24, 1913.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
G. H. Alfreds
H. R. Wilkins

Inventor
Joseph Harrington
by Pole & Brown attys.

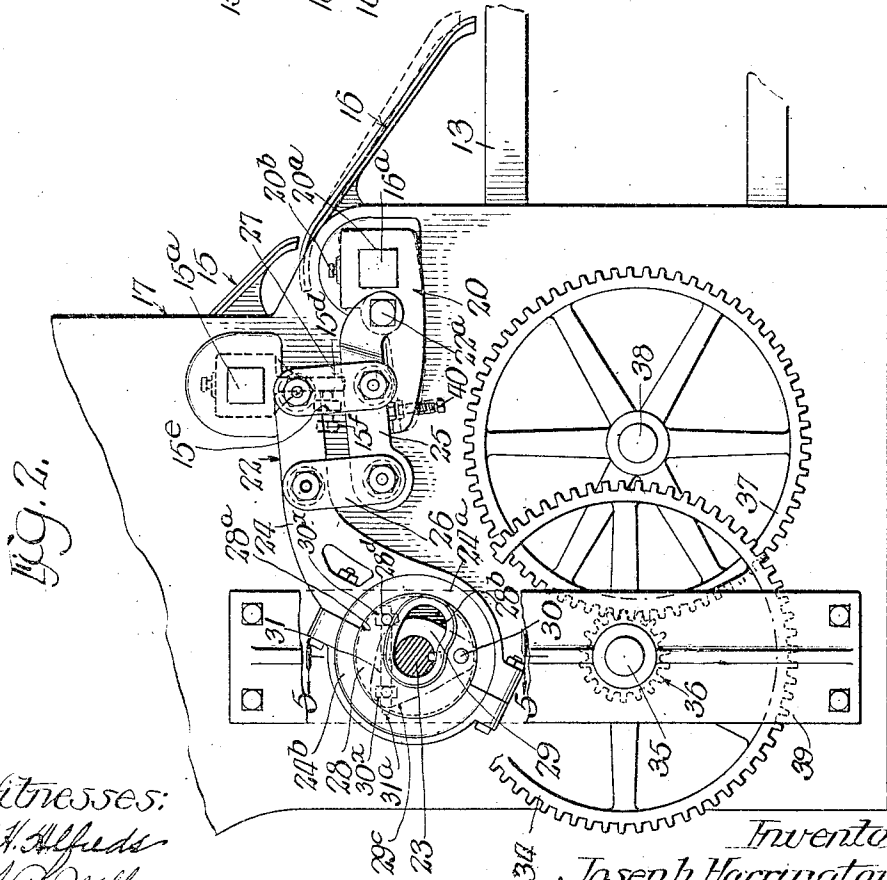
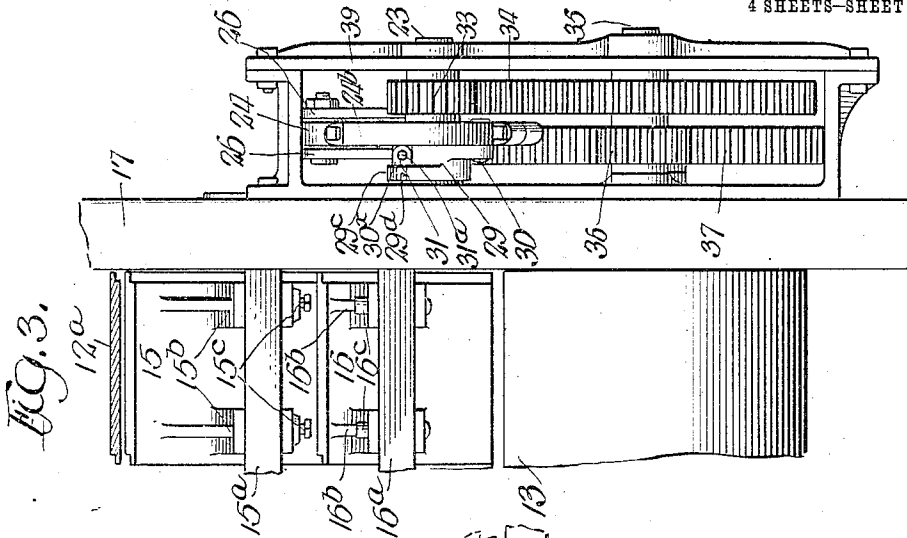
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4 SHEETS—SHEET 2.



Witnesses:
J. H. Alfords
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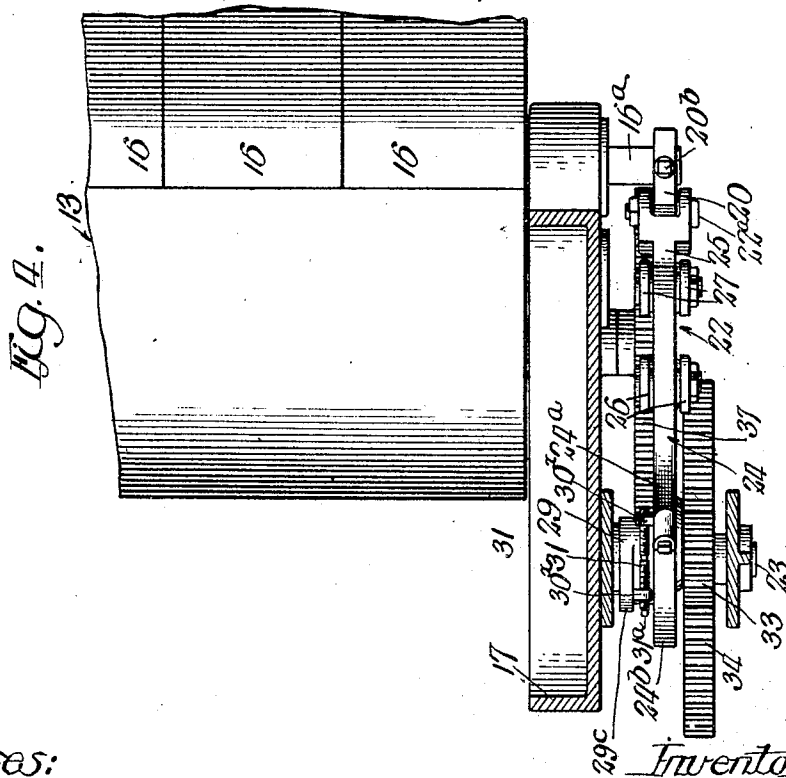
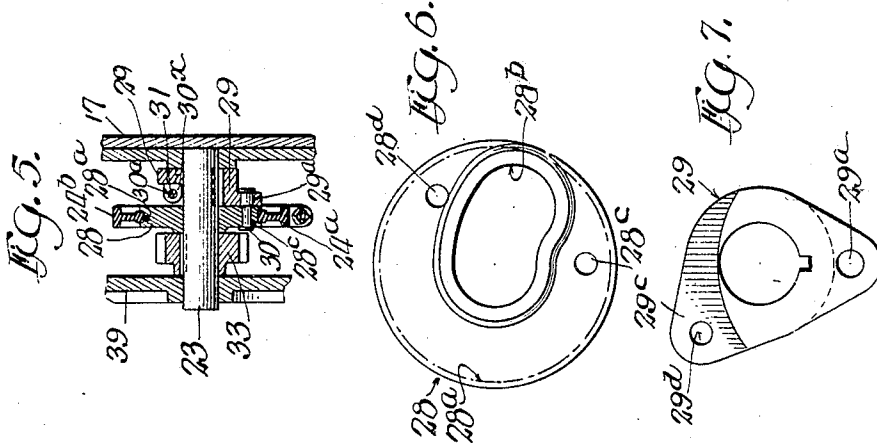
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Patented June 24, 1913.

4 SHEETS—SHEET 3.



Witnesses:
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APPLICATION FILED AUG. 3, 1911.

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Patented June 24, 1913.

4 SHEETS—SHEET 4.

Fig. 9.

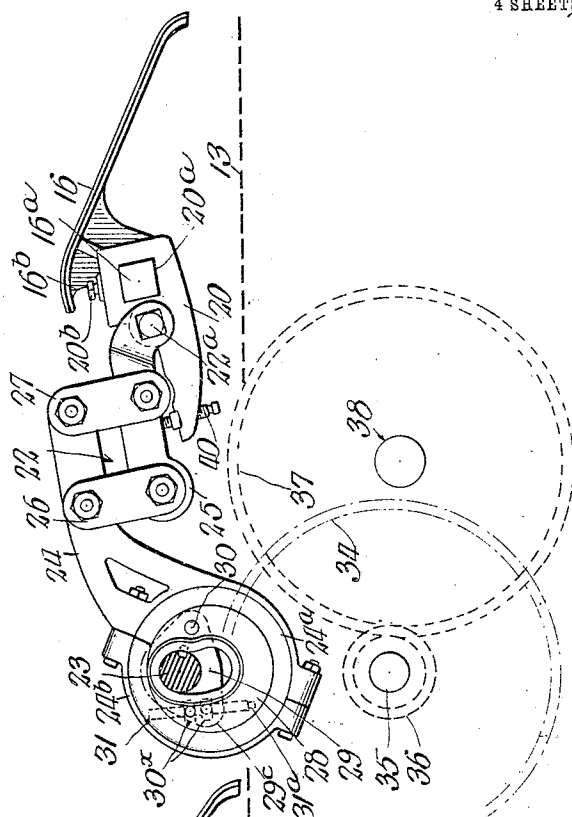
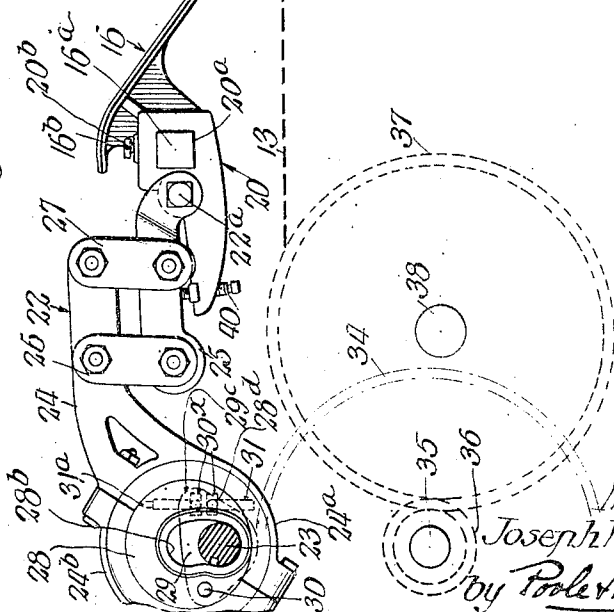


Fig. 8.



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UNITED STATES PATENT OFFICE.

REST ~~AVAILABLE~~ COPY
JOSEPH HARRINGTON, OF RIVERSIDE, ILLINOIS.

FURNACE.

1,065,359.

Specification of Letters Patent.

Patented June 24, 1913.

Application filed August 3, 1911. Serial No. 642,058.

To all whom it may concern:

Be it known that I, JOSEPH HARRINGTON, a citizen of the United States, and a resident of Riverside, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in furnaces of that kind provided with automatic stoking devices or means by which the fuel fed to the furnaces is continually advanced or moved in a horizontally disposed layer along or through the combustion chamber during the progress of combustion.

The present invention relates more particularly to stoking devices of that kind having an inclined fuel support on which the fresh fuel rests while undergoing a preliminary coking operation, in this respect resembling a device shown in a prior reissued Patent No. 13168, dated November 15, 1910, granted to Herman A. Poppenhusen and the present inventor.

The invention consists of the matters hereinafter described and more particularly pointed out in the appended claims.

In the drawings—Figure 1 is a view representing a central vertical section of a furnace embodying one form of my invention. Fig. 2 is a view representing a partial side elevation of the front part of the furnace; Fig. 3 is an end elevation of the parts shown in Fig. 2; Fig. 4 is a top plan view of the parts shown in Fig. 2; Fig. 5 is a view representing a partial vertical section through Fig. 2 on the line 5—5 thereof; Figs. 6 and 7 are detail elevations of parts to be referred to more particularly later; Fig. 8 is a view representing a side elevation of the operating parts shown in Fig. 2 and illustrating a slightly different adjustment with the parts shown at one limit of their movement. Fig. 9 is a view representing a side elevation of the parts shown in Fig. 8 with the parts shown at the other limit of their movement.

Referring now in detail to that embodiment of my invention illustrated in the drawings, 10 indicates the front wall of the furnace, 11, the bridge wall thereof, 12, a fuel hopper located in the front wall in con-

nection with a fuel inlet or feed opening 12^a in said front wall.

13 indicates an endless traveling chain grate of that class which is moved or driven in such manner that its upper part or lap travels inwardly, that is to say, from the feed opening toward the bridge wall of the furnace, said upper lap being substantially horizontal.

14 indicates a deflecting arch or partition which extends from the upper part of the bridge wall 11 inwardly over the grate to a point near the front wall 10 of the furnace. A space is left between the forward edge of said partition and said front wall, which space constitutes the outlet opening for the upward and outward passage of the products of combustion from the combustion chamber or space beneath the said partition. The said arch or partition 14 is shown as inclined upwardly and forwardly from its rear end at which it is joined to the bridge wall, but it need not necessarily be so inclined.

At the forward end of and above the chain grate 13, and in position to receive the fuel delivered from the feed hopper 12 at its upper end is an inclined fuel support arranged at an angle corresponding substantially with the angle which will be assumed by the upper surface of a layer of coal resting thereon under the action of gravity. Said inclined fuel support is designed to sustain the layer of coal resting and moving downwardly thereon during the coking operation which takes place when the coal passing over said support is subject to the heat from the highly heated products of combustion from the burning fuel on the chain grate or radiated thereupon from the partition 14 or other heated surface of the furnace. As shown in the drawings, said inclined support is formed by means of two transversely extending inclined and overlapped metal plates 15, 16. Said plates are arranged with the upper edge of the uppermost plate 15 adjacent to the lower edge of the bottom wall 12^b of the feed hopper 12, and with the lower edge of said upper plate 15 overlapping the upper margin of the lower plate 16. The lower margins of said plates 15 and 16 are shown as deflected downwardly so as to form transversely extending ledges or shoulders, one located within the other at the bottom of the supporting surfaces formed by said plates. Said ledges or shoulders

constitute means to aid in preventing the layer of fuel resting on the plates and moving downwardly over the same becoming caked in a solid mass by the action of the heat to which it is subjected, as set forth in the reissued patent above referred to. The said plates 15 and 16 are movably supported in such manner that their lower edges may be adjusted for the purpose of changing the angle of inclination of the plates, thereby varying the rate of feed or movement of the layer of coal thereon according to the rate of coal consumption and the character of the coal used. In addition, means is provided for vibrating the plate 16, said means, as will presently appear, being capable of adjustment to vary the amplitude of the vibration and also to vary the relative angular position of the zone or locus of said vibration. The said plates are attached to and supported upon horizontal rock shafts 15^a, 16^a. As shown in the drawings, the ends of said rock shafts extend through bearing apertures in the vertical side plates 17, which form the supports for the hopper 12 and for the other parts in the front of the furnace.

As shown in the drawings, each of the plates 15 and 16 consists of a plurality of parts or sections joined end to end and each separately attached to its associated rock shaft. Means for securing the several plate sections to the rock shafts, shown in the drawings, consists of integral arms 15^b, 16^b, projecting from the rear or lower faces of the plate sections, and provided with laterally open rectangular sockets to receive the rock shafts. Said plate sections are secured to the rock shafts in the case of the upper plate 15 by means of set screws 15^c inserted through the side walls of the sockets and bearing on the rock shaft 15^a, and in the case of the lower plate 16 by means of pins 16^c inserted through extensions of the side walls of said sockets bearing against the rear face of the rock shaft 16^a.

Means is provided for imparting vibratory movement to the lower plate 16 as follows: One end of the rock shaft 16^a is prolonged through the side plate 17 of the furnace and has secured to it beyond said wall, a rock arm 20. Said arm, as illustrated, is provided with a rectangular, laterally open socket 20^a to receive said shaft and is rigidly held in place on the same by means of a set screw 20^b.

22 indicates as a whole, a compound lever arm which is pivotally connected at one end to the rock arm 20 near the rock shaft 16^a by a pivot bolt 22^a, and is adapted to engage a part carried by said rock arm near its end at a point spaced from the central axis of said rock shaft, and which at its other end has operative connection with a shaft 23 rotatively supported adjacent the side wall of the furnace. Said compound lever arm 22,

as shown in the drawings, comprises two horizontal, parallel members 24 and 25 connected together by two parallel substantially vertical links 26, 27, said horizontal and vertical members together forming a parallelogram and being pivotally connected together so that their parallelism is maintained in all positions that they occupy.

The operative connection of the arm 22 to the rotative shaft 23, comprises the following: 28 indicates an eccentric mounted on the shaft 23 and adapted for rotation therewith. The compound arm 22 is provided at its end with a yoke 24^a to which is secured a strap 24^b, said yoke and strap embracing the peripheral edge of the eccentric 28 which is provided with a bearing groove 28^a in which the inner edge of said yoke and strap engage. In the eccentric is formed an arcuate slot 28^b, through which the shaft 23 extends, said arcuate slot extending from the center of said eccentric to a point near its periphery. The arc of said arcuate slot is described about the center of an aperture 28^c located near the circumference of said eccentric. Said arcuate slot is equal in width to the diameter of the shaft 23 and is so formed at its end at the center of the eccentric that when the shaft 23 is at that end of the slot the central axis of the said shaft will coincide with the center of the eccentric so that any movement of the shaft away from that end of the slot will bring the shaft to a position eccentric of said eccentric.

On the shaft 23, adjacent the eccentric 28, is rigidly secured an arm 29. 29^a indicates an aperture in said arm, the center of said aperture being spaced from the rotative center of said arm a distance equal to the distance that the center of the aperture 28^c of the eccentric 28 is spaced from the center of said eccentric. Through said apertures 29^a, 28^c, extends a pivot pin 30, upon which said eccentric may be swung as a center, said movement being made possible by reason of the arcuate slot through which the shaft 23 extends. By swinging the eccentric 28 on its pivotal connection with the arm 29, it may be shifted to adjust the shaft 23 to any position in the arcuate slot 28^b, thereby varying the throw of the compound arm 22 connected to said eccentric from zero to an amount determined by the total possible movement of the shaft in said arcuate slot.

To adjust the eccentric 28 so as to vary the throw of the compound arm 22 connected thereto, or in other words to swing the eccentric on its pivotal connection with the arm 29 and to maintain it in the adjusted position, the following mechanism is provided: An aperture 29^a is formed in the arm 29 at a point remote from the aperture 29^a and a like aperture 28^a is formed in the eccentric 28 at a point an equal distance from

the aperture 28^c. The part 29^c of the arm 29 in which the aperture 29^d is formed is offset from the adjacent face of the eccentric 28, as clearly indicated in Fig. 5. In each of the apertures 28^d, 29^d are rotatively secured eye-bolts 30^c having threaded apertures 30^a which are located in line. In said apertures 30^a the right and left screw threaded ends of a screw 31 are engaged. The one end 31^a of said screw is provided with a square head so that the screw may be rotated by a suitable wrench to draw said eye-bolts toward each other or to force them apart. By this construction, the eccentric may be easily swung on its pivotal connection with the arm 29 and thus adjusted so as to bring the shaft 23 into a position in the slot 28^b thereof to provide the required throw of the operating arm 22.

On the shaft 23 is keyed a pinion 33 which meshes with a gear 34 mounted on a stub shaft 35 rotatively supported at one side of the plate 17. A pinion 36 is keyed to said shaft and is adapted to be driven by a gear 37 which is mounted on the shaft 38 and which drives the chain grate in a familiar manner. The shafts 23 and 35, as shown in the drawings, have bearing in a frame 39 secured in any convenient manner to the side plate 17 of the furnace.

A part is carried by the rock arm 20 which is adapted for engagement by the compound lever so that as said lever oscillates up and down on its pivotal connection with said arm near the rock shaft 16^a, said part may be engaged by the compound lever and the rock arm thus swung downwardly. The plate 16 overbalances the rock shaft 16^a so as to cause the same to move upwardly when said fixed part is relieved of the pressure of the compound lever. As shown in the drawings, this fixed member consists of a set screw 40 which is threaded through the end of the rock arm 20 and is adapted for engagement with the lower side of the horizontal arm 25 of the compound lever arm 22. It is apparent that by adjusting said set screw the angle of the plate 16 with the compound lever 22 may be varied so as to vary the position of the limits of the vibration of said plate or in other words, vary the zone or locus of said vibration.

The operation of the vibratory mechanism is apparent from the above description. The rotation of the shaft 23 rotates the eccentric 28, which imparts an up and down and forward and back movement to the end of the compound lever 22. As the position of the end of the arm 25, adjacent the rock shaft 16^a, is substantially fixed, and as the links 26, 27 provide for horizontal movement between the arms 24 and 25 of the compound lever arm, it is apparent that the horizontal component of the movement communicated to the end of the lever arm connected to

the eccentric will be lost and will have no effect on the operation of the rock arm 20. The vertical component of the movement of the compound lever 22 will be communicated to said rock arm 20 by the engagement of the arm 25 of said compound lever arm with the set screw 40. By adjusting the eccentric to vary the position of the shaft 23 in the arcuate slot 28^b thereof, the amount of this vertical component may be varied from zero, which will be when the shaft 23 occupies the position in the said slot indicated in Fig. 2, to the full possible throw of said eccentric, as indicated in Figs. 8 and 9, in which case the parts are so adjusted that the plate 16 will be vibrated through the greatest possible angle provided for in the mechanism illustrated in the drawings. By adjusting the screw 40 carried by the rock arm 20, the lowest and highest positions for any predetermined vibratory movement of the plate may be adjusted to suit the particular kind of fuel that is being handled, and I thus have in the present invention convenient means for varying not only the amount of the vibration but also the average inclination of the plate 16 during that vibration.

An important feature of the present invention is the fact that a continuous movement of the plate 16 is secured and that no matter how small the amplitude of the vibration, its continuity is always maintained. Its movement may be well represented by a sine curve. This continuity of the vibration eliminates the sudden jars and stops at the beginning and end of the vibration of the plate, as in apparatus of this kind heretofore employed and thus prevents the sliding movement of the fuel down to the plate from being influenced or affected by sudden jars. The importance of this feature will be realized when it is remembered that the average angle of the plate is adjusted substantially to the angle of repose of the particular fuel which is being used to supply the furnace.

To change the angle of inclination of the plate 15 of the inclined fuel support, and thus vary the rate of feed or movement of the layer of coal thereon according to the rate of coal consumption, the following means is provided: One end of the rock shaft 15^a, upon which said plate 15 is mounted, is prolonged through that side plate 17 of the furnace, which is opposite the side plate to which the bracket 39 is secured, and is there provided with a depending arm 15^d. Secured to and projecting outwardly from said plate 17 is a lug 15^e through which is threaded a set-screw 15^f. Said set-screw 15^f is adapted to bear against said depending arm 15^d adjacent its lower end. By turning the set-screw 15^f the arm 15^d will be moved away from said lug 15^e or permitted to move toward the same according to the direction

in which said set-screw is turned. It is manifest, that by moving said arm 15^a the plate 15 will be moved, thus adjusting or changing the angle of inclination of said plate. Said set-screw 15^a maintains the plate in its adjusted position. The construction above described is shown in dotted lines in Fig. 2.

The subject-matter of the foregoing paragraph forms a part of the subject-matter contained in a prior application filed January 23, 1911, Serial No. 604,042, and in which Herman A. Poppenhusen and myself are joint inventors.

I claim as my invention:—

1. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending plate and a rock shaft upon which said plate is mounted, mechanism for imparting continuous oscillatory movement to said rock-shaft including a rock-arm secured to said rock-shaft, a rotative eccentric located substantially in longitudinal alignment with the said rock-arm, an operating arm having operative connection with said eccentric, and means connecting said operating arm with said rock-arm, permitting endwise movement of the former with respect to the latter.

2. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending pivotally supported plate, mechanism for imparting continuous oscillatory movement to said plate including an eccentric having operative connection with said plate, a shaft upon which said eccentric is mounted, and means for connecting said eccentric with said shaft, permitting the adjustment of said eccentric in a direction substantially at right angles to a line passing through the said shaft and the axis of oscillation of said plate.

3. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending pivotally supported plate, mechanism for imparting continuous oscillatory movement to said plate including a rock-arm having operative connection with said plate, a rotative eccentric, an operating arm having operative connection with said eccentric, means connecting said operating arm with said rock-arm, permitting endwise movement of the former with respect to the latter, and means for adjusting the mean inclination of said plate for any amplitude of oscillation of said plate.

4. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending plate and a rock shaft upon which said plate is mounted, mechanism for imparting continuous oscillatory movement to said rock-shaft including an eccentric, an operating arm having operative connection with said eccentric, a rock-arm secured to said rock-shaft, and means connecting said operating arm with said rock-arm, permitting endwise movement of the former with respect to the latter.

5. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending plate and a rock-shaft upon which said plate is mounted, mechanism for imparting continuous oscillatory movement to said rock shaft including an eccentric, an operating arm having operative connection with said eccentric, a rock-arm secured to said rock-shaft, and two parallel links affording a connection between said operating arm and said rock-arm, adapted to permit endwise movement of the former with respect to the latter.

6. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending plate and a rock shaft upon which said plate is mounted, mechanism for imparting continuous oscillatory movement to said rock-shaft including an eccentric, an operating arm connected with said eccentric, a rock-arm secured to said rock-shaft, means connecting said operating arm with said rock-arm, permitting endwise movement of the former with respect to the latter, a shaft upon which said eccentric is mounted, means connecting said eccentric with said shaft, permitting the adjustment of said eccentric in a direction substantially at right angles to a line passing through the said shaft and the axis of oscillation of said plate, and means for adjusting the mean inclination of said plate for any amplitude of oscillation of the said plate.

7. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending plate and a rock-shaft upon which said plate is mounted, means for imparting continuous oscillatory movement to said rock-shaft including a rotative eccentric, a compound operating arm, a rock-arm secured to said rock-shaft and adapted to be engaged by

said compound arm, said compound arm comprising two parallel members, one of which is connected with said eccentric and the other with said rock-arm, and parallel links connecting said members.

8. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending plate and a rock-shaft upon which said plate is mounted, means for imparting continuous oscillatory movement to said rock-shaft including a rotative eccentric, a compound operating arm, a rock-arm secured to said rock-shaft and having a part remote from said rock-shaft adapted to be engaged by said compound arm, said compound arm comprising two parallel members, one of which is connected with said eccentric and the other with said rock-arm, and parallel links connecting said members, permitting one of said members to have endwise movement with respect to the other, and means for varying the angular relation of said member which is connected with said rock-arm, relatively to said rock-arm.

9. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending plate and a rock-shaft upon which said plate is mounted, means for imparting continuous oscillatory movement to said rock-shaft including a rock-arm secured to said rock-shaft, a rotative eccentric, and a compound arm, said arm comprising two parallel members, one of which is connected with said eccentric and the other pivotally connected

with said rock-arm adjacent said rock-shaft; one of said members having endwise movement with respect to the other, and an adjustable stop member adapted to vary the angular relation of said rock-arm to the member connected with the same.

10. In a device of the character described, in combination with a furnace provided with a traveling grate, and an inclined fuel support at the forward end of said grate, said support including a transversely extending plate and a rock-shaft upon which said plate is mounted, means for imparting continuous oscillatory movement to said rock-shaft including a rock-arm secured to said rock-shaft, an eccentric, located substantially in longitudinal alinement with said rock-arm and provided with an arcuate slot, the median line of which passes through its center, a shaft extending through said slot, an arm keyed to said shaft, said eccentric being pivotally connected with said arm and adapted to swing in the arc of said slot, an operating arm connected with said eccentric, means connecting said operating arm with said rock-arm, permitting endwise movement of the former with respect to the latter, and means for adjusting said eccentric in a direction substantially at right angles to a line passing through said shaft and the axis of oscillation of said plate and maintaining said eccentric in adjusted position.

In testimony, that I, claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 28th day of July A. D. 1911.

JOSEPH HARRINGTON.

Witnesses:

T. H. ALFREDS,
GEORGE R. WILKINS.