(No Model.)

H. S. WILLIAMS.

RECIPROCATING GRATE.

No. 456,457. Patented July 21, 1891.

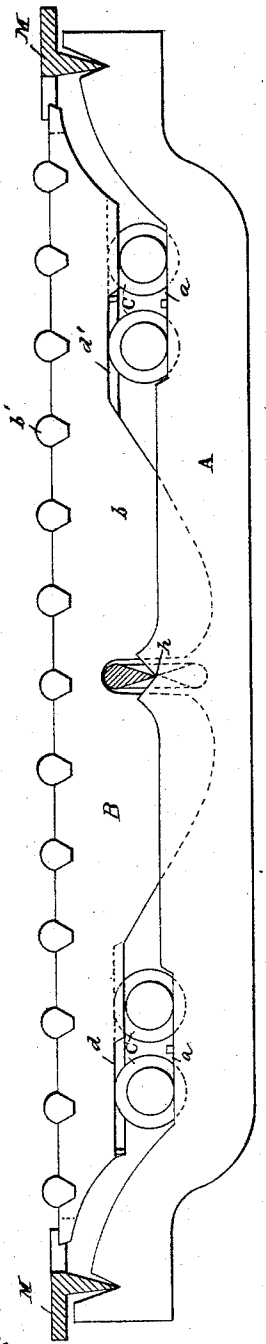


FIG. I.

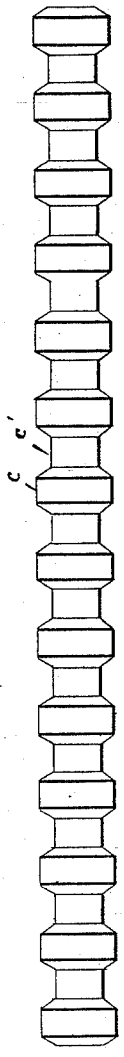


FIG. II.

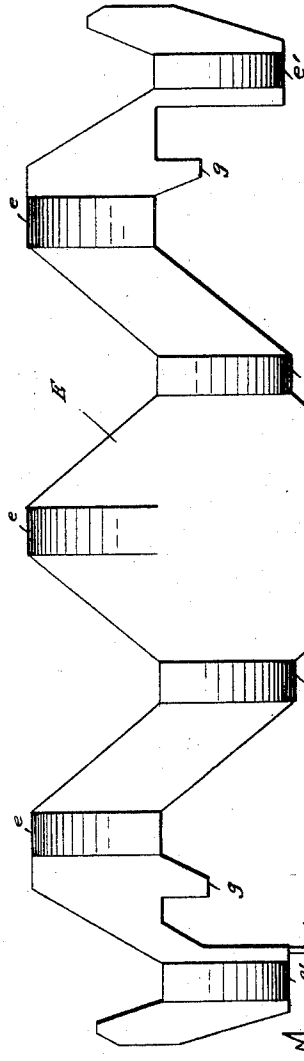


FIG. III.

FIG. IV.

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UNITED STATES PATENT OFFICE.

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RECIPROCATING GRATE.

SPECIFICATION forming part of Letters Patent No. 456,457, dated July 21, 1891.

Application filed February 14, 1891. Serial No. 381,485. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. WILLIAMS, a citizen of the United States, and a resident of Boston, county of Suffolk, and State of Massachusetts, have invented a new and useful Improvement in Reciprocating Grates, which improvement is fully set forth in the following specification.

The invention has reference to the construction of reciprocating grates for stoves and furnaces, and particularly to that class of grates in which all grate-bars have a reciprocating motion in horizontal planes, alternate bars moving in opposite directions. A grate of this description is shown in Letters Patent No. 361,036, granted to me April 12, 1887.

The general objects of the present invention are to simplify the mechanism by which the grate-bars are actuated to give motion to every part of the grate-surface, thereby promoting uniform combustion, to reduce greatly the difficulty and cost of construction and the liability of clogging, and to construct and assemble the parts composing the grate and its actuating mechanism in such manner that they will all be held securely in position while in use without the employment of bolts, nuts, keys, or fastenings of any kind.

The grate, as hereinafter described, is composed of five simple castings, requiring no prints, cores, or core-boxes. The parts when assembled present no dead surfaces or slots where cinders or clinkers could lodge. The headers or guide-bars, as well as the bearings on which the grate-bars are supported, partake of the oscillating motion, and the space beneath the grate-surface is always free for the ascent of air and descent of ashes and cinders. As no screws or other fastenings are used, the grate can be removed or parts thereof taken out, should occasion arise, without difficulty or delay. Expansion and contraction of the bars and other parts cannot derange the mechanism.

In order that the invention may be fully understood, I will describe the same in connection with the accompanying drawings, in which—

Figure I is a sectional elevation showing one of the hangers and one grate-bar in side elevation. Fig. II shows one of the anti-friction rollers in section and plan; Fig. III, an elevation of the rock-bar, and Fig. IV a partial plan showing relative positions of grate-bars and headers.

A represents one of the hangers or truss-supports upon which all parts of the grate rest. They may be hung at their ends on common bearing-bars or set in the brick-work of the furnace.

The reciprocating grate-bars B are in general form such as described in my said patent, having a deep thin web *b* and horizontal lugs or sections *b'* projecting above and on each side of the web *b*. The grate-bars rest loosely upon anti-friction rollers C. These rollers extend entirely across the grate from side to side and are formed with annular flanges *c*, alternating with recesses *c'*, as shown in Fig. II. Said rollers rest loosely upon the hangers A in depressions *a*, formed therein, which limit the play of the rollers. Lateral motion of the rollers is prevented by the flanges thereon, which project down on each side of the hanger. The grate-bars each rest in a recess in two of these rollers, and the flanges on each side of the bar hold it in position. These rollers are solid castings, and as the flanges and grooves are regularly disposed the roller can be cut off at any desired length in the sand, according to the width of the grate. Four rollers are used in each grate, and these are all cast from one pattern, and like other parts of the grate are reversible and interchangeable.

In assembling the parts every other groove of the rollers receives a grate-bar, so that the hangers can be placed between and not directly under the grate-bars.

As shown in Fig. 1, the webs of the grate-bars are cut away at *d d'*, so as to clear two of the rollers. Each bar therefore rests on two rollers and on a different pair of rollers from that which supports the adjacent bar on either side. Rollers of the form shown cannot come together so as to close up the space between them and so impede the circulation of air or removal of cinders.

The rocker-bar E is substantially the same as in my former patent, or the patent of John Cooper, No. 389,289, granted September 11, 1888. It has swelling projections *e e'*, adapt-

ed, when the bar is oscillated, to move the grate-bars back and forth. The projections *e* are above the axis of oscillation of the bar, whereas projections *e'* are below said axis. Consequently when the rocker-bar is oscillated it will move adjacent grate-bars in opposite directions.

Instead of mounting the rocker-bar, as heretofore, in the front of the grate, it is preferably placed in the center of the grate, being provided with knife-edge bearings *g*, which rest in notches *h* in the middle of the hangers A, and the webs of the grate-bars are provided with a deep notch at the middle thereof, which fits over the rocker. This construction has several important advantages. Power from the rock-bar is more easily applied in this position and less force is required to operate it. Moreover, the arrangement permits the construction of the grate-bars all from the same pattern without the expense of an extra pair of lugs at one end to admit of the bars being reversed. Bars made as shown herein are lighter, cheaper, and more easily made than those having depending arms or lugs to embrace the rocker-bar. This construction is specially advantageous for grates of small and medium size. In grates of large size having extra long grate-bars the rocker may be hung, as heretofore, at one end of the grate. The rocker-bar may be provided with an arm *i* and button *k* on which to hook a shaking-bar, or it may be oscillated in any other suitable way. The headers or guide-bars M are provided with webs *m*, which project between the slotted ends of the grate-bars, and with shorter webs *m'* between adjacent bars. These headers have a thin vertical portion terminating in an edge which rests at the bottom of a recess in the ends of hangers A. The header is not only connected loosely with the hangers or supports, but it is capable of a limited oscillating motion on its bearing-edge. The slots in the ends of the grate-bars being somewhat shorter than the webs *m*, which enter the same, the latter is struck by the end of the slot each time the grate is shaken, and the header thereby oscillated, dislodging all accumulations above the same and keeping the grate-surface clean to the extreme ends thereof.

It will be seen that when the parts are assembled they are all loosely mounted—that is to say, there are no positive connections between any of the parts—and the utmost ease and freedom of motion are thus provided for, that the shaking motion extends to every square inch of grate-surface, and that the mechanism beneath the grate-surface does not impede the descent of ashes or ascent of air and is not likely to become clogged in use.

While the foregoing description sets forth what is regarded as the best embodiment of the principles of my invention, it will be obvious that modifications may be made therein without changing its essential character, and that some of the improvements described are capable of use separately from others.

I am aware that grate-bars have heretofore been supported on anti-friction rollers of various forms. For example, smooth rollers extending entirely across the grate have been used, such rollers being either journaled in fixed bearings or mounted loosely on fixed spindles. A series of independent spools or rollers, one for each grate-bar, all mounted on a common fixed spindle, have also been used. I do not include in my invention any such devices. The construction described and claimed herein has several distinctive, characteristic, and advantageous features. The rollers, which extend entirely across the grate, are cast in one piece and are loosely mounted, so that they roll freely in both directions on their support and require no fastenings of any sort. The annular flanges at regular intervals both hold the grate-bars and also hold the rollers on the hangers. They are reversible, interchangeable, and can be cut off in the sand to the proper length for grates of any width. Although the rollers are free the flanges serve to keep an open space between them and to prevent clogging or choking of the draft.

I claim as my invention—

1. In a grate, the combination, with movable grate-bars, of the anti-friction rollers, each extending across the grate and loosely mounted on suitable supports or hangers, so as to roll thereon in both directions, said rollers being provided with flanges for holding and guiding the grate-bars, substantially as described.

2. The combination, with the hangers or stationary supports, of the anti-friction rollers in the form of solid castings having annular flanges at suitable intervals, each of said rollers extending across the grate and resting loosely upon said hangers, the edges of the latter lying in recesses between said flanges, and the grate-bars, each resting loosely in recesses in said rollers, substantially as described.

3. The combination of the hangers, the headers loosely held in recesses in said hangers and having transverse webs or projections, and the grate-bars adapted to reciprocate alongside of said webs or projections and to strike and rock the headers at each reciprocation, substantially as described.

4. The combination, with a series of grate-bars, all of the same pattern and reversible and interchangeable, said bars being provided with a deep notch in the middle thereof, of the hangers and the oscillating rocker-bar embraced by the recesses in said bars and resting in notches in the middle of said hangers, said rocker having projections alternately above and below its axis of oscillation for reciprocating the grate-bars, so that adjacent bars will move in opposite directions, substantially as described.

5. The combination of the hangers, the anti-friction rollers provided with flanges at regular intervals, the grate-bars, the headers, and the rocker-bar, the hangers being fixed and the other specified parts being loosely mounted and movable, substantially as described.

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

HENRY S. WILLIAMS.

Witnesses:
S. F. KEYES,
RALPH W. FOSTER.