W. E. RIDER.

GRATE.

APPLICATION FILED MAR. 14, 1908.

1,042,036.

Patented Oct. 22, 1912.

3 SHEETS—SHEET 1.

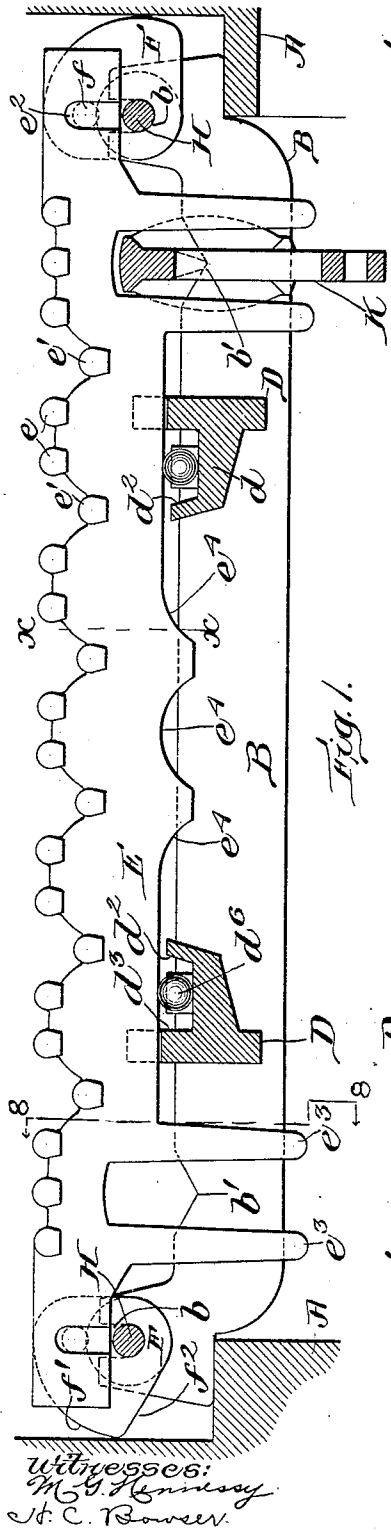

Fig. 1.

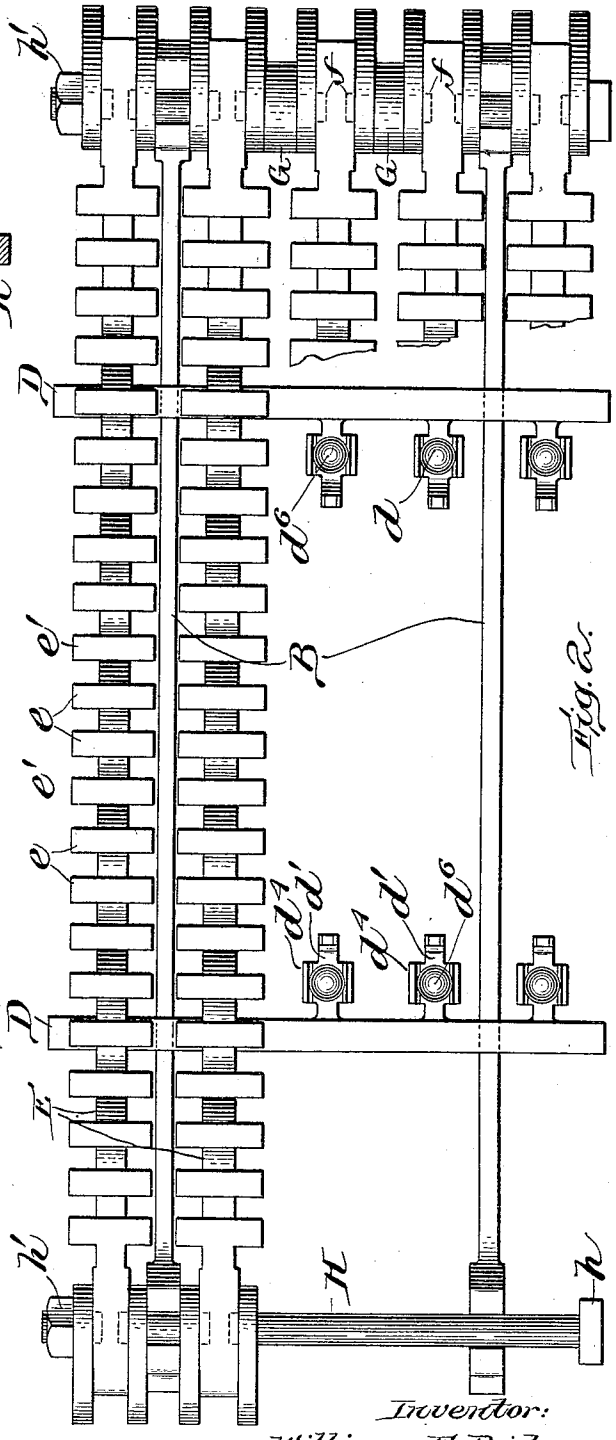

Fig. 2.

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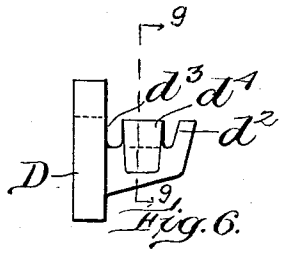


Fig. 6.

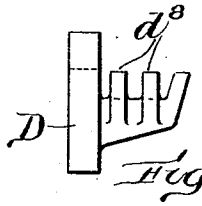


Fig. 7.

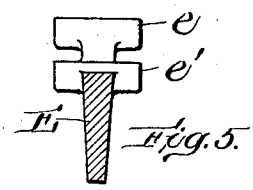


Fig. 5.

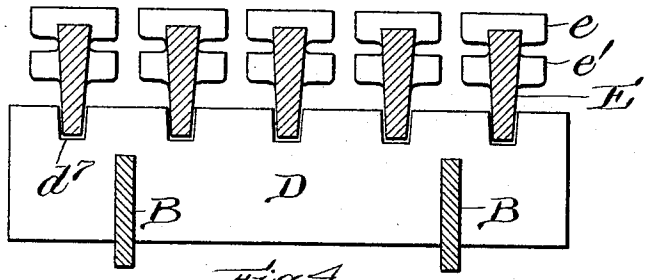
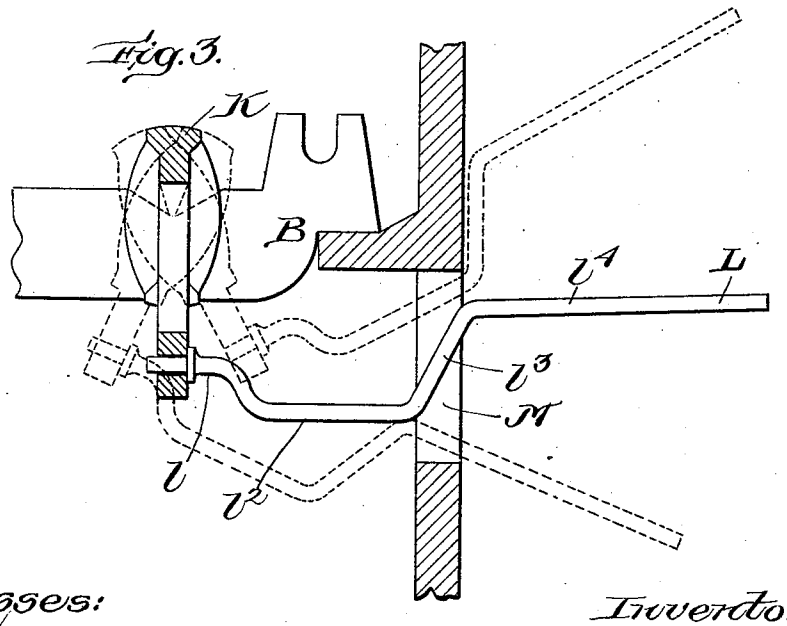


Fig. 4.

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 8.

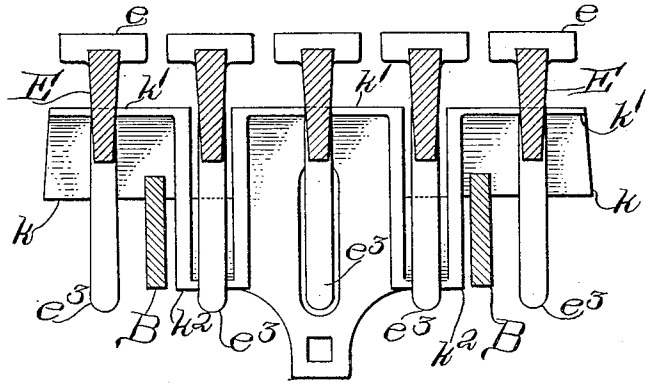
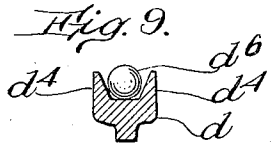


Fig. 9.



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UNITED STATES PATENT OFFICE.

WILLIAM E. RIDER, OF MANSFIELD, MASSACHUSETTS.

GRATE.

1,042,036. Specification of Letters Patent. Patented Oct. 22, 1912.

Application filed March 14, 1908. Serial No. 421,171.

To all whom it may concern:

Be it known that I, WILLIAM E. RIDER, of Mansfield, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in Grates, of which the following is a specification.

My invention relates primarily to reciprocating grates and one object is to provide a greater space than heretofore between the teeth of the grate bars both for the purpose of increasing combustion and also for relieving the fire of clinkers.

Another object is to provide a ball bearing which will be completely and easily cleaned by the movement of the ball.

Another object is to provide pivoted headers which will prevent the collection of clinkers at the ends of the grate.

Another object is to provide a shaker rod which will give a greater range of movement than heretofore, and consequently an increased efficiency when the grate bars are reciprocated.

To accomplish these objects my invention consists partly in grate bars which have some teeth in an upper plane and some teeth in a lower plane so that when the adjacent bars are reciprocated in opposite directions a greater air space is provided.

A feature of my invention is the ball bearing whose sides extend only part way to the ends of the track.

Another feature of my invention is the pivoted headers with their positive connection with the grate bars.

Another feature is the shaker rod having the handle portion offset from the portion which engages the rocking means.

In the drawings Figure 1 is an elevation showing certain parts in cross section; Fig. 2 is a plan of a portion of the grate with some of the grate bars broken away to show the ball bearings; Fig. 3 is a view of the shaker rod: Fig. 4 is a section across the grate showing the arrangement of teeth; Fig. 5 is a section on line x—x of Fig. 1 in the direction of the arrow; and Figs. 6 and 7 are details hereinafter described. Fig. 8 is a section on line 8—8 of Fig. 1; and Fig. 9 is a section on line 9—9 of Fig. 6.

The grate wall A supports the hangers B, as usual. The hangers have the indentations b' to receive the rocker bar and have circular recesses b to receive rod H to be hereafter described.

Rocker K oscillates on its edge k in indentation b' to impart movement to the grate bars, the portions k' above the center of oscillation of the rocker acting upon certain bars while the portions k^2 below the center of oscillation act on intervening bars so that oscillation of the rocker reciprocates adjacent grate bars in opposite directions.

Mounted on the hangers are cross pieces D from which project webs d, the horizontal top of which is track d' upon which roll the balls d^6. At one end of the track is stop d^2, which at its bottom is substantially of the same width as the track but is considerably narrower at its top. The stop at the other end of the track is that portion of the wall d^3 of the cross piece which is beneath the socket d^7, the track being in line with said socket but below it. Attached to the web d are the side guides d^4 which slope upwardly and outwardly from the track and which do not extend the full length of the track. In other words, the track is without side guides at its ends. With this arrangement it will be clear that the movement of the ball will force ashes and the like off the track at the ends, not only sidewise with relation to the track but at the end where stop d^2 is located they will be forced out in a direction parallel with the track by reason of the shape of the stop d^2, and also by reason of the outward sloping of the side guides.

In Fig. 7 is shown a form in which a plurality of side guides d^8, d^8 may be used. The only limitation in this respect is that the space must be such that the ball cannot escape through any of the open spaces. The grate bars E are mounted to reciprocate on the balls and are steered partly by the sides of the sockets d^7 and partly by the headers to be hereafter described. I prefer to make the bottom of the grate bar a series of arcs e^4, except at the bearing surfaces, which of course must be horizontal. The upper portion of the grate consists of a web in the form of a series of arcs having teeth e at the top of the arcs, and e' at the bottom of the arcs. Depending lugs e^3 are engaged by rocker K, as will be familiar to those skilled in this art. Each end of the grate bar is slotted at both sides, as indicated at e^2, and these slots are engaged by projections f on the headers F. These headers are pivoted on rod H and their surface adjacent to the grate wall may be circular as in the form at the right of Fig. 1, or may have a circular

portion f' at the top and a flat portion f^2 at the bottom, as indicated at the left of Fig. 1. One end of the rod H is headed at h and upon this rod are mounted the headers and rings G, the arrangement being such that a ring G will be between two headers; and each grate bar will be between two headers. The other end of the rod H is threaded to receive nut h' which may be screwed up to hold the parts in place but give freedom of rotation to the headers. The rocker bar K is operated by shaker rod L. This shaker rod comprises portion l which is at right angles to the rocker bar and comprises portion l^2 which is offset from portion l. Portion l^2 is in reality the handle but is extended through portions l^3 and l^4 to be more readily accessible. The shaker rod extends through the ash-pit doorway M and when the rocker bar is swung toward the ash-pit door the shaker rod may be raised a greater distance than heretofore, the increase being the amount of the offset.

In using my grate the shaker rod is applied to the rocker bar and by reason of the offset feature gives a greater range of movement to the shaker rod and consequently to the rocker bar and grate bars. The reciprocation of adjacent grate bars in opposite directions by the rocker bar will be clear without further description. When the grate bars are reciprocated on the balls any dust or ashes that may gather upon the ball track will be forced out sidewise at the ends of the track or lengthwise at the end away from the cross piece, and this method of keeping the track clear is quite new with me. When the grate bars are reciprocated they rotate the headers on their pivots by reason of the positive engagement between the projections f and the slots e^2. This insures the removal of clinkers and other matter from the ends of the grate and in the form of header shown at the left of Fig. 1 it will be seen that when the header is rocked and the portion f^2 becomes substantially parallel with the grate wall, there will be a considerable space between the grate wall and the header, and this form I prefer for some purposes.

From Fig. 4 it will be clear that although my grate bars reciprocate horizontally yet adjacent bars reciprocate in opposite directions and the arrangement of the upper and lower teeth is such that when the lower teeth of one grate bar are opposite the upper teeth of the adjacent grate bar there will be a greater air space between the teeth which are then side by side than is the case when the upper teeth of two adjacent grate bars are side by side, and the great importance of this arrangement is that a much greater air space with a given size of grate may be had with the two important resulting advantages of increased combustion and of passage for clinkers. It will also be clear that the arrangement of teeth in different planes will tend during reciprocation to break up the mass of coals as the lower teeth will tend to separate the mass of fuel from the upper teeth during that reciprocation.

Among the manifold advantages of my grate I may call attention to the increased air space between the horizontally reciprocating grate bars; to the improved breaking up of the mass of fuel; of the increased strength of the grate bars due to the arcing of their lower surfaces, this increased strength being not only in the downward direction but also in a sidewise direction, as it is true that there is a great tendency for the cast iron grate bars to warp sidewise, and this warping is almost invariably a result of downward bending; to the rotary headers which leave no slots in which clinkers may collect between the grate bars and headers as it will be clear that the headers and ends of the grate bars are in contact at all times; to the side guides of the ball bearing which while they keep the balls in place are not necessarily guides for grate bars; to the arrangement of separate removable headers which enables the parts to be removed and replaced in case one header becomes broken without the necessity of throwing away the whole header, and to the increased movement of the grate with a given size of ash-pit door.

I do not claim the shaker rod and ball bearing features as such in this application, as I intend to make them the subject of another application or applications.

What I claim is:

1. A grate bar comprising a web or body portion and transversely extending teeth, said web or body portion formed with supporting portions to permit of reciprocation of the grate bar in the plane of the web portion, said web portion being also formed with an undulated fire-surface extending along the path of reciprocation, said teeth being located both at the crest and the lower portions of the undulations.

2. A grate bar comprising a web or body portion and laterally extending teeth, said web or body portion formed with supporting portions to permit of reciprocation of the grate bar in the plane of the web portion, also formed with an undulated fire-surface extending along the path of reciprocation, said teeth being located both at the crest and the lower portions of the undulations.

3. A grate bar adapted to reciprocate in longitudinal direction, comprising a web whose top portion is corrugated, the corrugations extending transversely to the web and teeth extending laterally from said web, and arranged at intervals along the corrugated top surface and located both at the

upper and lower portions of the corrugations.

4. A grate bar adapted to reciprocate in longitudinal direction, comprising a web whose top portion is corrugated, the corrugations extending transversely to the web, and teeth extending laterally from said web and arranged at intervals along the corrugated top surface, the distance between the teeth being less than the distance between the highest and lowest parts of the corrugation.

5. In a grate the combination of a plurality of longitudinally reciprocating bars, arranged side by side, each of which has at its upper portion a series of raised and depressed portions, and which has teeth at the top of said raised and at the bottom of said depressed portions.

6. In a grate the combination of a pair of grate bars adapted to coöperate and to have relative longitudinal movement with respect to each other and having elevated and depressed fire-surface portions on each of the bars and teeth extending transversely from each of the bars toward the other bar, a part of the said teeth extending from the elevated portions of one of the bars, and a part of said teeth extending from the depressed portions of the other bar.

7. In a grate the combination of bearings; a grate bar comprising a web having a series of arches on its upper surface mounted to reciprocate on said bearings, and having its lower surface arched to conform to the series of arches on the upper surface of the web, except at the bearing parts.

8. In a grate the combination of corrugated grate bars having upper and lower teeth, the bottom of the upper teeth being higher than the top of the lower teeth; and bearings upon which the bars are mounted to reciprocate.

9. In a grate the combination of grate bars arranged side by side and each being corrugated and having teeth at the top and bottom of said corrugations, the shortest distance between the upper tooth of one grate bar and the upper tooth of an adjacent grate bar when those teeth are side by side being less than the shortest distance between the upper tooth of the first grate bar and the lower tooth of said adjacent grate bar when the two latter teeth are side by side; and bearings upon which the grate bars are mounted to reciprocate.

10. In a grate the combination of grate bars arranged side by side and each being corrugated and having teeth at the top and bottom of said corrugations, the shortest distance between the upper tooth of one grate bar and the upper tooth of an adjacent grate bar when those teeth are side by side being less than the shortest distance between the upper tooth of the first grate bar and the lower tooth of said adjacent grate bar when the two latter teeth are side by side; bearings for the grate bars; and means to reciprocate the grate bars.

11. In a grate the combination of grate bars arranged side by side and each being corrugated and having certain teeth whose tops are in an upper plane and certain other teeth whose tops are in a lower plane, the tops of the latter being lower than the bottom of the former teeth; and bearings upon which the grate bars are mounted to reciprocate.

12. In a grate construction the combination of a pair of corrugated bars and supporting members therefor, the bars being mounted on said supporting members so as to permit of relative longitudinal movement between the bars; teeth on each of the bars at the top and bottom of said corrugations, said teeth extending toward the companion bar, the bars, teeth and supporting means so constructed and arranged that the top of the lower teeth on one bar will be lower than the bottom of the upper teeth on the other bar when the lower teeth of one bar are opposite the upper teeth of the companion bar.

13. In a grate the combination of a grate bar; a roller bearing comprising a track, a roller in said bearing for supporting the grate bar, a stop at the end of the track and guides at the sides of the track, said guides extending only part way to said stop whereby there will be no accumulation of ashes between the ends of the guides and the stop.

14. In a grate the combination of a grate bar; a roller bearing comprising a track, a roller in said bearing for supporting the grate bar, a stop at the end of the track and a plurality of guides at each side of the track, there being spaces between the several guides on each side of the track and between the stop and the nearest guides, whereby accumulation of ashes between the guides and between the stop and the nearest guides will be prevented.

15. In a grate the combination of a grate bar; a track, a roller on said track for supporting the grate bar; a stop at one end of the track and guides at the sides of the track which guides extend only part way to said stop and which guides slope upwardly and outwardly from the track and terminate, whereby there will be no accumulation of ashes between the ends of the guides and the ends of the track.

16. In a grate the combination of a grate bar; and a roller bearing comprising a track, a roller in said bearing for supporting the grate bar, guides at the sides of the track, and a stop at one end of the track, the stop being at the bottom of the same width as the track but at the top being narrower than the track.

17. In a grate the combination of a grate

bar; a roller bearing comprising a track; a roller in said bearing for supporting the grate bar; a stop at each end of the track, one of the stops being at the bottom of the same width as the track but at the top being narrower than the track; and guides at the sides of the track, which guides slope upwardly and outwardly from the track.

18. In a grate the combination of a grate bar, a roller bearing comprising a track, a roller in said bearing for supporting the grate bar, a stop at each end of the track, one of the stops being at the bottom of the same width as the track but at the top being narrower than the track; and a plurality of spaced guides at each side of the track, which guides slope upwardly and outwardly from the track.

19. In a grate the combination of a grate bar and a cross-piece slotted to receive the lower part of the same; and a ball bearing projecting from the cross-piece in line with but below the slot in the cross-piece, said ball bearing comprising a track with a stop at one end, a roller on said track for supporting the grate bar, the cross-piece acting as a stop at the other end and a guide at each side of the track, there being spaces between said guides and the stop and spaces between said guides and the cross-piece.

20. In a grate the combination of grate bars adapted to reciprocate longitudinally; a pivoted header at the end of, and adjacent to, each grate bar; coöperating guiding surfaces on the sides of the bar and header; and means between the grate bar and header for swinging the latter on its pivot as the bar reciprocates.

21. In a grate the combination of a longitudinally reciprocating grate bar; a header pivoted adjacent to said bar at the end thereof and adapted to swing toward and from the grate wall, and having the upper portion of the surface adjacent to the bar circular, the circular portion being always at the same height as the top of the grate bar; and means between the bar and the header to oscillate the header.

22. In a grate the combination of a longitudinally reciprocating grate bar; a header pivoted adjacent to said bar at the end thereof and adapted to swing toward and from the grate wall, and having the upper portion of the surface adjacent to the bar circular and having the lower portion plane, the circular portion being always at the same height as the top of the grate bar; and means between the bar and the header to oscillate the header.

23. In a grate the combination of hangers; a rod mounted at the end of said hangers; headers pivotally mounted on said rod; grate bars connected with said headers to oscillate them; and rings on said rod, the several parts being mounted side by side so that the end of each grate bar is between two headers and so that each ring is between two headers.

24. In a grate the combination of several grate bars side by side each having a web whose top surface is corrugated and having teeth arranged at intervals along said corrugations, said teeth extending transversely from the web; and means to reciprocate adjacent grate bars in opposite directions.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."