Sept. 28, 1926. 1,601,388

E. S. DECKER

SHAKING GRATE FOR FURNACES

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Fig.1.

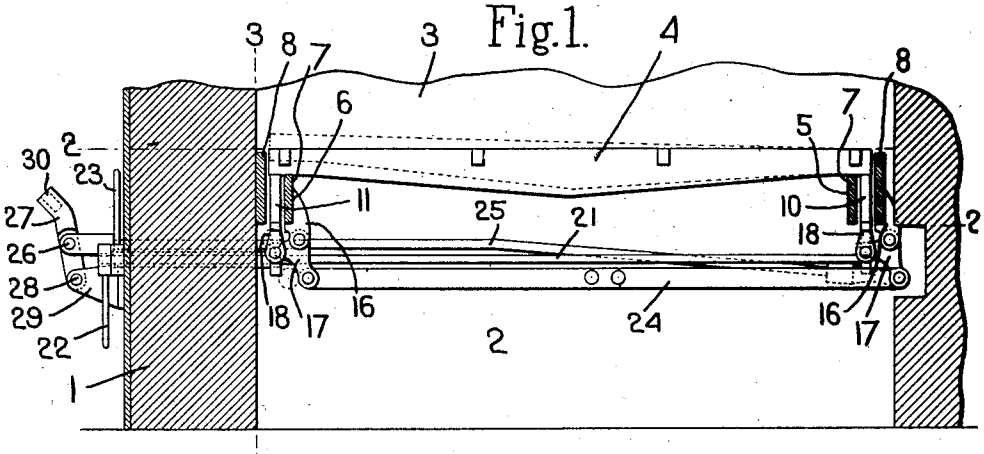


Fig.2.

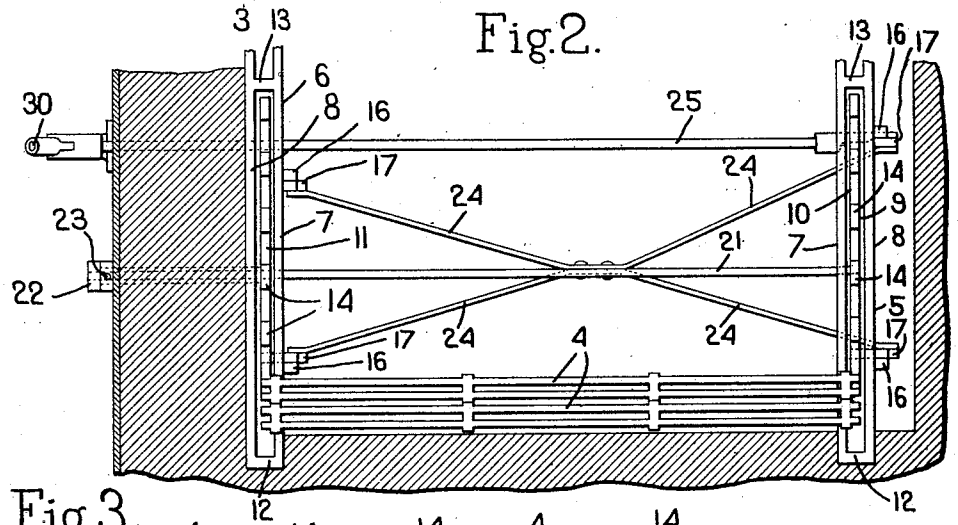
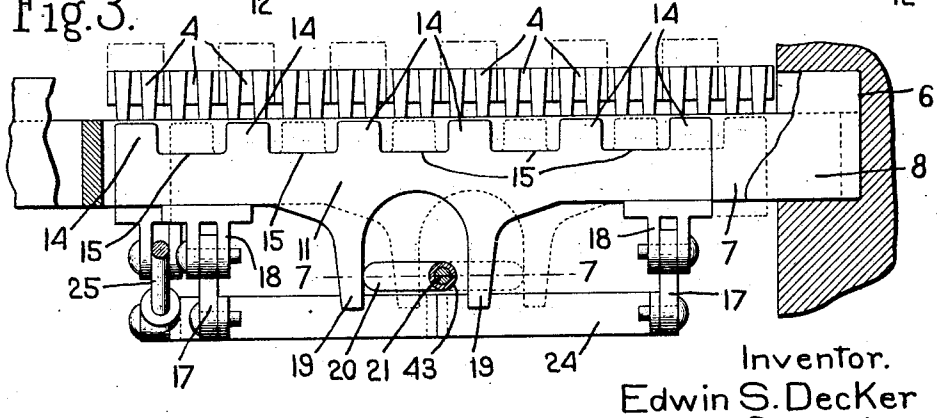


Fig.3.



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Fig. 4.

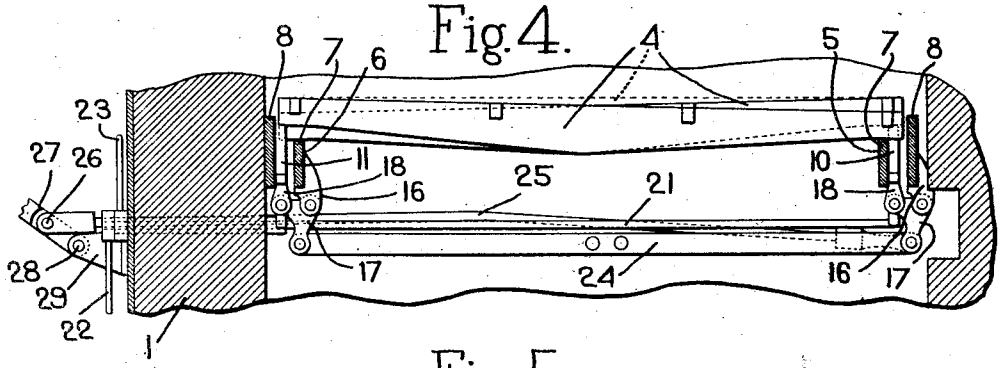


Fig. 5.

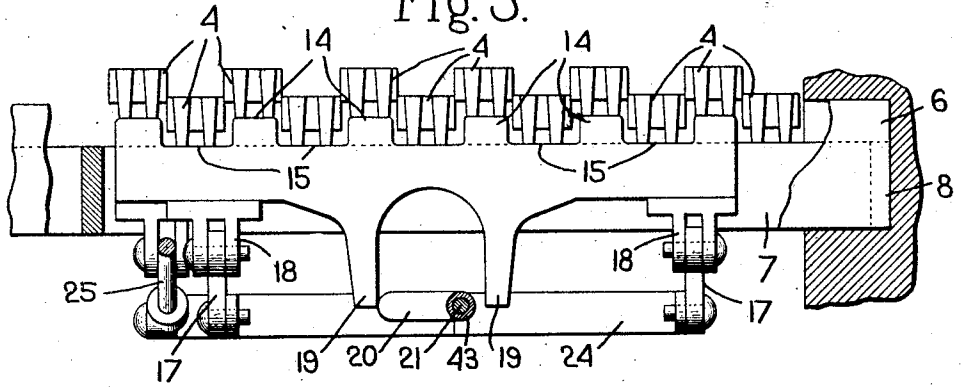


Fig. 6.

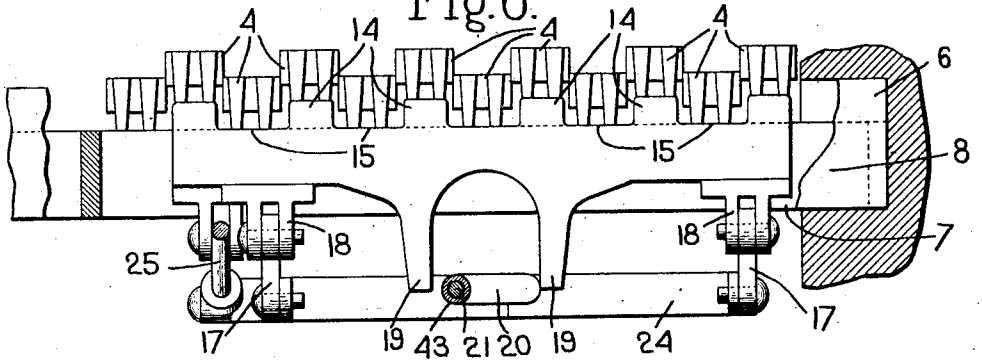
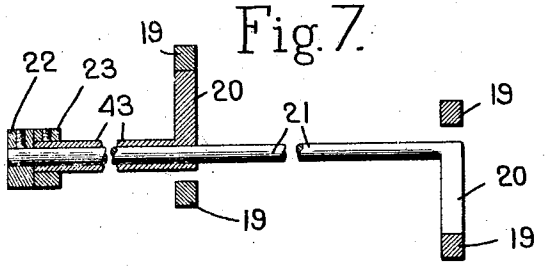


Fig. 7.



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UNITED STATES PATENT OFFICE.

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SHAKING GRATE FOR FURNACES.

Application filed September 29, 1925. Serial No. 59,415.

This invention relates to shaking grates for furnaces and it has for its general object to provide a novel form of shaking grate by which the grate bars can be selectively raised at either end or at both ends.

Another object of the invention is to provide a novel form of shaking grate which utilizes ordinary grate bars so that a furnace with stationary grate bars can be converted into a furnace having a shaking grate by installing the mechanism for shaking the grates while utilizing the ordinary grate bars which were in the furnace. This has the advantage that a furnace with a non-shaking grate can be converted into one with a shaking grate at a relatively small expense because the installation of the shaking mechanism does not necessitate buying new grate bars.

Other objects of the invention will be more fully hereinafter set forth in connection with the following description of a selected embodiment of my invention from which the principle thereof will be apparent.

In the drawings, Fig. 1 is a vertical sectional view through a furnace grate embodying my invention;

Fig. 2 is a section on the line 2—2, Fig. 1, some of the grate bars being shown in dotted lines, in order not to confuse the drawing;

Fig. 3 is a section on the line 3—3, Fig. 1;

Fig. 4 is a view similar to Fig. 1 but showing one set of grate bars raised at one end, another set raised at the other end;

Fig. 5 is a section similar to Fig. 3 showing the lifting bar 11 adjusted to raise one set of grate bars;

Fig. 6 shows it adjusted into a different position and adapted to raise another set of grate bars;

Fig. 7 is a fragmentary view showing the construction of the lifting bar shifting device.

In the drawings 1 indicates the walls of a furnace, 2 the ash-pit, 3 the fire-box and 4 the grate bars. These grate bars may be of the usual construction such as are used in stationary grates or they may be of any approved construction. These grate bars are normally supported at their ends upon bearing bars 5 and 6 which extend transversely across the furnace at the opposite ends of the ash-pit. The bearing bars are of special construction, each having an inner member 7 on which the grate bars rest and an outer member 8 which overlaps the ends of the grate bars and prevents them from moving longitudinally. The two members 7 and 8 of each bearing bar are spaced from each other to form a pocket or opening 9 in which is received a lifting bar, the lifting bar in the pocket of the rear bearing bar being indicated at 10 and that in the pocket of the front bearing bar being indicated at 11. The inner and outer members 7 and 8 of each bearing bar are integrally connected at their ends as shown at 12 and if the bearing bars are of sufficient length it may be well to further stiffen them by having the inner and outer members 7 and 8 connected at intervals by webs 13.

Means are provided for raising and lowering the lifting bars 10 and 11 and said lifting bars are constructed so that by means of them the grate bars may be selectively lifted at either end or at both ends. In other words, the grate-shaking mechanism is so designed that certain of the grate bars may be lifted at one end only and the other grate bars lifted at the other end only or certain of the grate bars may be lifted at both ends simultaneously while the other grate bars remain stationary. By this selective action it is possible to manipulate the grate bars so as to stoke the fire in the most effective manner.

The lifting bars 10 and 11 may be arranged to lift any desired number of grate bars at each operation. In the construction herein shown each lifting bar is arranged so that it will lift alternate grate bars and, therefore, when the front lifting bar 11 is raised the alternate grate bars will be raised at their front end as shown by dotted lines in Fig. 1 and when the rear lifting bar 10 is raised the alternate grate bars will be raised at their rear ends. The lifting bars are also capable of movement transversely of the grate bars or in the direction of their length so that each lifting bar may act on

either one of the two sets of alternate grate bars.

Each lifting bar has the construction shown best in Fig. 3, that is, it is provided at its upper face with teeth or projections 14, each one of which is of the width of a grate bar. Said teeth or projections are so spaced that the distance betwen the center of any tooth and the center of an adjacent tooth is equal to twice the width of a grate bar, and consequently the projections 14 will come under alternate grate bars.

Assuming that the lifting bar 11 is in the full line position Fig. 3 then the projections 14 will come under the 1st, 3rd, 5th, 7th, etc., grate bars counting from the left, and the other grate bars, that is, the 2nd, 4th, 6th, 8th, etc., counting from the left, will be situated over the spaces 15 between the projections 14. If the front lifting bar 11 is raised while in this position the alternate grate bars will be raised at the front end as shown in dotted lines in Fig. 3 and in full lines in Fig. 5, the other grate bars remaining stationary.

The lifting bar 10 has a similar construction and a similar operation.

Each lifting bar is capable of being shifted in the direction of its length, a distance equal to the width of the grate bars and if the lifting bar 11, for instance, is shifted to the right into the dotted line position Fig. 3 or into the full line position Fig. 6 so as to bring the lifting projections 14 under the 2nd, 4th, 6th, etc., grate bars counting from the left, and said lifting bar is then raised the 2nd, 4th, 6th, etc., grate bars will be lifted as shown in Fig. 5 while the other grate bars will remain stationary. By arranging the two lifting bars 10 and 11 so that they act on different sets of grate bars and then raising them it will be seen that one set of alternate grate bars, that is, the 1st, 3rd, 5th, etc., grate bars, will be raised at one end, while the other grate bars, that is, the 2nd, 4th, 6th, etc., will be raised at the other end as shown in full lines Fig. 8. On the other hand, by having the two lifting bars arranged to act on the grate bars of the same set and then operating said lifting bars the alternate lifting bars will be raised at both ends, the other grate bars remaining stationary as shown in dotted lines Fig. 4.

Each lifting bar is supported on a vertically-moving support which is secured to the corresponding bearing bar.

Each bearing bar is shown as having brackets 16 cast integral therewith and each bracket has pivotally connected thereto an elbow lever 17. The horizontal arm of each elbow lever carries a rest or support 18 on which the bearing bar is supported. There are two such elbow levers each with its support 18 for each lifting bar so that each lifting bar is supported at each end. The lifting bars are slidably mounted in supports 18 so that said lifting bars may be moved back and forth from the full to the dotted line position in Fig. 3.

Any suitable means may be employed for shifting the lifting bars. In the construction shown herein each lifting bar is formed with two downwardly-extending fingers or arms 19 between which is received a crank arm or cam member 20 fast on a longitudinally-extending shaft so that when the shaft is turned to swing the cam member 20 through 180° it will by its engagement with one of the arms 19 force the lifting bar to the right in the direction of its length. The cam member 20 for the rear lifting bar 10 is mounted on a shaft 21 which extends longitudinally through the ash-pit and projects beyond the front of the furnace and has a handle 22 fast thereon by which it may be turned. The cam 20 for the front lifting bar is carried by a sleeve 43 through which the shaft 21 extends and which projects beyond the front of the furnace and is provided with a handle 23 by which it may be turned.

Assuming the cam 20 for the lifting bar 11 is in the position shown in Fig. 5 a clockwise turning movement through 180° will bring the cam against the right hand arm 19 and will shift said lifting bar in the direction of its length into the position shown in Fig. 6. A turning movement of the cam in the opposite direction through 180° will return the lifting bar to the position shown in Fig. 5. In the same way the rear lifting bar 10 can be shifted and as one is shifted by the turning movement of the sleeve 43 and the other by the turning movement of the shaft 21 said lifting bars can be shifted independently of each other and may be placed so that they will act either on the same set of grate bars or on different sets. In Fig. 7 the two operating cams 20 are illustrated as in the position they would assume when the two lifting bars are relatively situated to act on different sets of grate bars.

The lifting bars are raised and lowered by rocking the elbow levers 17. In the present embodiment these elbow levers are all connected so that they operate simultaneously although this is not essential. As herein shown the vertical arms of said elbow levers are all connected by a connecting member 24, the latter having four arms leading to the four elbow levers. The vertical arm of one of the elbow levers has connected thereto a link or rod 25 which leads through the fire-box to the front of the furnace and is pivotally connected at 26 to a lever 27, the latter being pivoted at 28 to a bracket 29. The lever 27 is shown as having a socket 30 into which a handle may be inserted for rocking it and rocking movement of this lever will operate through the link connec-

tion 25 to rock the elbow levers 17 and thereby raise and lower the lifting bars 10 and 11.

If it is desired to raise the front end of some of the grate bars and the rear end of other grate bars then the two lifting bars 10 and 11 will be shifted so that they will act on different sets of grate bars and when the lever 26 is operated the alternate grate bars will be raised at one end and the other grate bars will be raised at the other end as shown in Fig. 4. On the other hand, by adjusting the two lifting bars so that they act on the same grate bars and then operating the handle 27 each alternate grate bar will be lifted at both ends as shown in dotted lines Fig. 4 while the other bars will remain stationary.

The bearing bars are designed so that they will support the ordinary grate bar which is commonly used in stationary grates and the lifting bars are designed to co-operate with said grate bars. Hence with this invention it is possible to convert a stationary grate into a shaking grate by simply replacing the bearing bars with which the furnace is equipped with the bearing bars such as herein illustrated having the lifting bars associated therewith and without the necessity of furnishing new grate bars.

Inasmuch as a considerable portion of the expense of a furnace grate is that of the grate bars my invention has the advantage that a shaking grate can be installed in a furnace for simply the cost of securing and installing the special bearing bars, lifting bars and associated mechanism and without the added expense involved in the purchase of new grate bars.

In the drawings I have illustrated a furnace of a size in which the grate bars extend from one end to the other of the ash-pit. In some large furnaces the grate area is divided centrally by a central bearing bar and front and rear grate bars are used, one set of grate bars extending from the center bearing bar forwardly and the other from the center bearing bar rearwardly. A furnace grate of this type can be readily equipped with my invention by simply duplicating the lifting bars and providing a pair of lifting bars for the front grates and another pair for the rear grates and connecting the lifting bars up to be operated as above described. Hence while I have illustrated a selected embodiment of my invention I do not wish to be limited to the constructional features shown.

I claim:

1. In a furnace grate, the combination with a plurality of grate bars, of selective means at each end of the grate bars by which the grate bars may be selectively lifted at said end, and a common actuator by which both of the selective means may be actuated simultaneously to raise the grate bars selectively.

2. In a furnace grate, the combination with a plurality of grate bars, of selective grate bar lifting means at each end of the grate bars, and a common actuator by which both of said lifting means may be simultaneously actuated.

3. In a furnace grate, the combination with a plurality of grate bars, of means at one end of the grate bars to lift certain only of the grate bars, and means at the other end of the grate bars for lifting either the same grate bars which are lifted by the first-named lifting means or the remaining grate bars, and a single actuator by which both of said lifting means may be actuated simultaneously.

4. In a furnace grate, the combination with a plurality of grate bars, of means at one end of the grate bars to lift the alternate grate bars, means at the other end of the grate bars to lift either said alternate grate bars or the other grate bars and means for actuating both of said lifting means simultaneously.

5. In a furnace grate, the combination with a plurality of grate bars, of means at each end of the grate bars to lift alternate bars, said means being adjustable so as to lift the same grate bars at both ends or one set of grate bars at one end and another set of grate bars at the other end and means for actuating both lifting means simultaneously.

6. In a furnace grate, the combination with a plurality of grate bars, of a lifting bar at each end of the grate bars, each lifting bar adapted when actuated to lift alternate grate bars, means for adjusting each lifting bar so that it will act on either set of alternate grate bars, and means for actuating the lifting bars simultaneously.

7. In a furnace grate, the combination with a plurality of grate bars, of a lifting bar at each end of the grate bars, each lifting bar when actuated being adapted to lift alternate grate bars only, independent means for adjusting each lifting bar transversely of the grate bars so that it will act on either set of alternate grate bars, and means for actuating the lifting bars simultaneously.

8. In a furnace grate, the combination with two bearing bars, one at each end of the furnace, of grate bars supported by said bearing bars, a lifting bar associated with each bearing bar and adapted when actuated to lift alternate grate bars, means for adjusting the lifting bars transversely of the grate bars so that each lifting bar will act selectively to lift either set of alternate grate bars, and means for actuating the lifting bars simultaneously.

9. In a furnace grate, the combination with two bearing bars, one at each end of the furnace, of grate bars resting on the

bearing bars, a lifting bar associated with each bearing bar, each lifting bar being adapted to act on alternate grate bars, lifting bar-supporting means carried by each bearing bar and on which the lifting bars rest, means for raising the supporting means for both lifting bars simultaneously, and means for shifting the lifting bars on the supporting means so that each lifting bar will lift either set of alternate grate bars.

In testimony whereof, I have signed my name to this specification.

EDWIN S. DECKER.