

(No Model.)

3 Sheets—Sheet 1.

E. FALES.
FUEL SUPPORT OR GRATE.

No. 526,073.

Patented Sept. 18, 1894.

Fig. 1.

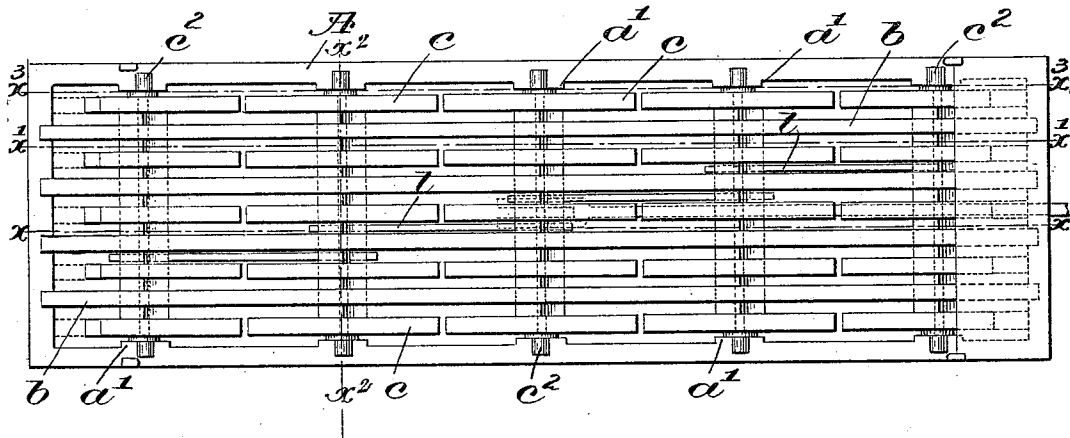


Fig. 2.

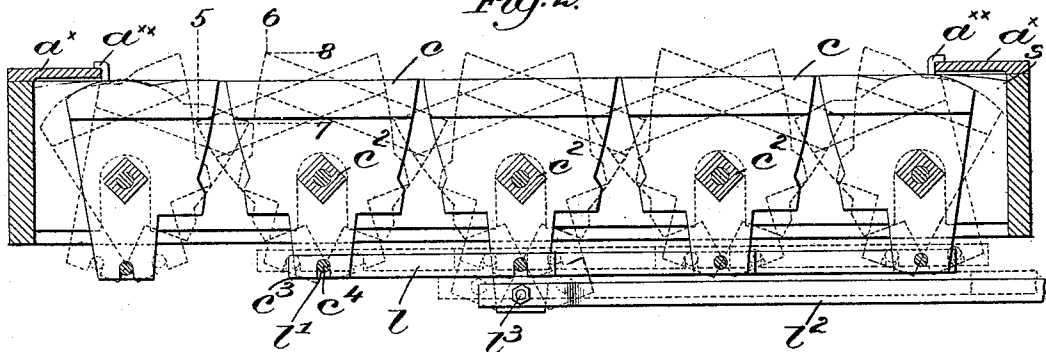


Fig. 3.

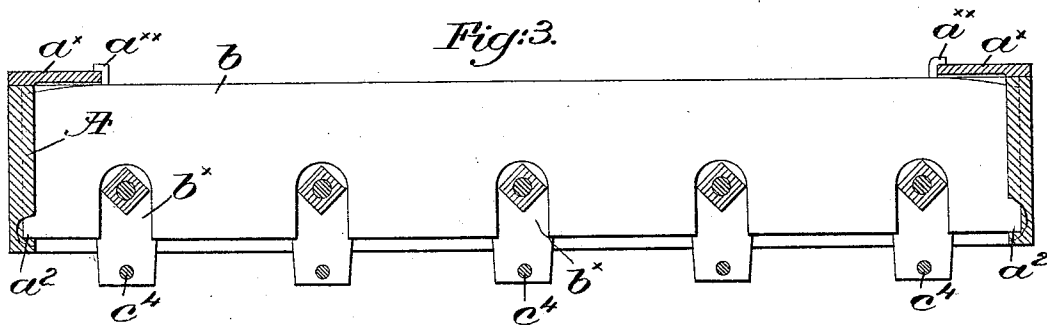
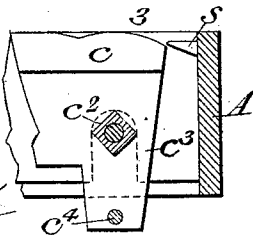


Fig. 2^a



Witnesses.

Fred S. Grunk of

Thomas J. Dummer of

Inventor:
Edward Fales,
by Crosby & Gregory
attys

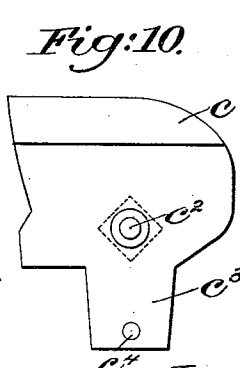
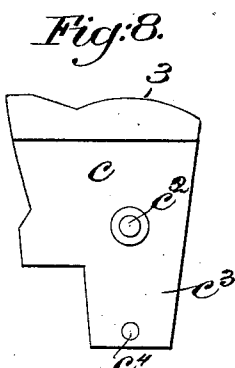
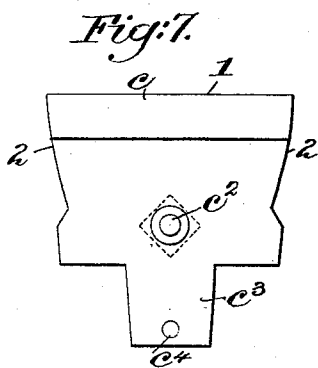
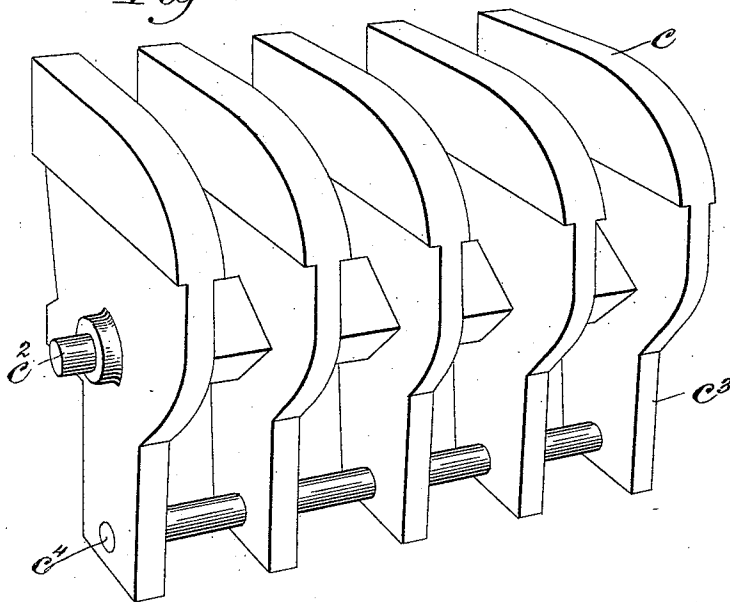
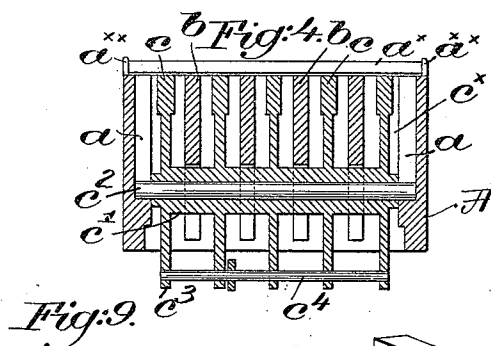
(No Model.)

3 Sheets—Sheet 2.

E. FALES.
FUEL SUPPORT OR GRATE.

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Witnesses.

Fred S. Grumbaf.

Thomas J. Drummond.

Inventor
Edward Fales.
by Crosby & Gregory
attys.

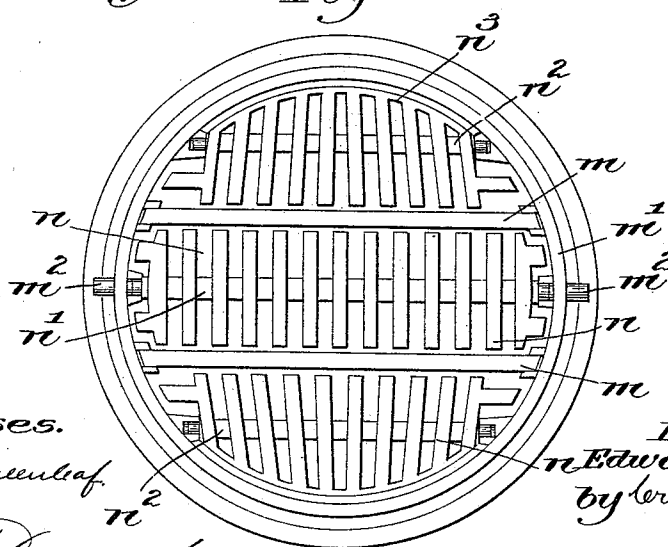
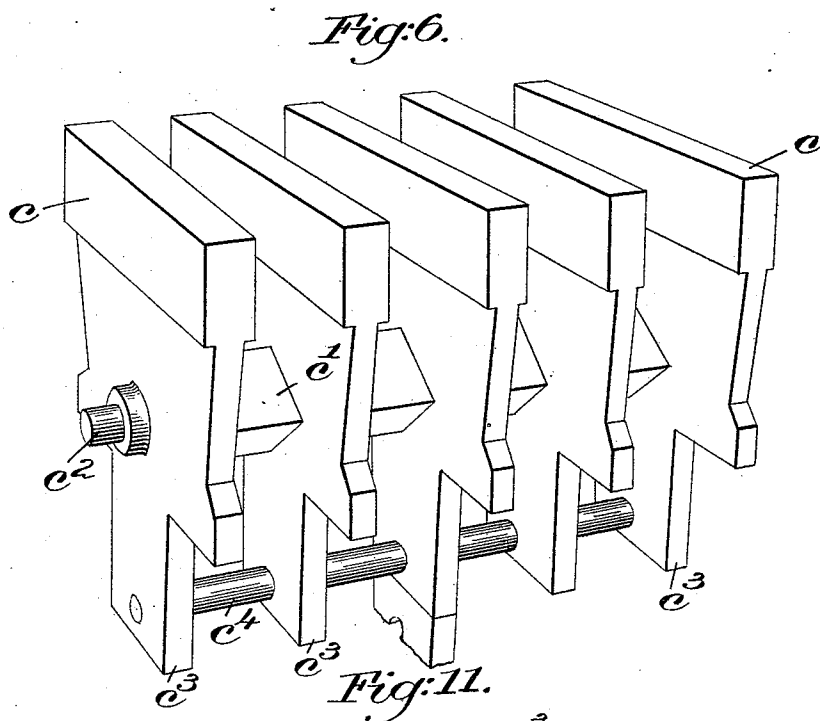
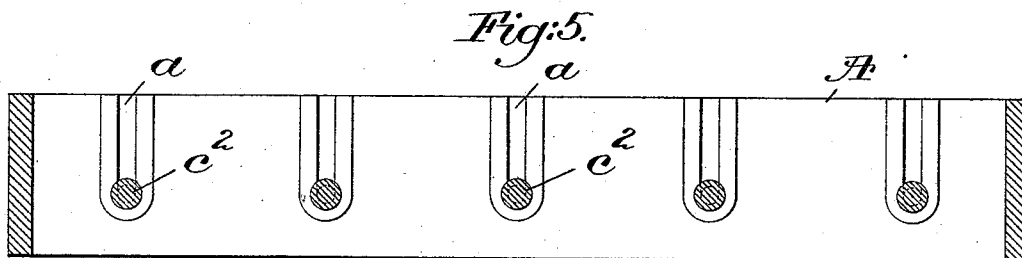
(No Model.)

3 Sheets—Sheet 3.

E. FALES.
FUEL SUPPORT OR GRATE.

No. 526,073.

Patented Sept. 18, 1894.



Witnesses.

Fred S. Greenleaf

Thomas Drummond

Inventor.

Edward Fales.

by Crosby & Gregory

attys.

UNITED STATES PATENT OFFICE.

EDWARD FALES, OF WINTHROP, MASSACHUSETTS.

FUEL-SUPPORT OR GRATE.

SPECIFICATION forming part of Letters Patent No. 526,073, dated September 18, 1894.

Application filed January 2, 1894. Serial No. 495,393. (No model.)

To all whom it may concern:

Be it known that I, EDWARD FALES, of Winthrop, county of Suffolk, State of Massachusetts, have invented an Improvement in Fuel-Supports or Grates, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

A main object of my invention is to provide a grate for burning soft coal. For this purpose the grate surface is as nearly flat and continuous as possible, and it is capable of being agitated without liability to being choked with ashes or clinkers, and at the same time the grate sections are of such depth as to heat the air on its passage to the fuel for purposes of expediting combustion. In my invention I attain these several requisites by means of a combination of alternating fixed and movable bars, the movable bars being of peculiar construction and journaling as will appear presently in detail.

In the drawings Figure 1 represents in top or plain view a fuel support or grate embodying my invention, one of the end plates a^x being removed; Fig. 2, a vertical longitudinal section of the same taken on the dotted line $x-x$ looking toward the rocker bars; Fig. 2^a is a section of one end of the grate, showing a modification; Fig. 3, a vertical longitudinal section taken on the dotted line $x'-x'$ Fig. 1 looking toward one of the fixed bars; Fig. 4, a vertical cross section taken on the dotted line x^2-x^2 Fig. 1; Fig. 5, a vertical longitudinal section on the dotted line x^3-x^3 Fig. 1, looking toward the inside of the frame; Fig. 6, in perspective showing several rocker bars, connected together in cross series as will be described; Fig. 7, a face view of one of the middle rocker bars; Fig. 8, a face view of one of the end rocker bars; Fig. 9, a perspective view showing several end rocker bars of modified form, connected together in cross series; Fig. 10, a side or face view of one of the bars in Fig. 9, and Fig. 11, a modification to be described.

Referring to the drawings A, represents a frame of suitable shape and construction to adapt it for the particular furnace in which it is to be used, said frame being preferably

box like in form, as shown, and having its opposite longest sides provided at their inner faces with substantially vertical grooves a, a , Fig. 5, open at their upper ends, the bottoms of said grooves constituting bearings for the rocker bar pivots to be referred to. A raised face or lip a' Fig. 1 is shown extended around each of the grooves to increase the pivot bearing surface at the bottom.

The frame A, at its ends, is provided with suitable seats a^2 , shown as sockets, to receive and hold the long fixed grate bars b, b , extending preferably longitudinally of the furnace. Between these fixed grate bars are arranged the rocker bars c, c , the same as shown, being arranged end to end in longitudinal series, one such series between two fixed bars. Those rocker bars of the several series, which are laterally, *i. e.*, looking crosswise the frame, in line with each other and therefore constituting a cross series of rocker bars, are herein shown as joined by pivot connections c', c' , preferably square or other than round, and at their ends, beyond the outermost bars of the cross series, terminating in the pivots c^2, c^2 , which rest in the bearings at the bottoms of the grooves a, a , in the sides of the frame. The fixed bars b, b , are slotted at b^x to span the square pivot connections c', c' . See Figs. 2 and 3. The rocker bars c, c , are shown provided with depending tail portions c^3 which in each cross series are connected by tie rods c^4 to be hereinafter referred to. As herein shown and preferably, the axes of the rocker bars are located considerably below the tops or carrying faces of said bars, as best shown in Fig. 2, in order that rocking of the bars may cause their tops or carrying faces to move longitudinally or forward and back as well as vertically or up and down. For example, referring to Fig. 2, the bars when rocked receive a longitudinal movement from the vertical dotted line 5, to the vertical dotted line 6, and a vertical movement from the horizontal dotted line 7 to the horizontal dotted line 8. It will thus be seen that the fuel supported upon and carried by the fixed bars b, b , is shaken or agitated between said fixed bars not only by a vertical or tapping movement of the rocker bars but also by a longitudinal move-

ment of the same the two movements together having in practice been found to be exceptionally effective in shaking the fire.

The side edges of the rocker bars, except those in the two end series, are curved as at 2, 2, Fig. 7 in order that the said bars may be arranged close together, end to end, as in Fig. 1, yet permit them, when rocked, to move longitudinally as described and always preserve the same distance or opening between their ends in any or all positions. It will be observed that inasmuch as the rocking grate bars' ends are at essentially uniform distances apart throughout their operation, it is impossible for clinkers to get in between said ends.

The rocker bars of the end series are shaped somewhat different from the others, see Fig. 8, said bars at their inner side edges being similar to the bar Fig. 7. At their outer side edges however, the said end bars are made more nearly straight and at their tops they are slightly curved as at 3, to sweep beneath the overhanging end bars or plates a^x which latter always overlap the shortened or abrupt edges of said end bars, as shown in Fig. 2, to prevent the fuel from working down between the said bars and the ends of the frame and obstructing movement of the former said overhanging plate a^x being retained in place in suitable manner as by the hooks a^{xx} which permit the plates to be easily removed when necessary. By this construction of the end bars I am enabled to agitate the fuel close to its outer edges and thus keep the fire bright throughout.

The rocker bars c, c , see Fig. 4, are made thinner at c^x to give greater freedom for the escape of the ashes without increasing the distance between the fixed and rocking bars at the upper or fuel carrying edges.

Referring now to Figs. 2, and 3, the several cross series of rocker bars are connected, to move in unison, in suitable manner as by short links l, l , provided at their ends with slots l', l' , to receive the rods c^4 , connecting the tails of the bars, I having herein shown several independent links, each connecting two series of bars. Instead of several independent links as shown, I may employ one long link connecting all the cross series and thus obtain the same action or the said cross series may be connected in any other desired manner. The rocker bars are moved by an actuating rod l^2 , forked at its end to straddle one of the tails Figs. 2 and 6 made longer for that purpose to which said forked end is pivoted by a pin l^3 , the said actuator at its outer end being connected with a suitable lever not shown. Reciprocation of the actuator l^2 , causes all the rocker bars to be moved or rocked from one to the other of their dotted positions Fig. 2. The fixed and rocker bars are made deep, as shown, in order that the air rising through the narrow spaces between them may be thoroughly heated and thereby enabled more thoroughly and perfectly to

unite with the products of combustion of the fuel thus practically avoiding smoke.

In ordinary grates it is not practicable to employ bars as deep as those herein shown and used by me in connection with this invention for the deep narrow spaces become easily filled and choked with ashes. In this present invention however, the peculiar and effective movement which the rocker bars receive operates to thoroughly free said spaces from ashes and prevents the choking referred to. This peculiar and effective movement is obtained by placing the axes of the rocker bars low down as described. Because I am enabled to use narrower spaces between the fixed rocker bars without danger of choking, I am enabled to burn all kinds of fuel however fine without formation of clinkers or danger of the coal dropping through the grate. The fixed bars support and carry the weight of the fuel while said fuel is being shaken by the rocker bars thus enabling the latter to be rocked with very little effort.

Rocking of the bars in the manner described whereby they are moved both forward and back and up and down at the same time causes the entire fire or body of fuel to be agitated to free ashes, &c., near the top or surface as readily as ashes near or in the vicinity of the grate, yet without unduly disturbing the fire. The crust or body of coke which always forms in bituminous coal is by my improved grate, thoroughly broken up and thus prepared for combustion. In some instances the best results are obtained by holding the cross series of rocker bars normally in their tilted positions with one of their corners or sides elevated as in dotted lines Fig. 2 the raised points or surfaces holding the fuel up away from the rest of the grate surface in the line of the raised points to thus form channels in the under side of the fuel body, just above the grate surface through which the air rising through the grate may freely circulate to mix with the products of combustion. After the rocker bars have been held in one tilted position for a time they may be rocked into their other tilted position with their opposite corners raised to thereby form channels at other points in the body of fuel.

For large grate areas two or more of the frames A, will be employed, set in usual manner.

Both the fixed and the rocker bars (the latter in cross series) may be independently removed at will when necessary. The fixed bars instead of being made removable as shown may be integral with the frame if desired, and the cross series of rocker bars herein shown as integral may be made independent and bolted or otherwise secured together either with or without the tail portions c^3 .

In lieu of the overhanging plates a^x I may use short spurs s shown by dotted lines Fig. 2^a projecting inwardly from the ends of the box frame there being a spur in line with each

rocker bar and of substantially the same width. When the spurs *s* are used I prefer to employ end rocker bars of a shape substantially as shown in Figs. 9 and 10.

5 The overhanging plates and the spurs obviously are functional equivalents one of the other, and I mean to include both in the term "covers" as used in the claims hereof.

10 Fig. 11 shows my invention in one of its forms as applied to a circular grate. Referring to said figure, *m*, *m*, are the fixed bars shown as dropped into sockets in the ring *m'*, which ring is pivoted to turn on the pintles *m*², although said bars may be formed inte-
15 gral with said ring if desired.

The several rocker bars *n*, *n*, are arranged in any desired number of cross series I having herein shown three such series the middle series being connected by the pivot connection *n'* journaled at its ends in bearings in the ring *m'*. The two end series of rocker bars are each shown connected by the pivot connections *n*² journaled at their ends in the ring *m'*, the said end series being also con-
20 nected at their outer ends by webs *n*³ of sufficient width to prevent the fuel getting down under the bars when their outer ends are rocked above the level of the grate. The rocker bars may be rocked in suitable manner.

30 This invention is not limited to the particular apparatus herein shown and described for the same may be varied in many ways without departing from the spirit and scope of the invention as claimed.

35 I claim—

1. A grate composed of a series of adjacent parallel air heating bars, journaled at their ends and provided with substantially flat upper surfaces, each of said bars being cut away
40 at its sides so as to preserve a substantially uniform distance between it and the adjacent edge of the next aligned bar during the entire operation of the grate, and each bar having

its journal at or near the bottom thereof, a number of said series of bars being coupled 45 so as to move in the same direction, substantially as described.

2. A grate composed of a series of adjacent parallel air heating bars, journaled at their ends and provided with substantially flat upper surfaces to support the fuel, and of a considerable depth from top to bottom so as to heat the air as it passes upward to the fuel, each of said bars being cut away at its sides so as to preserve a substantially uniform distance 55 between it and the adjacent upper edge of the next aligned bar during the entire operation of the grate, and each bar having its journal at or near the bottom thereof, a number of said series of bars being coupled to 60 move in the same direction, and stationary bars alternating with the series of air heating bars, and of substantially equal depth therewith, substantially as described.

3. A grate composed of a series of stationary 65 bars and longitudinally alternating rocking bars, the said rocking bars having their adjacent aligned edges cut away to preserve a substantially uniform distance from one another during the entire operation of the grate, 70 a frame in which the said bars are supported, rocking bars arranged at the ends of such frame and cut away at their edges adjacent to the end members of the frame so as to be fitted close to such end members, and covers 75 arranged to bridge the opening between the frame and the edges of the rocking bars in all their positions of use, substantially as described.

In testimony whereof I have signed my 80 name to this specification in the presence of two subscribing witnesses.

EDWARD FALES.

Witnesses:

FREDERICK L. EMERY,
LAURA MANIX.