(No Model.) 2 Sheets—Sheet 1.

W. R. RONEY & O. A. STRANAHAN.

FURNACE GRATE.

No. 519,775. Patented May 15, 1894.

Fig. 1.

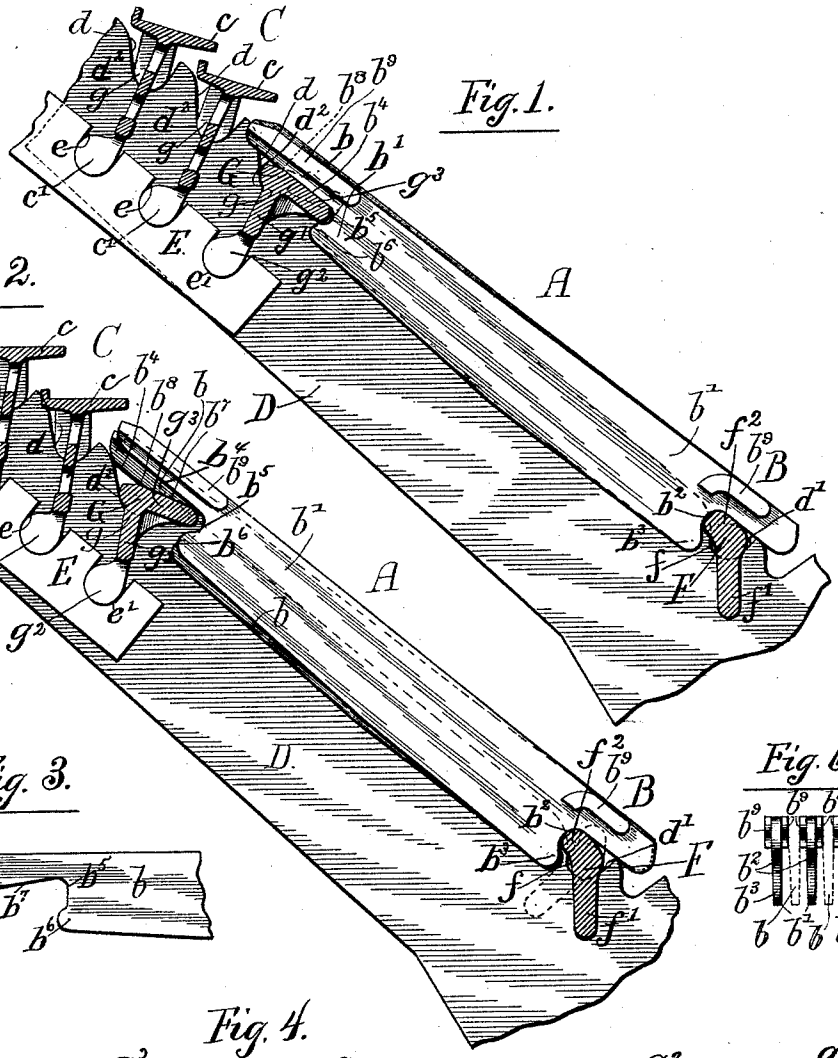


Fig. 2.

Fig. 3.

Fig. 6a.

Fig. 4.

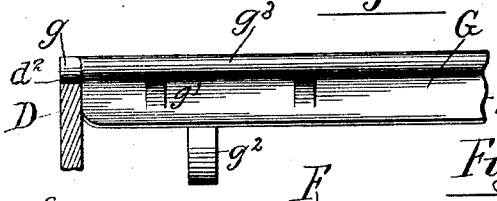
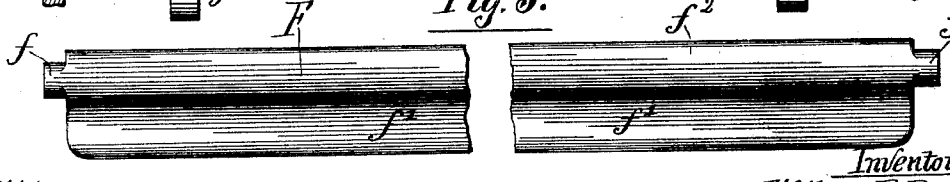


Fig. 5.



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WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

W. R. RONEY & O. A. STRANAHAN.

FURNACE GRATE.

No. 519,775. Patented May 15, 1894.

Fig. 6.

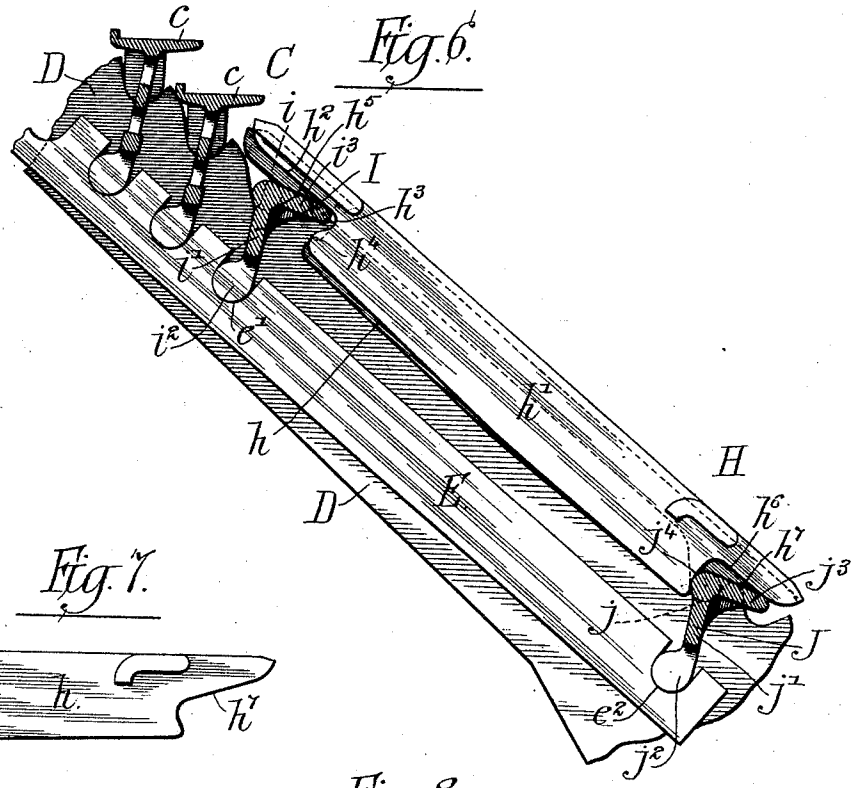
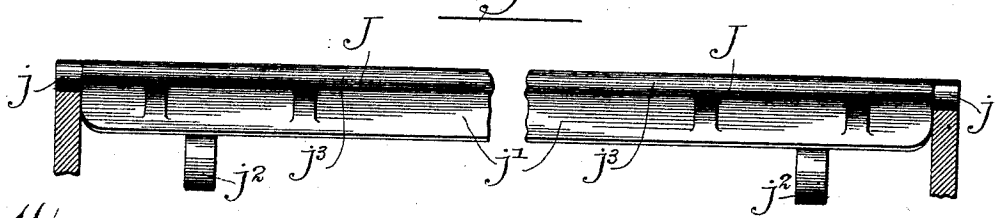


Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE.

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FURNACE-GRATE.

SPECIFICATION forming part of Letters Patent No. 519,775, dated May 15, 1894.

Application filed November 4, 1892. Serial No. 450,967. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM R. RONEY, of Boston, in the county of Suffolk and State of Massachusetts, and OLIN A. STRANAHAN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnace-Grates; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to furnace grates, and more particularly to that class of grates comprising a plurality of longitudinal grate-bars forming the lower and central portion of the grate, and a plurality of transverse rocking bars located at the head of the grate, such for instance, as forms the subject matter of Letters Patent No. 429,797, granted to one of the present applicants, William R. Roney, June 10, 1890.

The present invention is in the general nature of an improvement upon the structure set forth in said Letters Patent, and has for its objects, among others, to increase the effectiveness of the apparatus and at the same time simplify the construction and increase the durability thereof.

To these ends our invention consists in certain novel features which we will now describe and particularly point out in the appended claims.

In the accompanying drawings: Figure 1 is a longitudinal sectional view of so much of a furnace grate embodying our invention as is necessary for a proper comprehension thereof. Fig. 2 is a similar view, showing the moving parts in changed position. Fig. 3 is a detail side elevation of the upper end of one of the longitudinal grate-bars. Fig. 4 is a rear elevation of the upper bearing bar. Fig. 5 is a similar view of the lower bearing bar. Fig. 6 is a view in longitudinal section of a grate differing somewhat from that shown in the preceding figures. Fig. 6^a is an end elevation of the back or lower end of three of the movable longitudinal bars, the intervening stationary bars being indicated in dotted lines. Fig. 7 is a side elevation of the lower end of one of the longitudinal grate-bars. Fig. 8 is a view in side elevation of the lower bearing bar shown in Fig. 6.

In the form of grate, shown in Figs. 1 to 5 inclusive, of said drawings, A represents the inclined grate as a whole; B, the lower part of the inclined grate, composed of longitudinal grate-bars *b*, *b'*; C, the upper part of the grate, composed of transverse rocking-bars, *c*; D, D, side bearing plates, notched at *d* to receive the end trunnions of the rocking-bars, *c*; and E, a reciprocating rod or bar, having notches *e*, to engage the lugs, *c'*, of the rocking-bars and impart movement to these latter. Motion is imparted to this reciprocating rod in any suitable manner, the mechanism which we prefer for this purpose being that shown in Letters Patent No. 409,650, issued to the said William R. Roney, August 20, 1889. The lower portion B, of the grate is composed of two sets *b b*, *b' b'* of longitudinal grate-bars, the bars *b*, of one set, being stationary, and the alternate bars *b'*, of the other set, movable the latter having imparted to them a tilting motion in the manner hereinafter described. These bars are all supported at their lower ends by a cross bar, F, which forms the lower bearing bar of the longitudinal grate-bars. This cross-bar F, is normally stationary, and is provided at its ends with trunnions, *f*, which rest in notches, *d'*, in the side bearing plate D, near the lower ends thereof. The bar, F, is provided with a downwardly extending web or flange, *f'*, and with an upwardly and forwardly inclined rib or flange, f^2, rounded to form a bearing surface for the lower ends of the grate-bars *b*, *b'*. The lower ends of these grate-bars are each cut away to rest on the bearing F, the cut away portion terminating in a curved recess, b^2, to fit the rounded bearing surface of the flange f^2, of said bearing bar, and each grate-bar being provided below said recess, b^2, with a downward projection, b^3, to engage the flange f^2, when the bar F is in its normal position, as shown in full lines in Fig. 2 of the drawings, said projection b^3 serving to prevent accidental displacement of the bar.

G, is the upper bearing bar of the longitudinal grate-bars, the same consisting of a

cross-bar having trunnions g, which rest in notches, d^2, in the side bearing bars D. These notches d^2, are located immediately below and form a continuation of the series of notches d, in which rest the transverse rocking grate-bars, c. The cross-bar G is provided with a downwardly extending strengthening flange, g', having a lug g^2, to fit a notch e', in the reciprocating bar E, said notch being immediately below and forming a continuation of the series of notches e which receive the lugs c', of the rocking-bars c. At its upper portion the bearing bar G is provided with a rib or supporting flange g^3, inclined slightly downward and having, when the parts are in the inclined position shown in Fig. 1, its upper surface substantially parallel with the upper edges of the inclined grate-bars b, b', the free edge of said flange being preferably rounded off in the manner shown. The upper ends of the grate-bars b, b', rest upon the flange g^3 of the upper bearing bar G, the lower portions of their said upper ends being cut away to form vertically thin parts or arms which directly engage the cross-bar. The grate-bars b' b', are adapted to rest upon the rear part or edge of the flange g^3, so that in the usual position of the parts, the said bars are sustained or supported by said flange at a point remote from the pivotal axis of the cross-bar, with the result that the grate-bar is moved toward and from the said pivotal axis when the cross-bar is rocked or oscillated. The other bars b b are on the contrary so shaped as to bear upon the said cross-bar at a point opposite or adjacent to the pivotal axis of the same, and are free from contact with the flange g^3 in the usual position of the same, so that the cross-bar acts merely as a support for these grate-bars and gives practically no movement thereto when rocked or oscillated. The grate-bars b b, are however, so shaped adjacent to the cross-bar, that when the cross-bar is oscillated beyond a certain range of movement, the said flange g^3, will strike the lower edges of the grate-bars and lift the same, thereby providing a means of actuating or moving both sets of bars when a more vigorous shaking action is desired.

In the construction illustrated, wherein both sets of longitudinal grate-bars are made of practically equal length and extend upwardly over or past the cross-bar, the ends of the bars are shaped as follows: In the case of the bars b', the under edge, b^4, of the cut away portion, which edge rests on the bearing bar G, is straight and substantially parallel with the upper edge of the grate-bar. A curved recess, b^5, is provided at the termination of the bearing edges, b^4, to accommodate the edge of the flange g^3, and below this recess the bar is provided with a projection, b^6, which extends under said flange g^3. In the case of the stationary bars, b, the lower portion of the bearing edge, b^4, is inclined as shown at b^7, the junction, b^8, of the two edges, b^4, b^7, forming a bearing point which rests on the top of the flange g^3, opposite or near the pivotal axis of the bar. As shown in the drawings, the distance from the bearing edge b^4, to the top of the grate-bar, is greater in the stationary bars b, than in the movable bars b', so that when the said movable bars are in their lowermost position, as shown in Fig. 1, their upper edges are below the upper edges of the stationary bars, this difference in height being a diminishing one and disappearing at the lower end of the grate. It will be readily seen that a reciprocating movement imparted to the bar E, will not only cause a rocking motion of the grate-bars c, which compose the upper portion C of the grate A, but will also impart a reciprocatory motion to the upper ends of the movable longitudinal grate-bars, b'. The longitudinal bars are moved throughout their length to an extent sufficient to break up the clinkers and prevent stoppage of the air passage between the bars. It will be noted that in this form of grate, the same bar that rocks the transverse grate-bars also actuates the longitudinal grate-bars, and the upper bearing bar, which is the intermediate means for effecting this result, in dimensions and form closely approximates the transverse grate-bars and may be regarded as a modified form of one of these, and may, indeed, be substituted for the lowermost one of those retained in altering a grate entirely composed of transverse bars to a compound grate of the form shown, thus effecting a material saving of cost. The long connecting devices and moving parts at the lower and hottest portion of the grate, shown in the prior patent hereinbefore referred to, are of course, entirely dispensed with in our improved construction. By turning the lower bearing bar F into the position, shown in dotted lines in Fig. 2, any one or more of the grate-bars b, b', may be readily moved and replaced.

The grate-bars b have heretofore been referred to as stationary and in the construction shown, they are stationary within the usual or normal range of motion of the parts, but they may, if it be advisable, be made stationary whatever the range of motion of the parts may be. In the construction illustrated, which is that which we prefer, the grate-bars b b may have imparted to them, under certain circumstances, an independent lifting or tilting movement. When the range of movement of the parts is such that the upper bearing bar G, moves beyond the position shown in Fig. 2, in which position its bearing surface is parallel and in contact with the inclined bearing edge b^7, of the bars b, these latter bars will, of course, be lifted by such further movement, though not to the same extent nor during the same period of time as the bars b', are lifted. This additional movement of the stationary bars affords a more extended or violent action for the breaking up of any clinker which may resist the action of the movable grate-bars b', and insures a proper feeding of the material and a sufficient air supply.

In order to properly space the longitudinal grate-bars and preserve the air spaces between the same, we provide one of the two alternate sets, in the present instance the movable bars b', with lateral spacing projections or blocks, b^9, each bar b' being provided at each of the ends with two of these spacing blocks, located one on each side thereof. The bars b are in this case laterally smooth. These blocks may, however, be on the bars b, or partly on one set of these bars and partly on the other set.

In Figs. 6, 7 and 8 are shown modifications of the lower or longitudinal grate-bars, wherein the same are moved or actuated both at their upper and lower ends instead of at their upper ends only, as is the case in the construction shown in the figures of the drawings hereinbefore described. In this instance the upper part C of the grate is formed by grate-bars c c constructed in the same manner as hereinbefore described, and the lower part H consists of a plurality of longitudinal grate-bars h h, h' h', of which the bars h are sustained without movement in the usual working of the grate and are arranged in alternation with the bars h', which latter are movable, generally in the same manner as the bars b' hereinbefore described. The grate-bars h h' are supported at their upper ends by a cross-bar I, which is substantially like the cross-bar G, shown in Figs. 1 to 5, and the lower ends of the said grate-bars are supported by a cross-bar J, which is similar to the bar I, and may in practice be conveniently made identical in form therewith. Said bars I and J are provided with trunnions i j, which rest in notches in the side bearing plate D and are provided with downwardly extending webs i' j', having at their lower edges lugs i^2 j^2, for engagement with notches e' e^2, formed in the reciprocating bar E which in this instance is extended downwardly to the lower end of the grate for the purpose of actuating the lower cross-bar J. The bars I J are also provided with rearwardly extending flanges i^3 j^3, on which the grate-bars h h rest and which operate, when the cross-bars are moved, to actuate the upper and lower ends of the said bars h h. The upper ends of the grate-bars h h' are constructed in the same manner as the corresponding ends of the grate-bars b b' hereinbefore described; the said bars h' being shaped at their upper ends so as to form edges h^2 substantially parallel with the upper margins of the bars and adapted to engage the top surface of the cross-bar I, and with a recess h^3 to receive the rear edge of the flange i^3 of the cross-bar; said recess forming a projection h^4 which extends under the said flange i^3 to hold the bar from being lifted from its place. The stationary bars h are provided with the bearing edges h^5 which are adapted to rest on the cross-bar near the pivotal axis of the same, and are cut away or inclined above or opposite the flange i^3 of the cross-bar I, so that rocking movement of the cross-bar through a certain distance will move the bars h' without moving the bars h. The lower ends of the said bars h h' are in this instance made substantially like the upper ends thereof; the bars h' having straight bearing surface h^6 parallel with their upper edges for engagement with the flange j^3 of the cross-bar J, while the bars h are cut away opposite said flange, to form inclined surfaces h^7 preferably having the same inclination as the edges h^5 and bearing the same relation to the said cross-bar J, so that when the cross-bar is rocked or oscillated the movable or free edges of the flanges f^3 will act upon the bars h' but will have no tendency to move the bars h, unless said cross-bar is rocked so far as to bring the free edge of its flange j^3 against the said surface h^7. In this construction the grate-bars are sustained or supported from longitudinal movement at their lower ends by contact with the upper forward part of the cross-bar J, and in order to prevent the said bar from giving endwise movement to the grate-bars as it is rocked or oscillated, its bearing surface j^4, which is in contact with the lower ends of the grate-bars is made cylindric or rounded concentrically with the axis of rotation of the bar, in the manner illustrated. The two bars I and J in this construction being alike and being moved equally by the reciprocating bar E, the movable bars h' h' will be moved equally at their upper and lower ends and will thus remain practically parallel with the stationary bars h h. In this instance, as in the slightly different construction hereinbefore described, both sets of bars may be moved by lengthening the throw of the actuating bar E in such manner as to carry the free edges of the flanges i^3 j^3 of the cross-bars against the inclined edges h^5 h^7 of the said bars h^4.

It will be noted that in both of the forms of grates shown, movement of the alternate longitudinal bars is secured by means of an oscillating cross-bar which is engaged by the bearing edge of the moving bars at a point distant from its center of motion while engaged with the stationary bars at a point adjacent to its center of motion; the stationary bars or those which engage the cross-bar adjacent to its center of motion being recessed or cut away to prevent contact of the cross-bar therewith in the usual range of movement of the latter, and it is obvious that the result produced by the construction generally above described, can be obtained when the engaging parts of the grate-bars and cross-bars are shaped otherwise than in the particular manner illustrated. The construction by which the grate-bars which have little or no movement are so made that a portion of the cross-bar remote from its center of movement will strike and lift the same after a certain limit of movement is reached, is however, of special advantage as affording a means of

moving both sets of longitudinal bars when desired and is herein claimed as a separate improvement.

What we claim as our invention is—

1. An inclined furnace grate comprising longitudinal grate-bars and an oscillating cross-bar supporting the same, in which the cross-bar is provided with a lifting flange and some of the said grate-bars are sustained by resting on the cross-bar at points adjacent to its pivotal axis and others of the said grate-bars engage the lifting flange at points remote from said pivotal axis, whereby those of said bars which engage the cross-bar near its pivotal axis, remain stationary, and those which engage the lifting flange are raised and lowered when the cross-bar is oscillated, substantially as described.

2. An inclined furnace grate comprising longitudinal grate bars and an oscillating cross-bar supporting the same, in which some of said grate-bars engage the cross-bar at points adjacent to its pivotal axis and are provided with surfaces located in position for contact with the cross-bar when the throw of the latter is increased beyond a certain limit, and the other of said grate-bars being engaged with the cross-bar at points remote from the pivotal axis of the bar, substantially as described.

3. An inclined furnace grate comprising longitudinal grate-bars and an oscillating cross-bar supporting the same, said cross-bar being provided with a lifting flange extending outward from its pivotal axis beneath said longitudinal bars, which latter are provided with bearing surfaces adapted to rest on said cross-bar adjacent to its pivotal axis when the latter is at the limit of its oscillation in one direction, part of said longitudinal bars being so recessed adjacent or opposite to said flange as to permit limited oscillation of the supporting cross-bar without lifting said bars, substantially as set forth.

4. An inclined furnace grate, comprising transverse rocking bars, forming the upper part of the grate and longitudinal bars forming the lower part of the grate, and an actuating bar for rocking said transverse bars and simultaneously imparting a lifting movement to the alternate longitudinal bars, substantially as described.

5. An inclined furnace grate, comprising transverse rocking bars forming the upper part of the grate, longitudinal grate-bars forming the lower part of the grate, an oscillating cross-bar supporting and actuating the longitudinal bars, and a notched reciprocating bar for actuating the said rocking bars and cross-bar, said rocking bars and cross-bar being provided with depending parts or lugs engaging the notches of the reciprocating bar, substantially as described.

6. An inclined furnace grate, comprising transverse rocking bars forming the upper part of the grate, longitudinal bars forming the lower part of the grate, an oscillating cross-bar for supporting and giving movement to the said longitudinal grate-bars, said cross-bar being adapted to engage a portion of the longitudinal bars at points remote from its pivotal axis and to engage the others of said longitudinal bars at points adjacent to its pivotal axis, and means connected with the several rocking grate-bars and cross-bars for giving oscillatory movement to the same, substantially as described.

7. An inclined furnace grate, comprising transverse rocking bars forming the upper part of the grate, longitudinal grate-bars forming the lower part of the grate, an oscillating cross-bar for supporting and giving movement to the said longitudinal grate-bars, said cross-bar being adapted to engage a portion of the longitudinal bars at points remote from its pivotal axis and to engage the others of said longitudinal bars at points adjacent to its pivotal axis, and a single longitudinally reciprocating bar engaged with the several transverse grate-bars and cross-bars for giving oscillatory motion to the same, substantially as described.

8. An inclined furnace grate, comprising transverse rocking bars forming the upper part of the grate, longitudinal bars forming the lower part of the grate, oscillating cross-bars supporting both the upper and lower ends of the longitudinal bars, said cross-bars being adapted to engage the alternate longitudinal bars at points remote from the pivotal axis of the cross-bar and to engage the intermediate longitudinal bars at points adjacent to the pivotal axis of the cross-bars, and means for actuating the several grate-bars comprising a longitudinally reciprocating bar engaging downwardly projecting parts or lugs on the said transverse grate-bars and cross-bars, substantially as described.

In testimony that we claim the foregoing as our invention we affix our signatures in presence of two witnesses.

WILLIAM R. RONEY.
OLIN A. STRANAHAN.

Witnesses:
TAYLOR E. BROWN,
C. CLARENCE POOLE.