(No Model.)

W. BOWERS.

BOILER FURNACE GRATE.

No. 261,992. Patented Aug. 1, 1882.

Fig. 1.

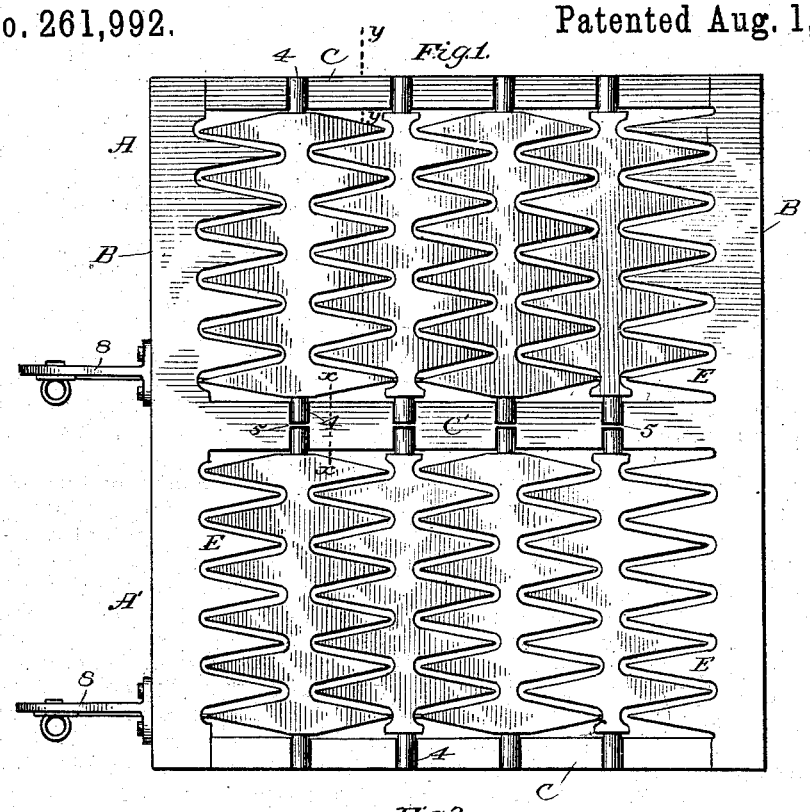


Fig. 2.

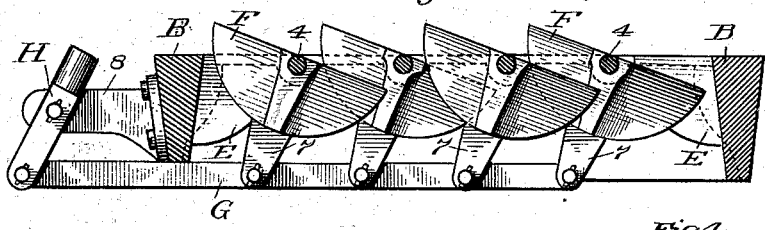


Fig. 3.

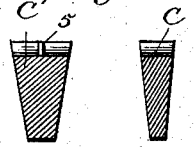
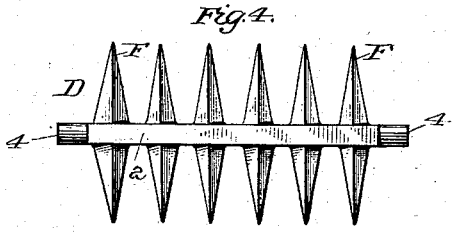


Fig. 4.



Attest:
Walter Dwaldson
F. L. Middleton

Inventor
William Bowers,
by S. W. Seely
Atty.

UNITED STATES PATENT OFFICE.

WILLIAM BOWERS, OF CARBONDALE, PENNSYLVANIA.

BOILER-FURNACE GRATE.

SPECIFICATION forming part of Letters Patent No. 261,992, dated August 1, 1882.

Application filed June 22, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BOWERS, of Carbondale, in the county of Lackawanna and State of Pennsylvania, have invented a new and useful Improvement in Boiler-Furnace Grates; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to improvements in grates for steam-boiler furnaces of the class in which the grate-bars are pivoted independently in bearings and are provided with interlocking teeth, by the action of which, when the bars are tilted, the clinkers and ashes are torn to pieces and permitted to pass between the bars, while the ignited fuel is at the same time thoroughly shaken and agitated.

The object of my invention is, first, to provide for a more ready and perfect admission of air to the fire by making the grate-bars of peculiar shape; further, to insure against clogging of the bars by the lodgment of clinkers between the same; further, to increase the strength of the bars and prevent warping and twisting without unduly increasing their weight; and, in general, to produce a simply-constructed, durable, and effective grate at small cost.

The invention consists partly in the peculiar quadrant-shaped grate-bars, tapered to an edge around the curve or arc and having a straight upper edge; further, in the construction of the frame of the grate, by which in a sectional grate material is economized and lightness secured; further, in the peculiar compound lever for oscillating all the grate-bars simultaneously in the same direction; and, finally, in the general construction and arrangement of the various parts and in their several combinations, all fully hereinafter described.

In the drawings, Figure 1 is a plan view of a grate composed of two sections. Fig. 2 is a side elevation of four grate-bars and their connecting-levers, showing them at their limit of motion in one direction. Fig. 3 is a cross-section on the lines *x x* and *y y*. Fig. 4 is a bottom view of a single grate-bar.

The grate for a boiler-furnace may be composed of any desired number of sections, according to the size and shape of the boiler. In Fig. 1 I have represented two of such sections, A A′, as forming the grate. Each section is composed of end bars, B, bolted to side bars, C C′, the end and side bars being preferably formed of cast metal. The side bar C, which is at the outer end of the grate is only of about half the diameter or thickness of the side bar C′, which separates adjoining sections A A′. In the side bars are formed rounded depressions or bearings to receive the trunnions of the grate-bars. The depressions in the bar C′ are of twice the length of those in the bar C, since they extend across the width of C′. The grate-bars are represented separately in Fig. 4 by D. Each bar consists of a rectangular central rib, 2, with quadrant-shaped teeth F projecting therefrom at right angles, forming prongs which extend on opposite sides of the rib and interlock with corresponding teeth in the next bar. These prongs are about four inches in length from the center of the rib, as I have found that it is not desirable for them to penetrate the fuel on the grate to a greater depth, as shown in Fig. 4, each tooth of the grate-bar—by which I mean the two oppositely-placed quadrant-shaped prongs referred to, which, taken together, form a single semicircular projection—is a top plan view of a narrow lozenge shape, the ends or corners being sharp. The bars taper from the plane top equally on all sides to the sharp-curved edge, but on top have a plain flat surface. The teeth of adjoining bars, when in position, fit closely together, as shown in the drawings, while the teeth on the last bar at each end mesh with stationary quadrant-shaped teeth E E, cast with the end bars, B B. Each grate-bar is provided with trunnions 4 4, by which it is journaled in the bearings in the side bars C C, the trunnions on one side, however, occupying less than half of the bearing-surface of the grooves in the side bar C′, the remainder of the space being filled by the trunnions on the grate-bars which form the next section, A′. These trunnions are prevented from coming in contact by the partition 5. While the bar C′ is on its upper surface of nearly twice the width of the bar C, yet, in order to admit air to the greatest extent possible, such bar is tapered, as shown in Fig. 3, thereby making it much lighter and economizing material.

The grate-bars are oscillated simultaneously

by a compound lever, G H. The arm G is pivoted to hangers 7, secured to or cast with the grate-bars. The arm G passes through the ash-pit and furnace-door through a narrow slot in the latter. On the outside of the furnace is supported a standard, 8, and to this standard is pivoted the arm H, which is also pivoted to the outer end of G. The end of the arm H may be formed into a hand-lever, or said arm may be provided with a socket to receive a suitable detachable lever, by either of which devices motion is communicated to the grate-bars. By this compound-lever arrangement the bar G is given a direct reciprocation, and consequently works in a narrow slot in the wall or door of the ash-pit. Hence the necessity of opening the door, in order to operate the lever, with the accompanying shower of ashes and dust, (particularly where a blast is employed,) is entirely obviated. Since each bar is provided with a hanger to which the rod G is pivoted, it follows that all the bars are given a simultaneous inclination in the same direction, as shown in Fig. 2, causing interlocking prongs of adjoining bars to move in opposite direction, those of one bar being depressed, while those on the other are elevated. I have found in practice that this movement effects a more complete and thorough tearing and grinding of the fuel than result when interlocking prongs move simultaneously in the same direction, since in the latter case the equal rising of the bars simply raises and lowers the fuel without thoroughly agitating it, while in my device a portion of the fuel drops while the remainder is lifted, and, the teeth penetrating the fuel, the whole mass is thoroughly shaken. By the peculiar shape of my grate bars three direct advantages are obtained: First, the central rib and semicircular or double-quadrant-shaped teeth are of such depth that their strength is greatly increased, and they are prevented from the warping and twisting incident to the narrow bars in general use; second, that while the bars fit so closely on their upper surfaces as to afford a firm support for the fuel, yet, on account of the beveled or tapered shape of the teeth, wide open spaces are left below for the admission of air to the fuel; and, third, that clogging of the grate by clinkers is prevented, since the spaces between the teeth widen downwardly. It also results from constructing the teeth with a flat top that sharp ends or corners are formed, which penetrate the mass of fuel and thoroughly agitate it.

It will be noticed that the hangers and levers for operating the bars are placed under and in line with the teeth. A clear air-space is thus permitted between the end of the grate-bars and the side walls, and the levers and fixtures form no obstruction to the admission of air to the fire. By utilizing the bar C′ as a support for the trunnions of both sections I economize metal, while I provide also a more solid frame-work than if separate side bars were used, while by tapering the said side bars downwardly I increase the air-space below the grate.

I prefer to use independent shaking devices for each grate-section; but it will readily be observed that by making proper connections all the bars in the different sections may be shaken simultaneously.

I have found that the agitation of the bars in my grate disposes so effectually of the ashes, clinkers, and other refuse that no means for dumping the grate are necessary. I am thus enabled to economize fuel to a very great extent.

Having described my invention, I claim as new and desire to secure by Letters Patent—

1. In a grate composed of two or more sections, A A′, the combination of the end bars, B B, having stationary quadrant-shaped teeth E, the side bars, C C C′, and a series of grate-bars pivoted in bearings in such side bars and having interlocking teeth.

2. The described grate-bars, having the central rib, 2, and a series of semicircular or double-quadrant-shaped teeth, E, adapted to interlock with corresponding teeth on adjoining bars, in combination with means for simultaneously oscillating such bars.

3. A grate-bar composed of a central rib, 2, and a series of teeth, F, set at right angles thereto, such teeth having the flat lozenge-shaped upper surface, sharp corners, and being beveled to an approximately semicircular lower edge, for the purposes set forth.

4. In a furnace-grate, the side bar, C′, having the divided bearing-grooves in its upper face and constructed of a tapered or beveled cross section, for the purpose set forth.

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

WILLIAM BOWERS.

Witnesses:
DAVID H. MEAD,
F. L. MIDDLETON.