(No Model.) 2 Sheets—Sheet 1.

S. H. LA RUE.

FIRE GRATE.

No. 306,762. Patented Oct. 21, 1884.

Fig. 1.

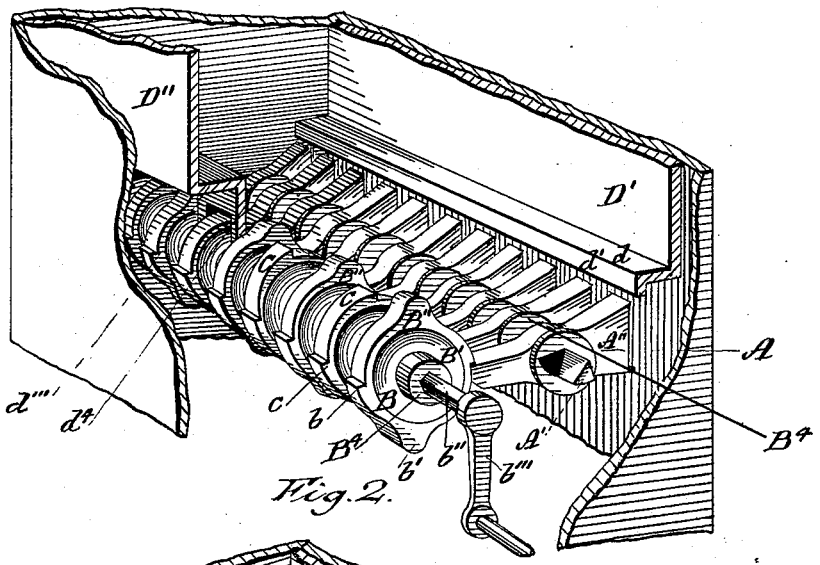
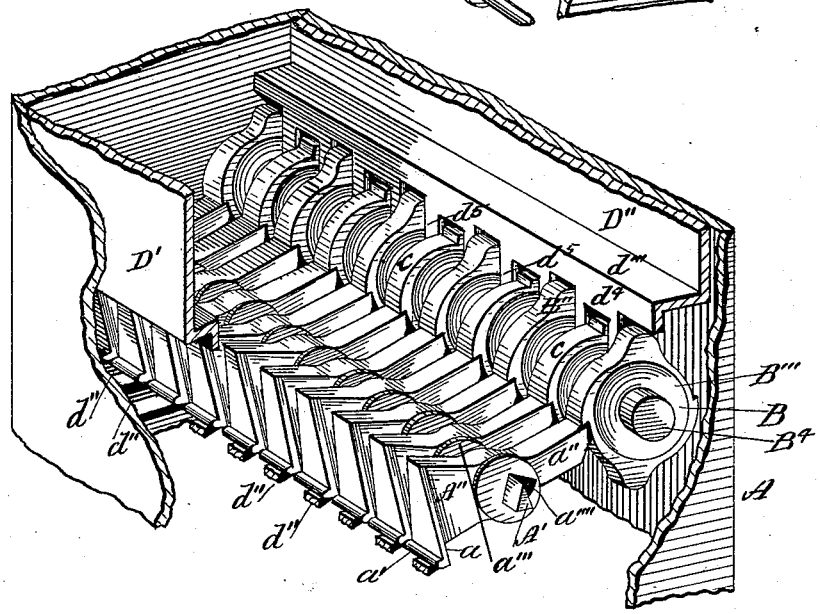


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

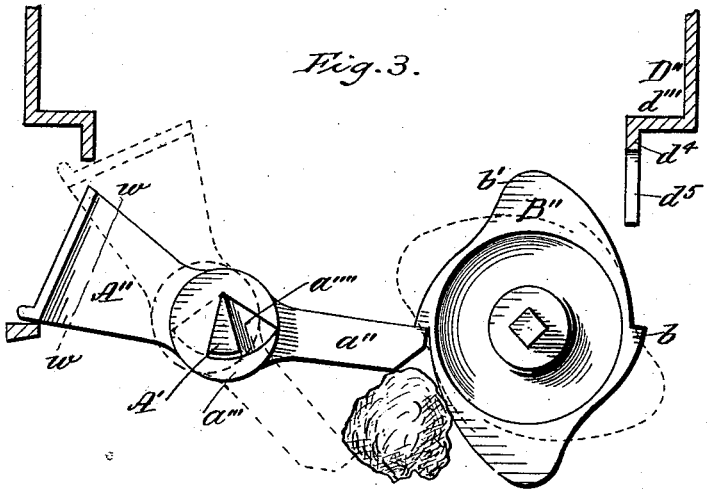


Fig. 6.

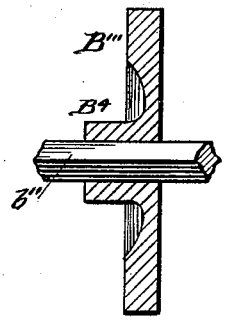


Fig. 4.

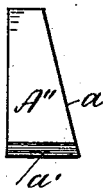


Fig. 5.

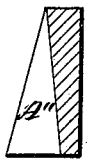


Fig. 7.

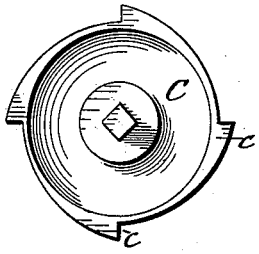


Fig. 8.

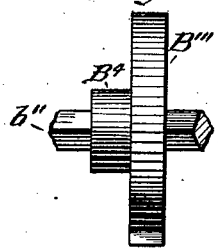
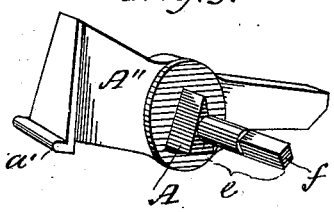


Fig. 9.



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Inventor;
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By J. H. Ashley Jr. Atty.

UNITED STATES PATENT OFFICE.

SILAS HUFFMAN LA RUE, OF READING, PENNSYLVANIA.

FIRE-GRATE.

SPECIFICATION forming part of Letters Patent No. 306,762, dated October 21, 1884.

Application filed October 5, 1883. (No model.)

To all whom it may concern:

Be it known that I, SILAS H. LA RUE, a citizen of the United States, and a resident in the city of Reading, in the county of Berks and State of Pennsylvania, have invented certain new and useful Improvements in Fire-Grates, of which the following is a full, clear, and exact description..

The improvements relate to grates of the class in which a portion of the fuel-supporting surface is vertically depressible to such an extent as to permit the discharge into the space below of a portion or of the whole of the contents of the fire-pot.

The invention consists in certain peculiarities in the construction of the parts which sustain the body of the fuel, and which are operable to agitate it, to discharge it, wholly or in part, and to return to position after such discharge certain of the members which, in connection with others, constitute the fire-bed or grate proper.

In the drawings, Figure 1 is a perspective view of the grate in position, the operating-section being at the front of the stove or furnace. Fig. 2 is a perspective view of the grate in position, the operating-section being at the rear of the stove or furnace. Fig. 3 is an end elevation, partly in section, showing the adaptation of the operating parts to each other. Fig. 4 is an end elevation of one of the series of vertically-agitable bars which constitute the principal portion of the fire-surface or fuel-supporting portion of the grate. Fig. 5 is a vertical transverse section of one of the cross-bars as taken on the line *w w* of Fig. 3. Fig. 6 is a vertical sectional view of one of the end sections of the operating-bar, the central longitudinal connecting-shaft being shown in perspective. Fig. 7 is a side view of one of the intermediate or alternate projections on the operating-bar. Fig. 8 is a view in elevation of the bearing-shaft, end section, and journal shown in Fig. 6. Fig. 9 is a detail perspective, showing the rear bearing-shaft as when adapted to project through the wall of the fire-box and be independently operated.

As shown, A is the rear division or cross-bar section of the grate, A′ being the fixed bearing-bar of the same; A″, the partially vertically-revoluble sections or cross-bars thereon; *a*, a flange projecting laterally from the outer extremity of each of such cross-bars; *a′*, a flange projecting longitudinally from the outer extremity of such cross-bars, and preferably at the bottom or near the bottom thereof, as shown in Figs. 1, 2, 3, 4, and 9 of the drawings; and *a″*, the inner or dumping end of such cross-bars.

B is the front division of the grate, B′ being the central revoluble operating portion of the same, and B″ and C the fuel-bearing sections thereon and concentric around the same.

Upon the section B″ are formed radial projections *b*, of the form shown, and radial curved projections *b′*, the latter being of greater extent from the center of the bearing-bar than the former.

The two end sections of the series of sections B″ B″ have cast therewith, or rigidly attached thereto, a disk or shoulder, B‴, which carries a journal, B⁴, both disk and journal being securely fitted to the supporting-bar *b″*, such bar squared, as shown, extending beyond the outer surface of the wall of the fire-chamber for the reception of a handled crank-arm, *b‴*, and the journal B⁴ resting in an orifice of corresponding form and dimensions formed in the wall or upon a bearing suitably attached to the inner surface of such wall.

At the rear of the grate, suitably secured to the inner surface of the wall of the fire-chamber, is a metallic lining-plate, D′, which at a suitable distance above the grate is provided with an inwardly-projecting horizontal flange, *d*, which, in turn, at its inner extremity, has a downwardly-projecting flange, *d′*. At the opposite side of the fire-chamber is a similar lining, D″, having horizontal flange *d‴*, which is provided with vertical depending flange *d⁴*, along the lower edge of which are formed, at intervals corresponding with the spaces between the sections B″ B″, rectangular continuations *d⁵* of this flange, which project into such spaces.

The several intermediate sections of the front division of the grate are each provided upon one side with circular concentric shouldered projections, to insure suitable distance between adjacent sections; and each of the cross-bars A″ has a similar projection, *a‴*, for a like purpose. The alternately-placed sections C have upon their periphery tooth-

like projections *c* for engagement with the projecting ends *a''* of the cross-bars of the grate. Projecting from the inner surface of the rear portion of the fire or grate chamber are rests or lugs *d''*, to limit the downward movement of the outer ends of the cross-bars, which constitute the rear division of the grate and serve as a support for the same.

The cross-bars or grate-sections A'' are each provided with eccentrically-placed openings *a''''*. These openings are substantially quadrantal in form, the area of the same being somewhat less than one-fourth of an entire circle, as I have preferred to represent it, although this may be varied without effecting the operation.

The bar A' is of a form in transverse section which corresponds with that of the orifices *a''''* in the cross-bars; but it is necessarily of less extent on its curved face, in order that the cross-bars may have vertical oscillation when placed in position thereon. Usually the bar A' will be fixed in its position by any well-known means; but, if desired, a short section of the projecting portion *c* of the same may be rounded, so as to rest in a circular orifice in the wall of the fire-chamber in the usual manner, a continuation, *f*, of the bar being squared to receive a winch or crank for operating the same, the opposite end of the bar B' being in all cases rounded to form a journal for that extremity of this division of the grate.

A brief description will explain the operation of the grate and its relation to the contiguous portions of the heater in which it is to be used.

When it is desired to clear the contents of the grate of ashes and other fine material which may be found to obstruct the draft through the burning fuel, successive slight movements to and fro of the crank-arm will so agitate the contents by bringing the two series of projections *b* and *c* into contact with the upper face of the ends *a''* of the cross-bars A'' as effectually to accomplish the desired object.

When clinkers or other substances too large to pass between the cross-bars are to be dislodged and removed, the crank-arm is so moved as to bring the longer projections *b'* of the sections B'' into contact with the ends *a''* of the cross-bars A'', as partially indicated in dotted lines in Fig. 3, when the cross-bars, as the movement progresses, will be further depressed, and, as the substance is precipitated into the cavity thus formed, that end of the cross-bar with which at one side the substance is in contact will move still farther down, the substance being pressed against, upon its opposite extremity, by the downwardly-moving projection *b'* until, if the clinker or other substance be so large as to require it, the flange *a'* of the cross-bar will be brought into contact with the vertical flange *d'* above, which in that direction limits its movement. In almost all cases, however, the clinker will have fallen through the opening into the space below before the parts will have reached the positions indicated by dotted lines in Fig. 3. It will be noted that the cross-bars are of greater size and weight at their outer extremity than at the opposite end, and that only that particular bar will be depressed, in the manner shown in Fig. 3, which is in contact with the substance which is to be discharged. Should the depressed bar fail from any cause, such as friction with small coals between it and an adjacent bar, to resume its position, after the refuse substance has been discharged, a reverse movement of the part B'' will bring the cam-like projection *b'* against the under surface of the end *a''*, and thus restore the bar to the position shown in full lines in Figs. 1 and 2, the flange *a'* resting upon the stops *d''*, which under all circumstances limit the downward movement of the outer end of the cross-bars. It is thus apparent that all the projections upon the operating-bar engage with the upper surface of the inner ends of the cross-bars to move them downwardly, and that when such inner ends have been depressed below their normal position the large projections *b'* may engage with the same and move them upwardly to place. None of the projections can, however, move these inner ends upwardly beyond their ordinary position, such movement being rendered impossible by the rest or stop *d''*. It will be observed that under this construction no operating-gearing is employed, and that one of the two divisions of which the gate is composed when agitated by the crank-arm acts by its projections directly upon the several parts which compose the fuel-surface of the other division. It will be understood also that a large chunk of clinker may be passed through the grate at one point without at all disturbing the contents of the fire-chamber at other points, since only that bar will be moved downwardly with which the foreign substance is in contact.

It is obvious that either portion of the grate may be used as the front thereof without changing the operation of the parts.

It will be apparent on reference to Fig. 3 of the drawings that the projecting flange *a'* might be dispensed with without affecting the operation of the parts, for the ends of the cross-bars would still be brought into contact with the stop above and with the rest below the same. It will also be seen that the lateral flanges on the cross-bars will serve to preserve uniformity in the dimensions of the space between such bars. These bars, it will be noted, diminish in thickness from top to bottom, so that a clinker or other object which has once passed through the interval between two bars on the upper surface of the grate will surely be ejected below.

I am aware of a grate in which a pivoted lever is used to oscillate in vertical planes, the alternate members of a series of pivoted grate-bars, but in this construction the actuating-levers do not, as in my device, form part of the fuel-supporting surface.

I am also aware of a series of loose grate-bars which at either end are actuated by a wiper-shaft which has on each of two opposite faces a series of curved cam projections.

I am also aware of the combination of a frame and two series of grate-bars which are pivoted at their inner ends, and which are caused by a cam-shaft to vibrate about their pivotal point.

I am also aware of a series of grate-bars which are loosely secured to a dumping-frame, and are operated by means of differential cams. In each of these constructions the actuating element is placed beneath the part which is actuated. I do not claim such a construction as either of these. In my construction one of the vertically-oscillating fuel-supporting sections operates directly upon the other fuel-supporting section to impart vertical oscillation to it, and I am not aware that a grate having such functions has ever before been made.

Having thus described the construction and operation of the grate which forms the subject of this my invention, what I desire to claim and secure by Letters Patent is—

1. A grate which consists of two distinct fuel-supporting sections, one of which engages directly with the other to produce vertical oscillation thereof.

2. A grate which consists of a series of vertically-oscillating cross-bars or sections, and a series of revoluble fuel-supporting sections, substantially as described.

3. A grate which consists of a series of vertically-oscillating cross-bars or sections, and a series of revoluble sections, the revoluble sections being adapted to engage with the oscillating sections, substantially as described.

4. The combination of a series of grate-sections or cross-bars capable of vertical oscillation, and an operating-bar which is provided with two series of dissimilar projections, which constitute a portion of the fuel or fire bed, and which are adapted to produce such agitation.

5. The combination of a series of sections together constituting a grated fuel-supporting surface, each section adapted to be vertically oscillated, a rest for such sections, and an operating-bar which has lateral projections which constitute a portion of the fuel or fire bed, and which are adapted to engage with the grate-sections and move them downwardly, as described.

6. The combination of a series of cross-bars or grate-sections which are adapted to be vertically oscillated, a rest for such cross bars or sections, and an operating-bar which has lateral projections which also constitute a grate-section, and which are adapted to engage with the cross-bars and move them downwardly, as described, and which has also other lateral projections which are adapted to engage with the cross-bars and move them upwardly to their ordinary position.

7. The combination of a series of cross-bars or grate-sections which are adapted, as described, to be moved in a vertical plane, and an operating-bar which is provided with two series of lateral projections, as shown, which constitute a portion of the grate or fuel surface, one series being capable of imparting a downward motion to the cross-bars, and the other series being capable of imparting both a downward and an upward motion to such cross-bars, substantially as described.

8. A bearing-bar which is capable of partial revolution only, vertically-oscillating cross-bars which are sleeved upon such bearing-bar, and each of which is capable of independent agitation, a rest for such cross-bars, and a vertically-revoluble bar which has fire-surfaces which are provided with projections, substantially as shown and described, which are adapted to engage with the inner ends of cross-bars and impart a downward motion thereto, all in combination.

9. A bearing-bar which is capable of partial revolution only, independently-oscillating cross-bars fitted loosely upon such bearing-bar, a rest for the independently-oscillating cross-bars, and a vertically-revoluble bar which has fire-surfaces which are provided with projections, as described, which are adapted to engage with alternate members of the cross-bars and impart an upward motion thereto, all in combination.

10. A bearing-bar which is partially revoluble, and vertically-oscillating cross-bars which are sleeved loosely thereon, in combination with a vertically-revoluble bar which is provided with projections, as described, which form fire-surfaces, such projections being provided, as described, with smaller projections upon their peripheries for imparting a downward motion to the cross-bars when they are in their ordinary position, and with other projections which impart an upward motion to alternate members of the cross-bars when they have been depressed below their ordinary position.

11. A grate which consists of independent vertically-oscillating cross-bars which are sleeved upon a partially-revoluble bearing-bar, and a revoluble section which constitutes a part of the grated fire-bed or fuel-support, and which has projections which are adapted, as described, to impart a downward motion to the inner ends of the vertically-oscillating cross-bars, and which has other projections which are adapted, as described, to impart an upward motion to the vertically-oscillating cross-bars.

12. The combination, in a grate, of a series of loosely-sleeved vertically-oscillating sections, a rest or stop to support the same, and an agitating and fuel-supporting section, the agitating fuel-supporting section being wholly revoluble in one direction, and but partially revoluble in the opposite direction.

13. The combination, in a grate, of a series of vertically-oscillating fuel-supporting sections, each of which has at one end a flange or

lug, and an agitating fuel-supporting section, which is provided with two dissimilar series of projections, all the members of both series being adapted for engagement with the series of vertically-oscillating sections.

14. The combination, in a grate, of a series of cross-bars or grate-sections which are movable in a vertical plane, each bar or section of which is adapted, after agitation, to resume its normal position, if unobstructed, through gravity alone, and each alternate member of which may be forced into position by projections upon an operating-bar, which projections constitute a portion of the fuel-surface of the grate.

15. The combination of the revoluble agitating-bar, having lateral fuel-supporting projections, as set forth, and the partially-revoluble cross-bars A″.

16. The combination of the agitating fuel-supporting projections C *e* with the depressible ends *a*″ of the cross-bars A″.

17. The combination of the revoluble fuel-supporting operating-bar and the sections thereon, which are provided, as described, with projections, all of which are adapted to impart a downward motion to one end of the cross-bars, and a portion of which projections are adapted also to impart an upward motion to alternate members of the series of cross-bars.

18. The combination of the vertically-oscillating fuel-supporting sections, and an agitating fuel-supporting section which acts directly upon the vertically-oscillating sections.

19. The combination of the vertically-oscillating cross-bars or grate-sections with the stops *d*′ and the rests *d*″.

20. The combination of the vertically-oscillating cross-bars or grate-sections provided with end projection, *a*′, with the stops *d*′, and with the rests *d*″, substantially in the manner described.

21. The vertically-oscillating cross-bars A″, having lateral flange *a*, in combination with the agitating fuel-supporting section B of the grate.

22. The vertically-oscillating cross-bars or grate-sections provided with a lateral flange, *a*, and a longitudinal flange, *a*′, in combination with the fuel-supporting agitating division or section B of the grate.

SILAS HUFFMAN LA RUE.

Witnesses:
J. P. KREMP,
D. KREMP.