H. MacN. PARSON.

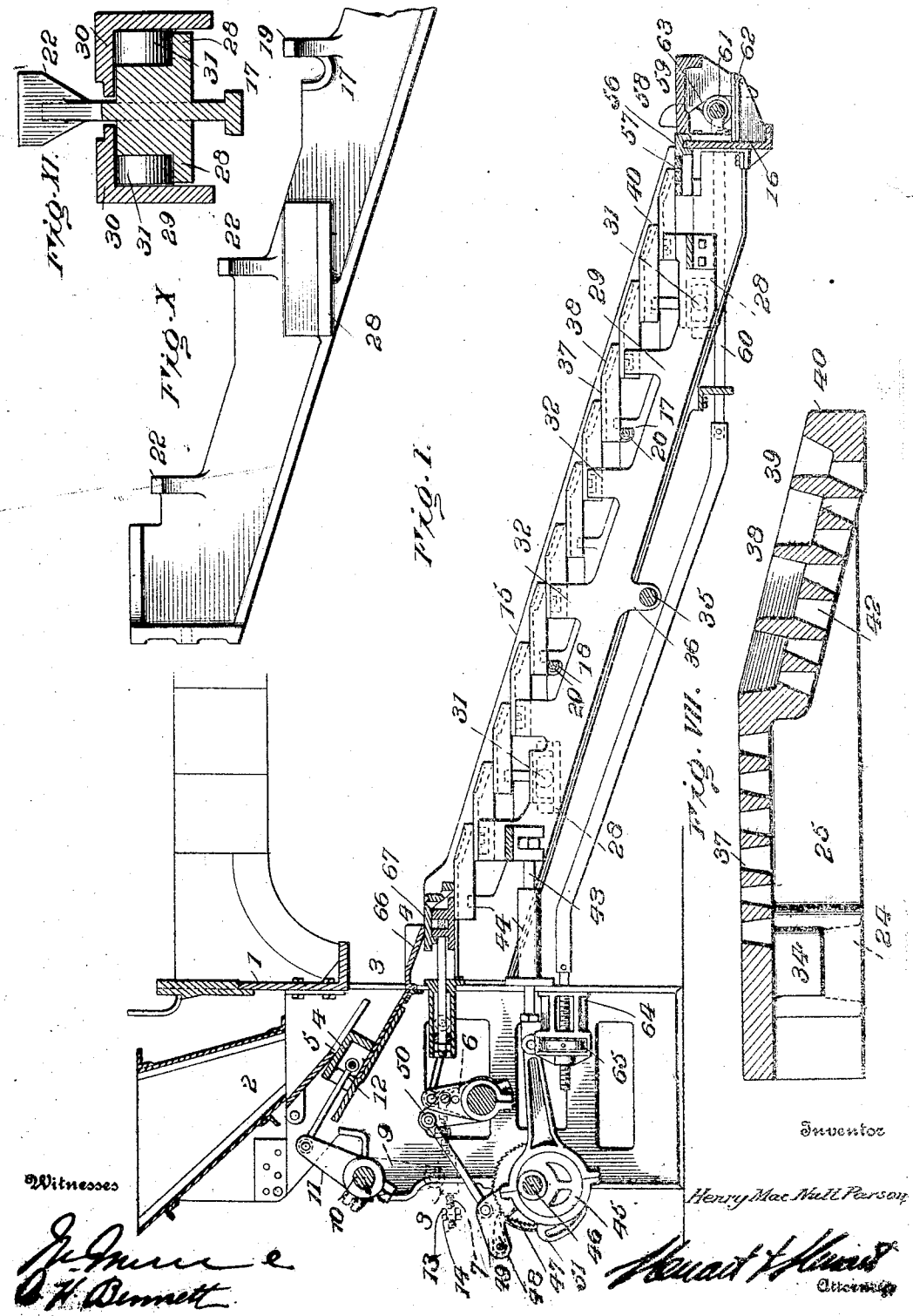
MECHANICAL STOKER.

APPLICATION FILED NOV. 22, 1906.

1,027,149.

Patented May 21, 1912.

5 SHEETS—SHEET 1.



Witnesses

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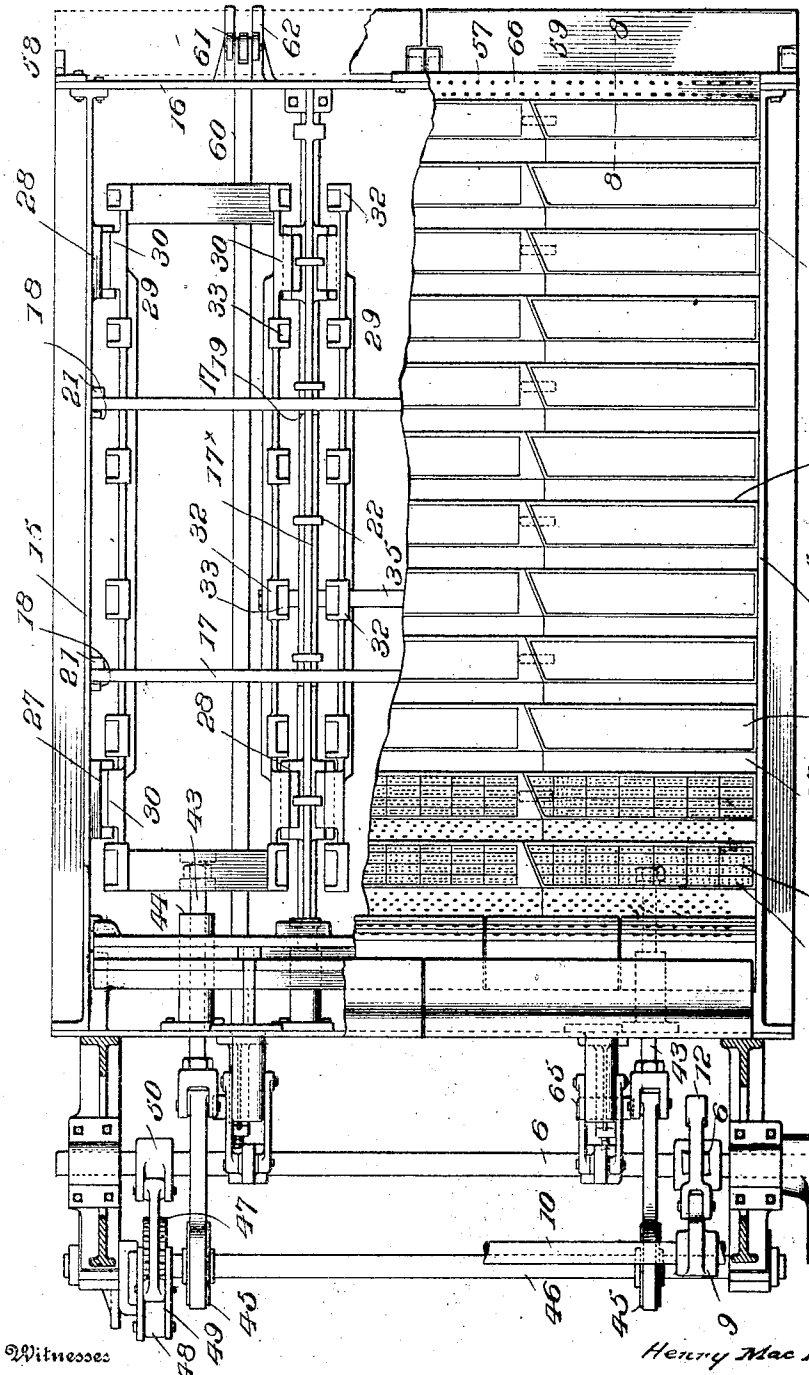

Fig. II.

Witnesses

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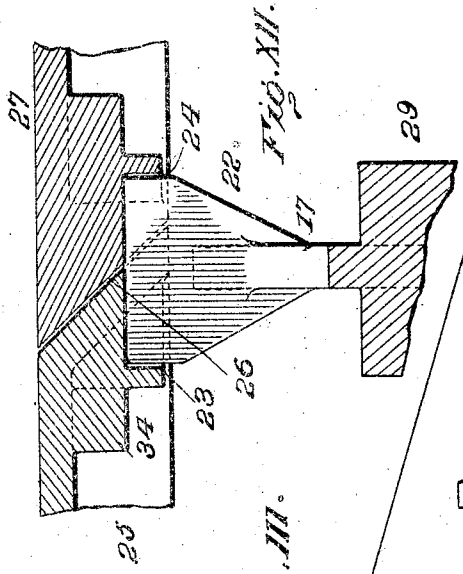

Fig. XII.

Fig. III.

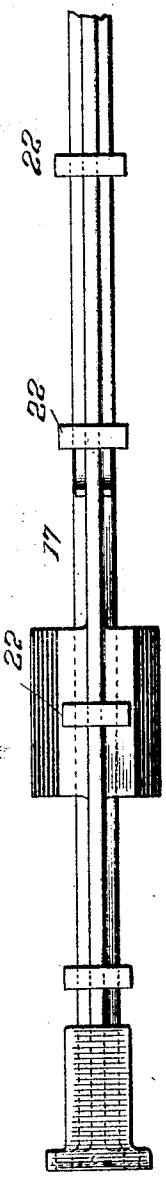

Fig. IV.

Fig. XIII

Witnesses

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5 SHEETS—SHEET 4

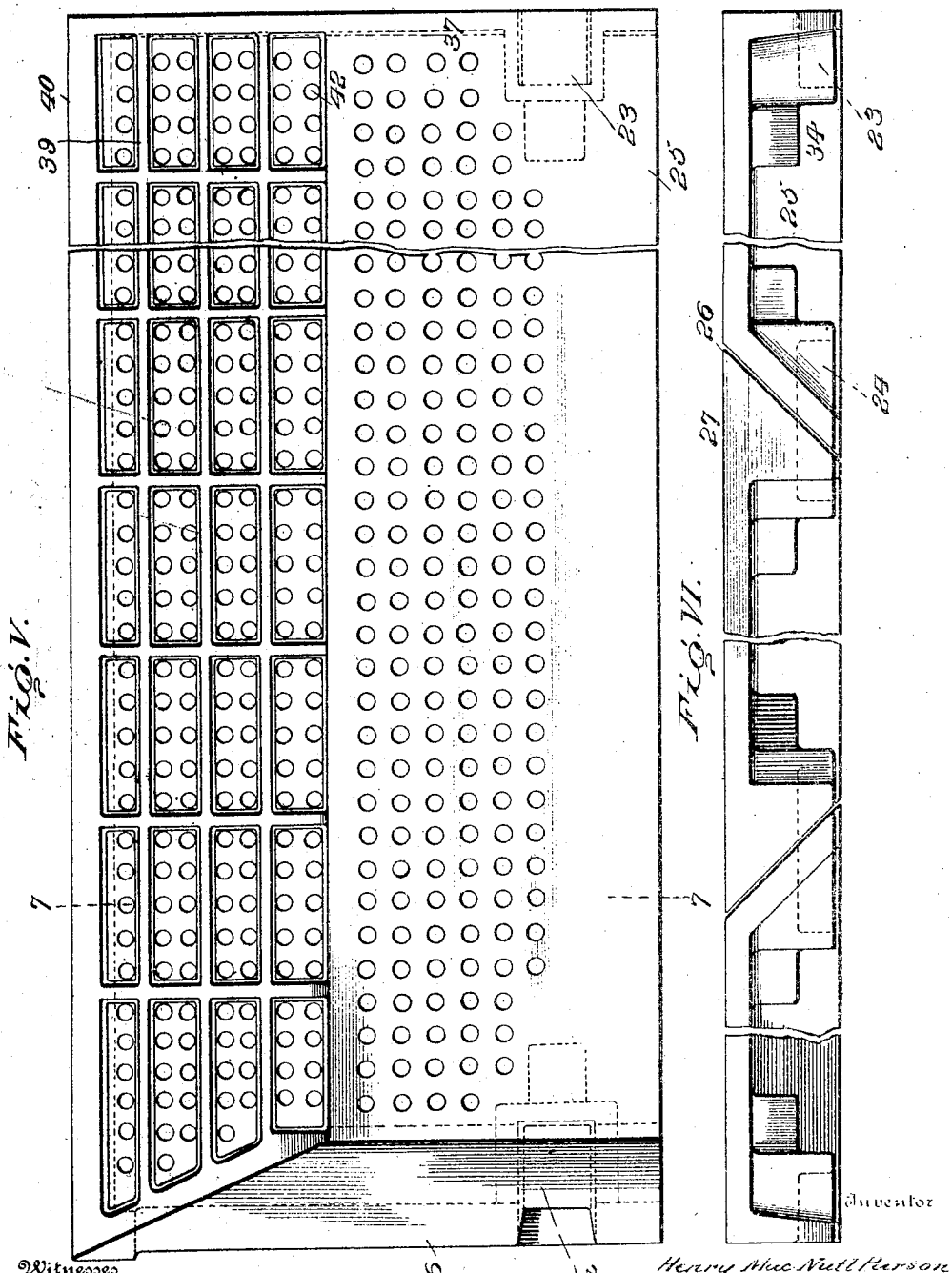

Fig. V.

Fig. VI.

Witnesses

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5 SHEETS—SHEET 5.

Fig. VIII.

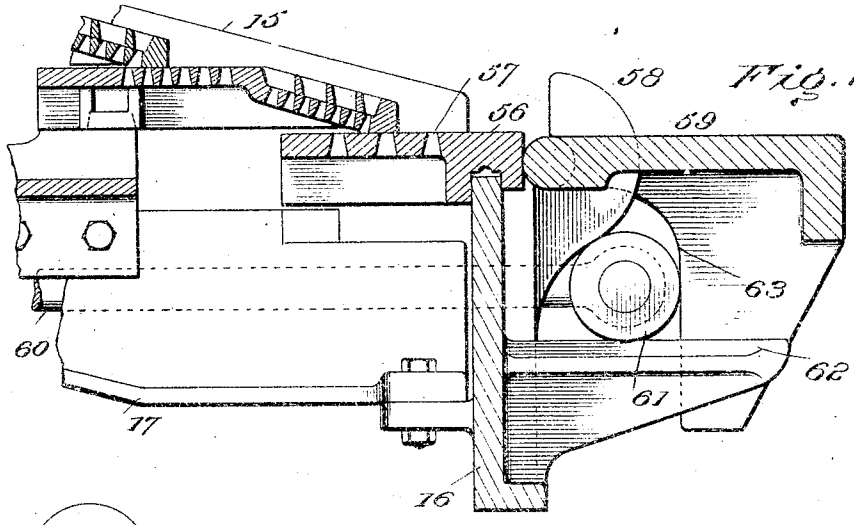
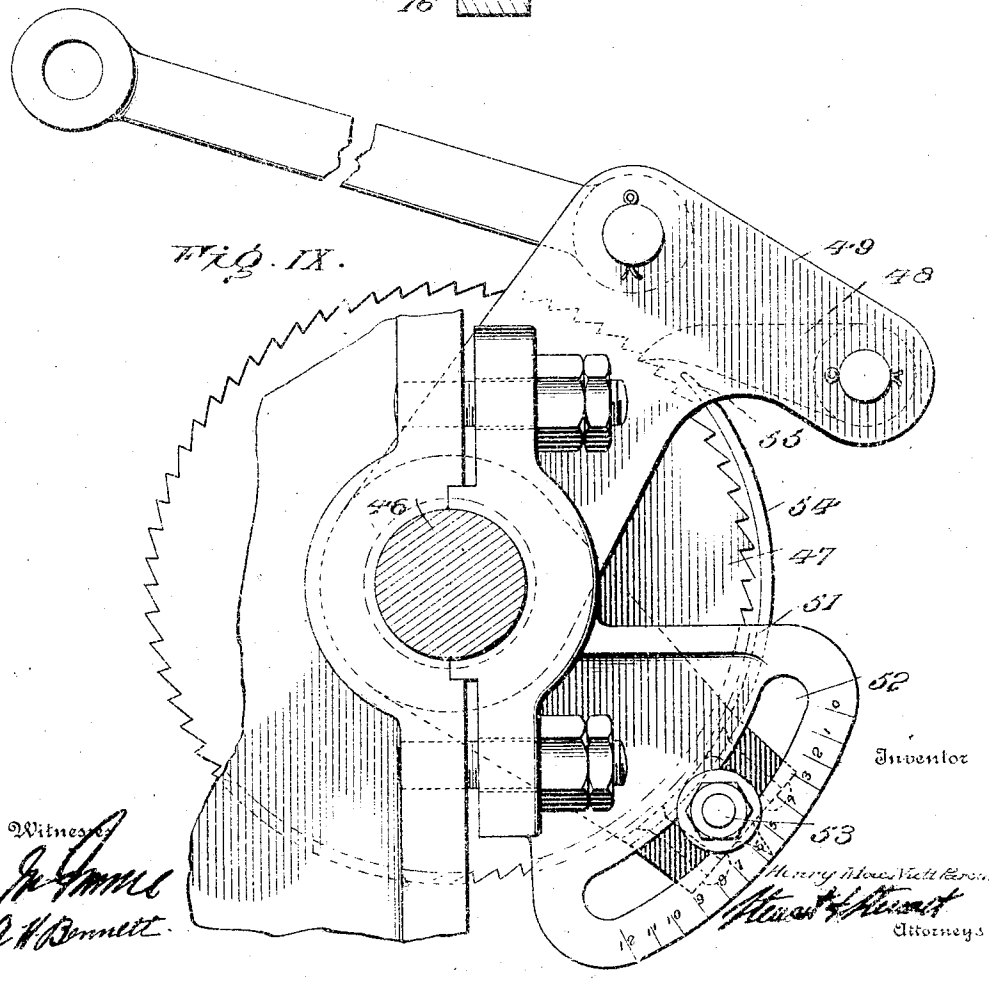


Fig. IX.



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UNITED STATES PATENT OFFICE.

HENRY MACNUTT PARSON, OF NEW YORK, N. Y., ASSIGNOR TO PARSON MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MECHANICAL STOKER.

1,027,149. Specification of Letters Patent. Patented May 21, 1912.

Application filed November 22, 1906. Serial No. 344,605.

To all whom it may concern:

Be it known that I, HENRY MACNUTT PARSON, citizen of the United States of America, and resident of the city, county, and State of New York, have invented certain new and useful Improvements in Mechanical Stokers, of which the following is a specification.

My invention relates to a mechanical stoker, the structure of which is simpler, more durable, and better protected from the effects of heat, and the operation of which is more efficient and less complicated in action than that of mechanical stokers heretofore in use.

More particularly my invention relates to a stoker, the construction of the parts of which is such that the fuel is advanced with regularity across the grate at constantly accelerating speed and diminishing depth; the rate of feed and depth of fuel on the grate being substantially the same at all points equally distant from the point at which the fuel is fed to the grate.

Difficulty has been experienced in maintaining an even and regular flow of fuel across furnace grates. The fuel advancing grates now in use are not so constructed as to insure an entirely reliable flow of fuel across them, but on the contrary require the services of an attendant, from time to time, to assist the flow. All fuel advancing grates known to me have positive feeding engagement with the fuel at comparatively few points, appreciably removed from each other, say the width of the grate bar apart; in consequence of which when unusually large pieces of coke are formed or forced upon the grate, such pieces, because of the insufficient feeding surface of the grate, often fail to move in response to the mechanical action of the stoker, and in stopping on the grate surface, impede the feed of fuel over the same, and also, when dislodged by the attendant, strip the grate, leaving it exposed to injury by heat.

In my invention, I have designed a grate, which in feeding, positively engages the fuel at a large number of points of the grate surface, and causes the fuel to be fed over the same in a smooth continuous sheet, and to continue to be so fed without any outside attention whatever.

I obtain my improved feeding engagement of grate and fuel without sacrifice of proper provision for draft through the grate. The grate is so constructed that the air passes through it in such a direction as not to blow the fuel from the surface of the grate bars, and in such quantity as to completely effect the combustion required. Furthermore by reason of having the fuel advancing action of the grate extended over all parts of its surface, I have found it unnecessary to operate the grate in independent transverse sections: the fuel on my grate will advance down the sides at the same rate as down the center, though sides and center move as one.

My invention further presents a novel means for accelerating the feed of the fuel as it advances over the grate, so that the more it is exhausted in its advance, the faster it is fed, to the end that the combustion may be maintained even, from the top to the bottom of the grate. I have also devised a novel means for regulating the depth of fuel on the grate in accordance with varying conditions, such as character of fuel used, and intensity of fire desired.

I attain my improved fuel feed across the grate by "stepping" the grate surface, not merely from bar to bar, but from point to point on each individual bar. The accelerated fuel advancing action of the grate, I obtain by providing for decreasing degrees of lost motion between reciprocating grate bars and the carriages by which they are carried. The steps of my grate bars project vertically, so that the air passages between them may also be vertical, whereby the fuel may not be blown down the grate from bar to bar; and, the bars being reciprocating, and fitting snugly over one another, any misdirected air drafts between them are precluded.

Having set forth the objects and nature of my invention, I will now describe an embodiment of the same in connection with the accompanying drawings in which—

Figure I is a view in cross-sectional elevation of an assembled stoker embodying the grate of my present invention. Fig. II is a plan view of the stoker shown in Fig. I, the grate bars being partly broken away to show the supports and operating mechanism below. Fig. III is a view in elevation of a portion of the right hand stoker frame side plate. Fig. IV is a detail plan view of a portion of one of the intermediate

frame pieces. Fig. V is a plan view of a portion of a right hand grate bar. Fig. VI is a detail view showing the right and left hand bars overlapped by the central bar. Fig. VII is a view in cross-sectional elevation on line 7—7 of Fig. V. Fig. VIII is a detail view in cross-sectional elevation on the line 8—8 of Fig. II, showing the manner of mounting the platform and dam at the foot of the grate, and the operating means for the dam. Fig. IX is an enlarged detail view of my device for regulating the stroke of the carriages. Fig. X is a view in elevation of a portion of one of the intermediate braces. Fig. XI is a detail view in cross-sectional elevation showing the manner of mounting the carriages on the supports. Fig. XII is a view in cross sectional elevation showing the manner of mounting the stationary bars on the supports. Fig. XIII is a view in cross sectional elevation showing the manner of mounting the movable bars on the carriages.

Referring to Fig. I of the drawings, the front plate of the furnace is indicated at 1, and directly in front of the plate 1 is a hopper 2, communicating with the interior of the furnace through an opening 3, in front wall 1. Within the furnace below the opening 3 is a grate, and the fuel is fed to the grate from the hopper by a feeder or pusher 4, sliding in guideways 5 and actuated from the power shaft by means of a crank 6 on the power shaft, the connecting rod 7 attached at one end to the crank 6, and having loosely mounted thereon a sleeve 8 to which is attached a bell crank lever 9 rocking on shaft 10, one arm 11 of the bell crank being pivotally attached to the shaft 12 of the pusher 4. As is common in the art, the stroke of the pusher is varied by adjusting the play of the sleeve 8 on the rod 7 as by means of a nut 13 and lock nut 14.

The grate and stoker frame within the furnace consists of right and left hand side frame pieces 15 (see Fig. III), attached at their forward ends to the front wall 1, and at rear ends to a rear plate 16. Intermediate the side plates 15 are plates or braces 17 (see Fig. IV). With their ends resting in brackets 18 on side pieces 15 and in brackets 19 on the intermediate supports 17 are transverse braces or rods 20. On the side pieces 15 are upwardly projecting lugs 21, and on the intermediate supports 17 in line with the lugs 21 are lugs 22 of about twice the width of the lugs 21.

Referring to Fig. V, the right hand grate bar is shown as provided with a socket or pocket 23 at its right hand end adapted to fit over lug 21 on the side frame piece 15 and at its opposite side with a similar pocket 24 adapted to fit over the lug 22 on the intermediate brace 17, whereby the stationary bar is supported. As shown in Figs. VI and VII, the grate bar 25 is beveled or tapered as at 26 on its left hand side, and the opposing grate bar 27 is oppositely beveled or tapered to interlock with, or be overlapped with the bar 25, and the opposing pockets of the two bars are both engaged by the lug 22 on the brace 17. The opposite end of the bar 26 is similarly tapered as shown in Fig. II to interlock with the left hand grate bar, and the latter bar engages a lug corresponding to the lug 21 on the left hand frame side piece.

Referring to Figs. III and IV, it will be observed that the frame side piece 15 carries near its upper end a bracket or pocket 27, and a similar bracket or pocket near its lower end. On the intermediate supports 17, and on either side thereof, are brackets or pockets 28 in line with the pockets 27 on the side pieces. The pockets 27 and 28 serve as bearings for the carriages on which the movable grate bars are supported.

Referring to Figs. I and II the carriages 29 are shown as provided near their upper and lower ends on either side with brackets or pockets 30. These pockets are in line with the pockets 27 and 28 on the side and intermediate frame supports, and are reversed with respect to same. Engaging on the one hand the bearings 27 and 28 and on the other hand the pockets or bearings 30, are rollers 31. These rollers have a certain amount of play in their bearings, and the requisite stroke for the carriages in the stoker frame is thus provided.

Referring to Figs. I and II, it will be observed that the carriages on either side are provided with a series of upwardly extending bosses 32. These bosses are flat at their upper ends, and have pockets 33, open at the sides of the carriage. The carriages are shaped to the slope of the grate, and the bosses 32 appear as a series of steps to engage the alternate or movable bars of the grate.

For the sake of expediency in manufacture, I prefer to cast my stationary and movable grate bars from a single pattern, and the bars shown in Figs. V and VII consequently represent the movable bars as well as the stationary bars. Referring to these figures, the bar 25 is shown as provided on its under face and at either side with a dependent lug 34. The lugs 34 serve as bearings or supports for the movable bars and rest in the pockets 33 of the bosses 32. Whereas the lugs 34 are of a uniform size, the pockets in the bosses 32 are considerably wider at the top of the carriage than at the bottom, gradually decreasing in width as the steps of the grate descend. It will therefore be seen that the lugs 34 fit quite loosely in the bearings on the carriage at the top of the grate, and have considerable play in

their bearings at this point, but that the extent of this play gradually decreases toward the foot of the grate.

The carriage (see Figs. II and III) are locked to move together by means of a rod 35 fitting in lugs 36 dependent from the bottom of the carriages.

Referring to Figs. V and VII, the grate bars are shown as having a flat upper face 37, and a sloping upper face 38. The face 37 serves to support the forward end of the bar next above, and acts in conjunction with the bar above to cause the fuel upon actuation of the carriages to be forced from the face 37 to the face 38. The sloping face 38 of the bar is shown as provided with a series of vertically disposed transverse ribs 39 flush at their upper ends with the face of the bar, whereby the ribs gradually increase in altitude with the slope of the bar. In this construction the front edges 40 of the bars act to engage positively from behind the fuel lying on the grate and each rib 39 to the extent that it rises above the edge 40 or rib 39 directly forward of it, also positively engages the fuel, and when the bars are advanced by the carriage, forces the fuel forward. The ribs 39 when viewed in front or rear elevation are seen to overlap each other so as to present a vertical fuel pushing surface unbroken by horizontally disposed air passages. The continuous surface thus presented for pushing the fuel results in an increased feeding efficiency for the grate. The faces 38 of the bars for the entire length of the slope therefore present gripping or feeding surfaces for the fuel, and as the bars largely overlap each other, the fuel is engaged practically over the entire surface of the grate, instead of at a series of points as 40, as would be the case, were the bars continually flat from front to rear. Between the ribs 39 and through the faces 37 of the bars, are vertically disposed passages 42 for draft. By thus designing the bars so that the ribs 39 are vertical, the air passages 42 may also be vertical, and the fuel is properly maintained on the grate instead of being blown off, as would be the case were the air passages 42 required to be horizontally disposed in order to get the stepped fuel engaging surface.

The grate carriages and consequently the movable grate bars are actuated by means of shafts 43 attached to one or more of the carriages, being shown in the drawing as attached to the two end carriages. It is obvious that since the carriages are locked to each other by means of the rod 35, an actuating rod for each carriage is unnecessary. The shaft or rod 43 extends through an elongated bearing, 44, projecting inwardly from the front plate of the furnace, and at a point outside of the front plate is connected to an eccentric 45 on the shaft 46.

Also fastened to the shaft 46 is a ratchet wheel 47 operated from the power shaft by a pawl 48 carried on an arm 49, which in turn is actuated by a crank 50 on the power shaft. Mounted on the shaft 46 adjacent to ratchet wheel 47 is a bracket 51 (see Fig. IX) having a curved slot 52 adjacent the teeth of the ratchet wheel. Overlying certain of the teeth of the ratchet wheel and supported by a bolt 53 in slot 52 is a curved plate 54. By loosening the bolt 53 and adjusting the position of the same in slot 52, the position of the plate 54 over the teeth of the ratchet wheel may be adjusted at will. Preferably the edge of the slot is marked to serve as a gage for determining the position of the plate 54. The plate 54 overlies more or less of that portion of the ratchet wheel adapted to be engaged by the pawl 48, and when interposed between pawl and the ratchet wheel, prevents the pawl from engaging the wheel until it has passed beyond the end 55 of the interposing plate. By varying the position of the plate 54, the point of engagement of the pawl with the ratchet wheel is similarly varied and the extent to which the ratchet wheel is turned by the pawl is also varied. As the throw of the eccentric 45 is determined by the movement of the ratchet wheel 47, the throw of the carriage bars is determined by the adjusted position of the plate 54 in the slot 52. In this manner, there is provided a ready means for varying the throw of the carriages within considerable limits without any waste of space.

Mounted on the end plate 16 at the rear of the stoker and at the foot of the grate, is a platform 56 for the fuel. This platform is provided with air passages 57. Pivotally mounted in brackets 58 on the plate 16 is a dam 59 for regulating the amount of fuel that the grate will maintain. This dam is preferably in sections as shown in Fig. II and is movable on its pivots by means of one or more rods 60. These rods pass through holes in the plate 16, and carry at their end rollers 61 adapted to move on ways 62 and engage cam surfaces 63 on the underside of the dam. By moving the roller along the ways, the dam is raised or lowered at will. The rod at its forward end passes through the front plate 1 of the furnace and through a yoke 64 where it threads through a milled wheel 65 held in the yoke. By turning the wheel 65, the rod 60 is advanced or receded, and the position of the dam 59 adjusted.

At the upper end of the grate and between the top grate bar and the opening through the wall 1 to the hopper, is shown means for coking the fuel before it reaches the grate, and for properly breaking the coke before feeding it to the grate. This coking device which consists of a coking

plate 66, and a reciprocating breaker 67 actuated from the power shaft, forms the subject matter of a co-pending application, Serial No. 344,606, filed Nov. 22, 1906 and will not be described in detail here.

In operation, the fuel fed from the hopper is pushed on to the coking surface by the pusher where it is coked, broken, and fed to the grate. The position of the plate 54 is adjusted to give the carriage the proper stroke and the position of the dam is adjusted, to accord with conditions such as character of fuel and intensity of fire desired, to regulate the capacity of the grate. The fuel upon reaching the top reciprocating bar of the grate is advanced by this bar, slowly because of the large amount of loose play between this bar and the carriage. From the top bar the fuel is fed to the bar below and so on down the grate, moving faster, and decreasing in depth as the lost motion between the grate bars and the carriages decrease. Because of the stepped surfaces of the grate bars, the fuel is engaged, over the entire sloping face of each bar, in addition to being engaged at the tips of the bars, and consequently there is little or no opportunity for pieces of fuel of unusual or irregular sizes and forms to rest at any spot on the grate and delay the feed. The fuel, whatever its character, is steadily and regularly advanced until it reaches the foot of the grate entirely exhausted of combustible material.

When any section of the grate is burned or injured it may be readily removed without displacing any other section. It is merely necessary to uncouple the movable carriage from its driving eccentric so that the movable grate sections may be pushed out from under the stationary sections. Then since the adjacent sections of my grate bar loosely overlap each other at their beveled edges, and also rest loosely on the carriages, the injured sections may be removed by simply lifting the same. To be able to remove a section of a grate bar without removing the entire bar or displacing any other part of the stoker frame, and to be able to do this expeditiously is of great importance.

As the movable grate bars are held in position on the carriage only by engagement of the lugs 34 thereon with the upwardly disposed pockets 33 in the bosses 32 on the carriages and the weight of the fixed bars, it will be apparent that when the carriage is moved forward as above described so that the movable bars are disengaged from the fixed bars, the former are unlocked, and may be lifted from the carriages. As has been described, there is some play or lost motion between the bars and carriages, and if the traverse of the carriage is not sufficient to clear the movable bars, the bars may be moved in a horizontal plane relatively to the carriage for this purpose, and then lifted to free them.

Although I have described in detail the structure which now appears to me to be the preferable embodiment of my invention, yet it is obvious that the particular structure described is capable of considerable variation within the scope of the invention.

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

1. In a mechanical stoker, a fuel advancing grate, some of the bars of which have reciprocating movement with respect to the others, and a movable carriage on which the reciprocating bars are so mounted as to have lost motion with respect thereto.

2. In a mechanical stoker, a fuel advancing grate, some of the bars of which have reciprocating movement with respect to the others, and a movable carriage on which the reciprocating bars are so mounted as to have different degrees of lost motion with respect thereto.

3. In a mechanical stoker, a fuel advancing grate, some of the bars of which have reciprocating movement with respect to the others and a movable carriage on which the reciprocating bars are so mounted as to have a decreasing degree of lost motion with respect thereto, as the fuel advances over the grate, whereby the fuel is fed faster as it advances.

4. In a mechanical stoker, a stepped fuel advancing grate, the bars of which are alternately stationary and reciprocating, a movable carriage for actuating the reciprocating bars, and connections between the reciprocating bars and the carriage providing a lost motion between the same which decreases as the steps of the grate descend, whereby the fuel is fed faster as it advances.

5. In a mechanical stoker, a stepped fuel advancing grate, the bars of which are alternately stationary and reciprocating, a movable carriage for actuating the reciprocating bars, and connections between the reciprocating bars and the carriage providing different degrees of lost motion between the carriage and the several reciprocating bars.

6. In a mechanical stoker, a fuel advancing grate, the bars of which are alternately stationary and movable, means for actuating the movable bars, and means connecting the movable bars to their actuating means, such connecting means being constructed to provide a lost motion between the grate bars and the actuating means, which gradually diminishes from the top to the bottom of the grate.

7. In a mechanical stoker, a fuel advancing grate having individual sections some of which are movable and each in turn having individual ribs, the ribs being spaced

one from the other, the spaces extending through the section forming apertures therein and the tops of the ribs being of increasing altitude to form steps, certain of the ribs having a fuel pushing surface disposed toward the next rib, the pushing surface of a higher step extending above the top of the pushing surface of the next lower step so that the combined projection of the pushing surfaces of the ribs on a plane at right angles to the plane of movement of the section is substantially continuous, the pushing surfaces being at an angle approaching 90 degrees to the said plane of movement.

8. In a mechanical stoker, a fuel advancing grate, alternate sections of which move as a unit and each section of which has individual ribs, the ribs being spaced one from the other, the spaces extending through the sections to form apertures therein and the tops of the ribs being of increasing altitude to form steps, certain of the ribs having a fuel pushing surface disposed toward the next rib and placed at an angle to the direction of the movement thereof, the pushing surface of a higher step extending above and below the top of the pushing surface of the next lower step so that the combined projection of the pushing surfaces of the ribs on a plane at right angles to the plane of movement of the section is substantially continuous, the pushing surfaces being at an angle approaching 90 degrees to the said plane of movement.

9. In a mechanical stoker, a fuel advancing grate having individual sections, each movable as a unit and each in turn having individual ribs, the ribs being spaced one from the other, the spaces extending through the section to form apertures therein, the tops of the ribs being of increasing altitude to form steps, the grate sections having upwardly directed air passages and each rib having a fuel pushing surface, the pushing surface of a higher step extending above the top of the pushing surface of the next lower step so that the combined projection of the pushing surfaces of the ribs on a plane at right angles to the plane of movement of the section is substantially continuous, the pushing surfaces being at an angle approaching 90 degrees to the said plane of movement.

10. In a mechanical stoker, a fuel advancing grate having bars extending laterally to the direction of the flow of the fuel over the grate and each bar having a series of projections on its fuel supporting surface, the tops of which increase in elevation toward the top of the grate the bars having upwardly directed air passages between said projections, the horizontal cross-sections of the passages being elongated in a direction transverse to the flow of the fuel.

11. In a mechanical stoker, a fuel advancing grate having bars which extend laterally to the direction of flow of fuel over the grate and have on their fuel supporting faces a series of upwardly projecting transverse ribs between which are apertures extending parallel to the ribs, the tops of the ribs decreasing in altitude toward the outer sides of the bars.

12. In a mechanical stoker, a fuel advancing grate having bars which extend laterally to the direction of flow of the fuel over the grate and have on their fuel supporting faces a series of upwardly projecting transverse ribs the upper surfaces of which decrease in altitude toward the outer sides of the bars, the bars having air passages elongated in a direction parallel to the ribs and extending through the bars between the ribs.

13. In a mechanical stoker, a fuel advancing grate, an adjustable dam at the lower end of the grate for regulating its fuel maintaining capacity, a rod for adjusting the position of the dam, a cam on the dam, and a roller on the rod engaging the cam, whereby sliding contact is had between the rod and the dam.

14. In a mechanical stoker, a fuel advancing grate, an adjustable dam at the lower end of the grate for regulating its fuel maintaining capacity, a rod for adjusting the position of the dam, and a cam on the dam, engaged by the rod.

15. In a mechanical stoker, a fuel advancing grate, an adjustable dam at the lower end of the grate for regulating its fuel maintaining capacity, a rod for adjusting the position of the dam, a cam on the dam, a roller on the rod engaging the cam, whereby sliding contact is had between the rod and the dam, and a guideway for the roller.

16. In a mechanical stoker, a fuel advancing grate, a receiving platform at the foot of the grate having air passages therethrough and a dam at the end of the platform adjustable to various settings in the operation of the stoker to vary the fuel carrying capacity of the grate.

17. In a mechanical stoker, a fuel advancing grate comprising stationary and movable bars extending transversely to the direction of the flow of the fuel and each formed of over-lapping lengths, driving mechanisms for the movable bars, means whereby they may be released from the driving mechanism whereby the movable bars may be withdrawn from engagement with the stationary bars, and the over-lapping edges of the adjacent bar sections being so formed that when the movable bars are so withdrawn, the individual bar sections are unlocked and may be removed.

18. In a mechanical stoker, a fuel advancing grate comprising stationary and movable bars extending transversely to the direction of the flow of the fuel and each

formed of over-lapping sections, driving mechanism for the movable bars, means whereby the movable bars may be released from the driving mechanism to be withdrawn from engagement with the stationary bars, the abutting edges of the adjacent bar sections being so formed that when the movable bars are withdrawn, the individual bar lengths are unlocked and may be removed by a single motion.

19. In a mechanical stoker, a fuel advancing grate comprising stationary and movable bars, extending transversely to the direction of the flow of the fuel and each formed of abutting sections, carriages supporting the abutting ends of the bar sections, driving mechanism for the carriages, means whereby the carriages may be released from the driving mechanism so that the movable bars may be moved out of engagement with the stationary bars, the ends of the bar sections being so formed that when the movable bars are withdrawn, any individual section is unlocked and may be removed from the adjacent section and from the carriage by a single movement.

20. In a mechanical stoker, a fuel advancing grate comprising stationary and movable bars formed of interlocking sections, carriages supporting the sections, driving mechanism for the carriages, means whereby the carriages may be released from the driving mechanism so that the movable bars may be withdrawn from engagement with the stationary bars, the interlocking portions of the adjacent bar sections being so formed that when the movable bars are withdrawn, each section is released and may be removed from the adjacent section and from the carriage.

21. In a mechanical stoker, a fuel advancing grate comprising stationary and movable bars formed of interlocking sections, carriages supporting the interlocking ends of the bar sections, driving mechanism for the carriages, means whereby the carriages may be released from the driving mechanism so that the movable bars may be withdrawn from engagement with the stationary bars, the interlocking edges of the adjacent bar sections or lengths being so formed that when the movable bars are so withdrawn, some of the bar sections are unlocked so that they may be removed from the adjacent bar sections and from the carriage by a single motion.

22. In a mechanical stoker, a fuel advancing grate having bars extending transversely to the direction of feed, and means for reciprocating the bars, certain of which are divided into a series of ribs with substantially flat fuel advancing surfaces transverse to the direction of motion of the bars, the tops of the ribs decreasing in altitude toward the outer portion of the bars.

Signed by me at New York city, N. Y., this 19th day of November, 1906.

HENRY MacNUTT PARSON.

Witnesses:
WENDELL P. BARKER,
WM. L. MORRIS.