No. 884,603. PATENTED APR. 14, 1908.

T. E. MURRAY.

AUTOMATIC STOKING DEVICE FOR FURNACES.

APPLICATION FILED AUG. 28, 1907.

4 SHEETS—SHEET 1.

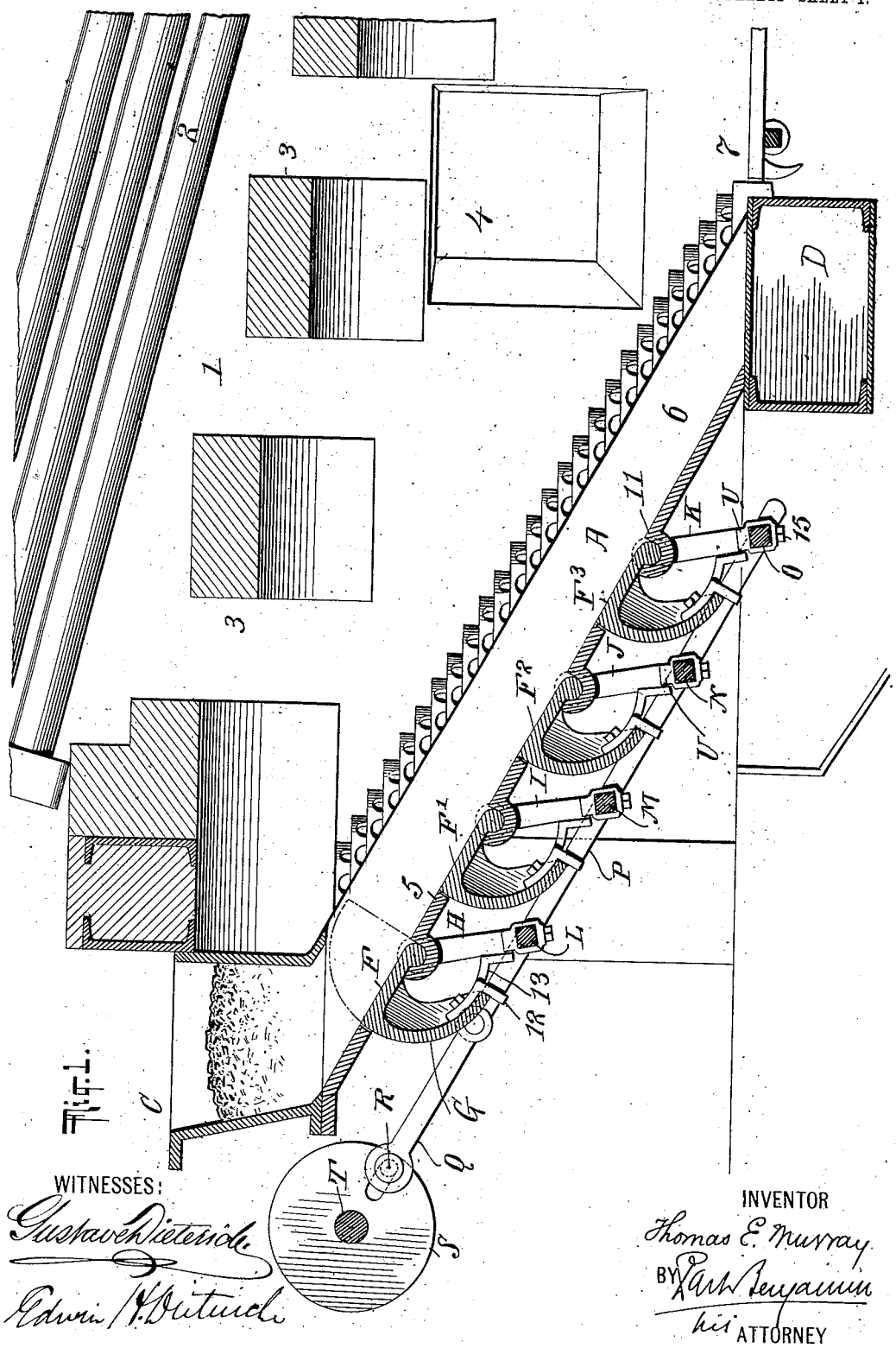

Fig. 1.

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4 SHEETS—SHEET 2.

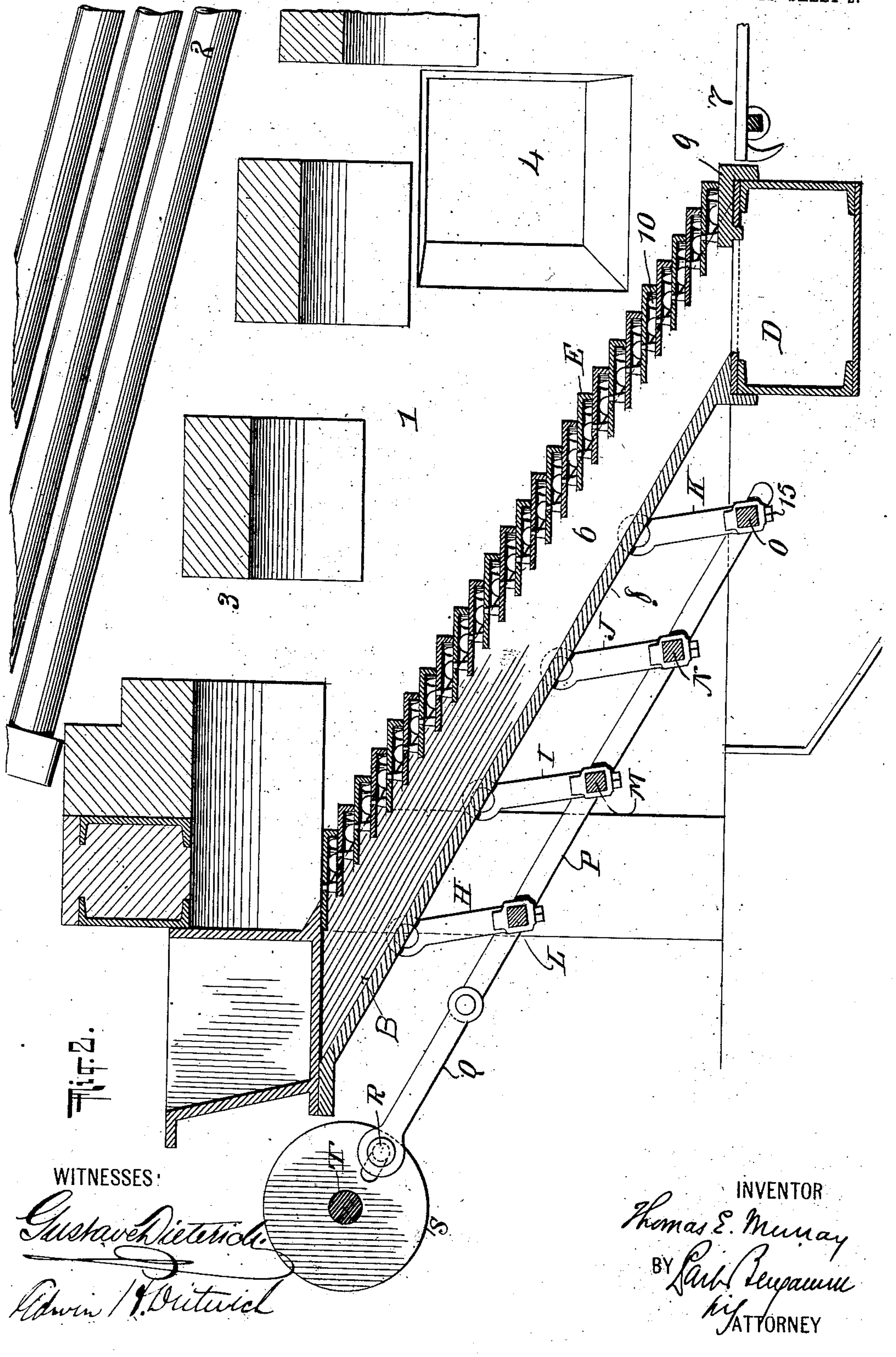

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

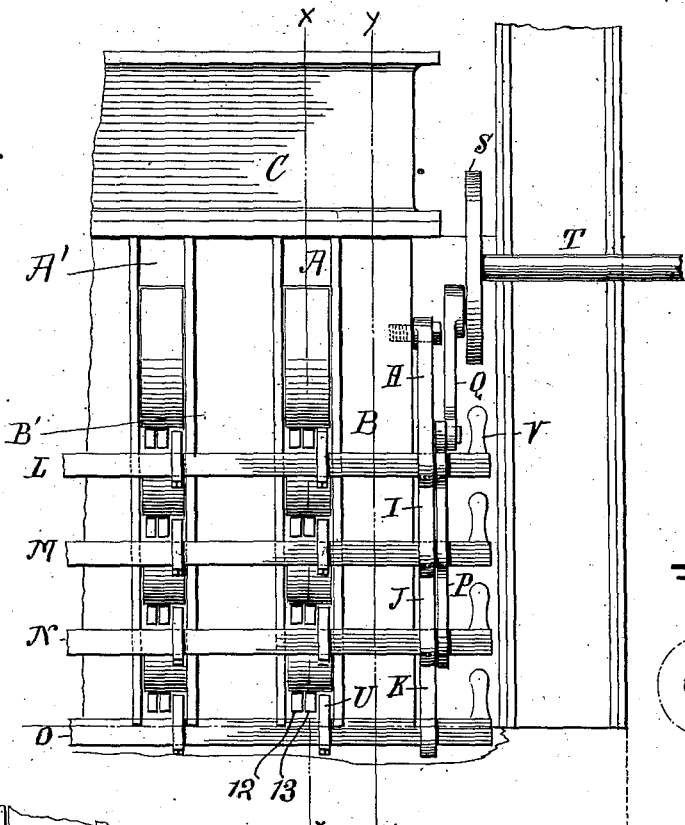


Fig. 7.

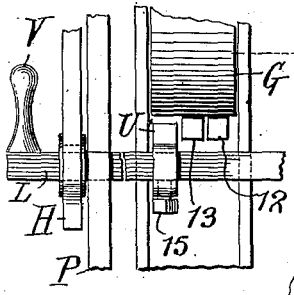


Fig. 4.

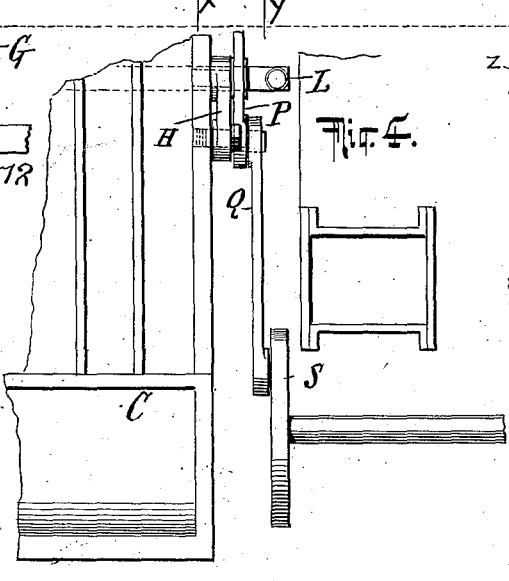
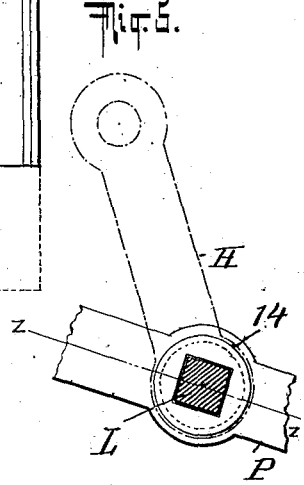


Fig. 5.



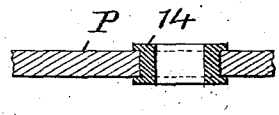


Fig. 6.

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No. 884,603. PATENTED APR. 14, 1908.

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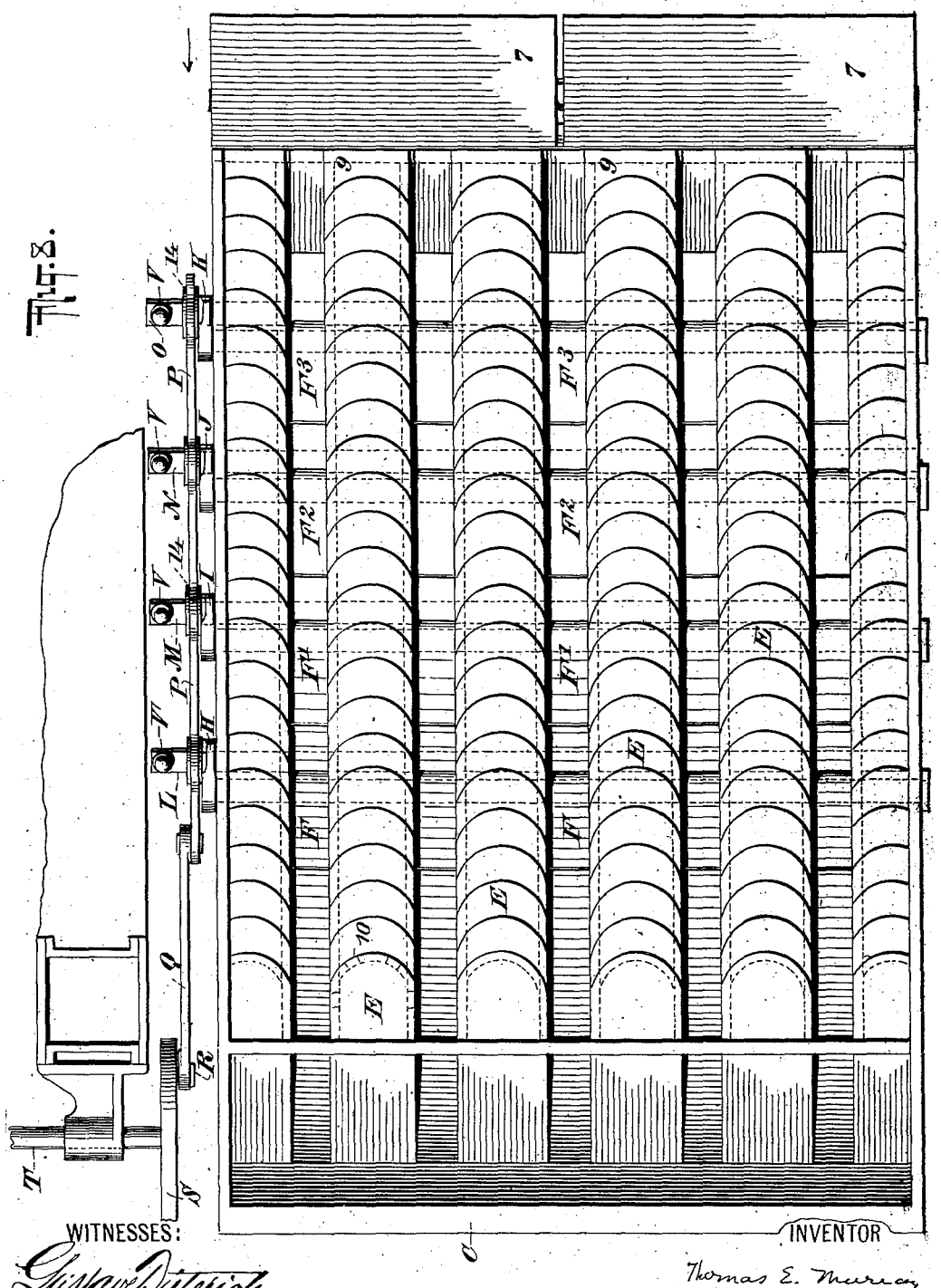
APPLICATION FILED AUG. 28, 1907.

4 SHEETS—SHEET 4.

Fig. 8.



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UNITED STATES PATENT OFFICE.

THOMAS E. MURRAY, OF NEW YORK, N. Y.

AUTOMATIC STOKING DEVICE FOR FURNACES.

No. 884,603. Specification of Letters Patent. Patented April 14, 1908.

Application filed August 28, 1907. Serial No. 390,423.

To all whom it may concern:

Be it known that I, THOMAS E. MURRAY, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Automatic Stoking Devices for Furnaces, of which the following is a specification.

The invention is an automatic over-feed stoking device for furnaces.

The principle of the invention consists (1) in the mode of organization whereby, when the fuel is delivered from a suitable source of supply to a rearwardly inclined platform, devices operating above the plane of said platform shall move the fuel down the incline; (2) in the mode of organization whereby said devices may be controlled so as to vary or prevent their effect upon the fuel at will; and (3) in the mode of organization whereby said devices may be individually controlled so as to produce different effects upon the fuel at different places.

The present embodiment of my invention exhibits it in connection with a boiler furnace of the type in which narrow inclined fuel compartments alternate with air compartments; in which the inner inclined sides of the air compartments are closed and perforated; and in which the burning fuel in successive fuel compartments arches over the said perforated sides of the air compartments.

In the accompanying drawings—Figure 1 is a longitudinal vertical section of the furnace showing part of the boiler tubes, on the line *x x* of Fig. 3. Fig. 2 is a similar section on the line *y y* of Fig. 3. Fig. 3 is a partial front elevation seen in the direction of the arrow, Fig. 8. Fig. 4 is a plan view of the part shown in Fig. 3. Fig. 5 is a detail view showing the mode of suspending the sliding bars which control the motion of the swinging plates F. Fig. 6 is a section on the line *z z* of Fig. 5. Fig. 7 is a detail view showing the manner in which one of the sliding bars coöperates with the swinging plate which it controls. Fig. 8 is a plan view of the fuel receiving inclined platforms and twyers and of the mechanism for operating the swinging plates F F′ F^2 F^3.

Similar numbers of reference indicate like parts.

1 is the furnace chamber of a steam boiler, the tubes of which are shown at 2.

At 3 are brickwork arches crossing the fire space and at 4 is a side door.

The fuel receiving compartments A, A′, etc. may be in any desired number and alternate with the air compartments B, B′, etc. All are inclined downwardly from front to rear of the furnace. Each fuel receiving compartment as A, Fig. 1, is trough shaped and has a lower fuel supporting platform 5 and side walls 6. Communicating with the upper open end of each fuel compartment is a hopper C, in which the fuel is placed, and from which it may slide by gravity down the platform 5 to the dumping grate 7 which may turn on horizontal pivots in the usual way.

Each air compartment B, Fig. 2, has a bottom plate 8, which extends between the side walls 6 of the adjacent fuel compartments A, A′. The upper ends of said compartments are closed. The lower ends are open and communicate with an air duct D. In each air compartment and above the air duct and lying between the side walls 6 of the adjacent fuel compartments is a supporting plate 9 upon which rests the lowermost of a series of twyers E. Said twyers are disposed step-fashion one above the other, so that the whole inner inclined side of each air compartment is closed by them, and as shown in Fig. 2, they extend rearwardly beyond the inclined edges of the walls 6 of the adjacent fuel compartments. In each twyer are side openings 10 for the escape of air.

From so much as has been described, it will now be understood, that the fuel passing from the hopper C into the several fuel compartments A, A′, etc., fills these compartments (meanwhile resting on and moving down the inclined platforms 5) and arches over the twyers E between said fuel compartments; and that the twyers E deliver air laterally under the fuel which is arched over them, and hence across the open inner sides of said fuel compartments A. The construction of the twyers E, as here shown, is merely illustrative and not specifically essential. Any device which closes the inner inclined sides of the air compartments B, B′, etc. and which is provided with escape orifices for directing the air under the arched over fuel, may be substituted.

For the purpose of automatic stoking or, in other words, regulating and controlling the fuel supply in the compartments A, A′,

etc. I provide the following devices. In the platform 5 of each fuel compartment A are parallel transverse openings in which fit plates F F′ F² F³. Each plate is hinged or pivoted at its lowermost transverse edge in its opening in any suitable way, as by making said edge rounded and seating it in a concavity at the edge of the platform opening as shown at 11, Fig. 1. At the upper transverse edge of each plate F F′ F² F³ is a downwardly depending curved portion G, which is struck on a radius from the hinge or pivot axis. To each plate F F′ F² F³ and portion G are bolted, two lugs 12 and 13 both having their rear ends bent downwardly and the lug 13 being longer and hence extending further rearwardly than the lug 12. Pivoted at their upper ends to the exterior of a wall of the furnace are as many swinging arms H, I, J, K, as there are plates F F′ F² F³, Figs. 1 and 3. Similarly pivoted to the exterior of the opposite side wall are corresponding swinging arms, not shown. Each pair of said arms, that is the two arms correspondingly placed on opposite sides of the furnace furnishes a suspension device for a laterally sliding bar. Thus the bar L, Fig. 3, is supported by the arm H, and its corresponding arm on the opposite side of the furnace, the bar M by the arm I and its corresponding arm, the bar N by the arm J and its corresponding arm, and the bar O by the arm K and its corresponding arm. The bars, L, M, N, O, are all connected together by the link P, which is jointed to a pitman Q, the other end of which is connected to a radially adjustable pivot pin R on the pulley S, fast on shaft T.

As the pulley S rotates, the bars L, M, N, O, because supported on their swinging arms H, I, J, K, vibrate in a lateral direction simultaneously and beneath the several depending portions G of the plates F F′ F² F³. The bars L, M, N, O, are, however, of rectangular cross section and pass through similarly shaped openings in the link P, and arms H, I, J, K. Hence, in order to permit of the motion above stated, the arms H, I, J, K, at their lower ends are provided with cylindrical flanged sleeves 14, Figs. 5 and 6, which are seated and are capable of free rotation in said arms. In these sleeves are formed the rectangular openings in which the bars L, M, N, O, may longitudinally slide. Similar flanged sleeves are also arranged in the link P to receive said bars.

Upon each bar L, M, N, O, are placed a number of tappets U, one tappet being disposed directly in front of the depending portion G of each plate F, F′, F², F³; see Fig. 7. Each tappet U is adjustable along its supporting bar, and may be fastened in desired position by a clamping screw 15. Referring now to Fig. 7, and considering for convenience plate F only, it being understood that each plate of the series F, F′, F², F³, is operated in like manner it will be plain that when the bar L is in the position shown, then the swinging to and fro of said bar (that is toward and from the plane of the drawing) will cause the tappet U to pass under the depending portion G, and hence no motion will be imparted to the latter. But if by means of the handle V the bar L be moved to the right of Fig. 7, then as said bar vibrates the tappet will strike the lug 12 on said depending portion, and if said bar be still further moved longitudinally in the same direction, then, again as said bar vibrates, the tappet will strike the lug 13. The lug 13 is of such length as when met and carried onward by the vibrating bar, the plate F is moved into a position at right angles to the plane of platform 5, see dotted lines, Fig. 1. The lug 12 is of such length as when met and carried onward by the vibrating bar the plate F is moved into a position at an angle less than 90° to platform 5; say, for example, at an angle of 45°. It will be seen, therefore, that by sliding the vibrating bar L longitudinally into one position it will not move the plate F, but on sliding it into another position it will intermittently raise the plate F to some angle less than 90° to the plane of platform 5 and on sliding it into still another position it will intermittently raise the plate F to a position at right angles to the plane of platform 5. The elevation of plate F also elevates the depending portion G thereof (dotted lines Fig. 1). The effect then is as follows: As the plate F moves upwardly, it lifts the fuel that lies over it and then pushes that fuel down the inclined platform 5. As the depending portion G rises at the same time, said portion forms a dam which prevents the fuel on the inclined platform from sliding down. If the plate F moves up to a position at an angle less than 90° to the platform 5, then its pushing action is exerted on a smaller depth of fuel and for a shorter period than if moved up to a position at a right angle to the plane of said platform. In the latter case the dam formed by portion G does not completely stop the descent of the fuel down the incline, since some may move over it.

Referring now to Fig. 1, and considering the plates F, F′, F², F³, disposed in the platform 5 of the particular fuel compartment A there shown, it is obvious, that by suitably moving the bars L, M, N, O, longitudinally, each one of said plates may be left unraised, or raised intermittently to a limited extent or to the full extent of 90° above the platform 5. Therefore, any plate or number of plates may be caused to exert maximum moving effect on the fuel to cause it to move down the incline: or any plate or number of plates may be caused to exert a less moving effect on the fuel for the same purpose, or any plate or number of plates may be caused

not to exert any moving effect on the fuel. The result is that a very complete control of the burning fuel is obtained at several points on each fuel supporting platform 5, which control may not only be exerted at will, but varied at will, and which further is accomplished by motor mechanism governed by the operator. Of course, each sliding bar as L controls the movement of one plate in each of the parallel fuel compartments; but said control is not necessarily the same for each plate, since by adjusting the tappets on said bar in different positions, one plate may be raised fully, another plate in the adjacent compartment may be raised partially, a third in another compartment may be not raised at all, or any other variation provided for.

The operation of the whole apparatus is as follows: Fuel supplied from the hopper C descends the platforms 5 of the several fuel compartments A, A', etc., and being ignited arches over the twyers E which deliver into it air from the air compartments B, B', etc. The rotary shaft T being driven by any suitable motor actuates (through the pulley S, pitman Q and link P) the swinging arms H, I, J, K, and hence the bars L, M, N, O. These bars acting on the lugs 12, 13, cause such of the plates F, F', F^2, F^3, as are engaged by the tappets, to rise above the platforms 5, thus moving the fuel onward and downward. Maximum movement of the fuel is caused at any plate by sliding the associated bar so that its tappet will act on lug 13; less motion when the associated bar is moved so that its tappet acts on lug 12, and no movement is impressed when the tappet acts on neither lug.

I claim:

1. In a furnace, an inclined fuel supporting platform, an inclined grate parallel and in proximity thereto and receiving fuel therefrom, means for supplying fuel to the upper part of said platform and means disposed in the plane of said platform for engaging the fuel thereon and moving it down said incline.

2. In a furnace, an inclined fuel supporting platform, an inclined grate parallel and in proximity thereto and receiving fuel therefrom, means for supplying fuel to the upper part of said platform and means disposed in the plane of said platform and supported thereon for engaging the fuel on said platform and moving it down said incline.

3. In a furnace, two inclined parallel grates, an inclined platform disposed between said grates and below the surface thereof, means for supplying fuel to the upper part of said platform and means disposed in the plane of said platform for engaging the fuel thereon and moving it down said incline.

4. An inclined grate, an inclined fuel supporting platform in juxtaposition thereto and having an opening, and an upwardly swinging plate disposed in said opening and constructed to engage the fuel on said platform and move it down the incline.

5. An inclined grate, an inclined fuel supporting platform in juxtaposition thereto and having an opening, an upwardly swinging plate disposed in said opening and constructed to engage the fuel on said platform and move it down the incline and means for varying the throw of the plate.

6. An inclined grate, an inclined fuel supporting platform in juxtaposition thereto and receiving fuel at its elevated end, a plurality of openings in said platform, and a plurality of upwardly swinging plates pivoted in said openings and engaging the fuel at different points along the said platform to move said fuel down the incline.

7. An inclined grate, an inclined fuel supporting platform in juxtaposition thereto and receiving fuel at its elevated end, a plurality of openings in said platform, a plurality of upwardly swinging plates pivoted in said openings and engaging the fuel at different points along the said platform to move said fuel down the incline and means for independently adjusting each of said plates to vary the extent of its upward swinging movement.

8. An inclined grate, an inclined fuel supporting platform in juxtaposition thereto and receiving fuel at its elevated end, a plurality of openings in said platform, a plurality of upwardly swinging plates pivoted in said openings and engaging the fuel at different points along the said platform to move said fuel down the incline, actuating mechanism and a device for detachably connecting said actuating mechanism and said plates, whereby said plates may be separately adjusted and separately operated.

9. An inclined grate, an inclined fuel supporting platform in proximity thereto and having an opening and receiving fuel at its elevated end, an upwardly swinging plate in the plane of said platform and disposed in said opening, means for operating said plate and means for preventing fuel descending said platform passing under said plate.

10. An inclined grate, an inclined fuel supporting platform, means for supplying fuel at the upper part thereof, an upwardly swinging transverse plate normally supported in the plane of said platform and pivoted thereto at its edge which is furthest down the incline, means for operating said plate, means for varying the extent of upward swing of said plate and means for preventing fuel descending said platform from passing under said plate.

11. An inclined fuel supporting platform, means for supplying fuel at the upper part thereof, a plate supported in the plane of said

platform and pivoted thereto at its edge which is furthest down the incline, a bar extending transversely in front of and below said platform, means for laterally moving said bar and means for transmitting motion from said bar during its lateral movement to said plate to swing said plate upwardly.

12. An inclined fuel supporting platform, means for supplying fuel at the upper part thereof, a plate supported in the plane of said platform and pivoted thereto at its edge which is furthest down the incline, a bar extending transversely in front of and below said platform, and a tappet on said bar, the aforesaid parts being constructed and arranged so that said tappet may be adjusted to engage with said plate and thereby cause said plate to be swung upwardly by said bar.

13. An inclined fuel supporting platform, means for supplying fuel at the upper part thereof, a plate supported in the plane of said platform and pivoted thereto at its edge which is furthest down the incline, a bar extending transversely in front of and below said platform, swinging supports for said bar, in which supports said bar is longitudinally adjustable, means for laterally moving said bar and a tappet on said bar movable by the said longitudinal adjustment of said bar into engagement with said pivoted plate, to cause said plate to be swung upwardly by said bar.

14. A plurality of inclined grates, a plurality of inclined fuel receiving platforms alternating with said grates and having openings, means for supplying fuel to the upper parts of said platforms, a plurality of upwardly swinging plates pivoted in said platform openings and disposed in the plane of said platform, and means for operating said plates to move the fuel down the inclined surfaces of said platforms.

15. A plurality of inclined grates, a plurality of inclined fuel receiving platforms alternating with said grates, means for supplying fuel to the upper parts of said platforms, a plurality of upwardly swinging plates pivoted in each platform, and means for operating a predetermined number of plates in any platform to move the fuel down the inclined surface thereof.

16. A plurality of inclined grates, a plurality of inclined fuel receiving platforms alternating with said grates, means for supplying fuel to the upper parts of said platforms, a plurality of upwardly swinging plates pivoted in each platform, and means for operating a predetermined number of plates in each platform to move the fuel down the inclined surfaces of said platforms.

17. A plurality of inclined grates, a plurality of inclined fuel receiving platforms alternating with said grates, means for supplying fuel to the upper parts of said platforms, a plurality of upwardly swinging plates pivoted in each platform, means for operating said plates to move the fuel down the inclined surfaces of said platforms and means for adjusting the extent of upward movement of each plate.

18. A plurality of inclined grates, a plurality of inclined fuel receiving platforms alternating with said grates, means for supplying fuel to the upper parts of said platforms, a plurality of upwardly swinging plates pivoted in each platform, means for operating a predetermined number of plates in any platform to move the fuel down the inclined surface thereof and means for adjusting the extent of upward movement of each plate.

19. A plurality of inclined grates, a plurality of inclined fuel receiving platforms alternating with said grates, means for supplying fuel to the upper parts of said platforms, a plurality of upwardly swinging plates pivoted in each platform, means for operating a predetermined number of plates in each platform to move the fuel down the inclined surfaces of said platforms and means for adjusting the extent of upward movement of said plate.

In testimony whereof I have affixed my signature in presence of two witnesses.

THOMAS E. MURRAY.

Witnesses:

A. H. LAIDLAW,

MILES E. LANDAN.