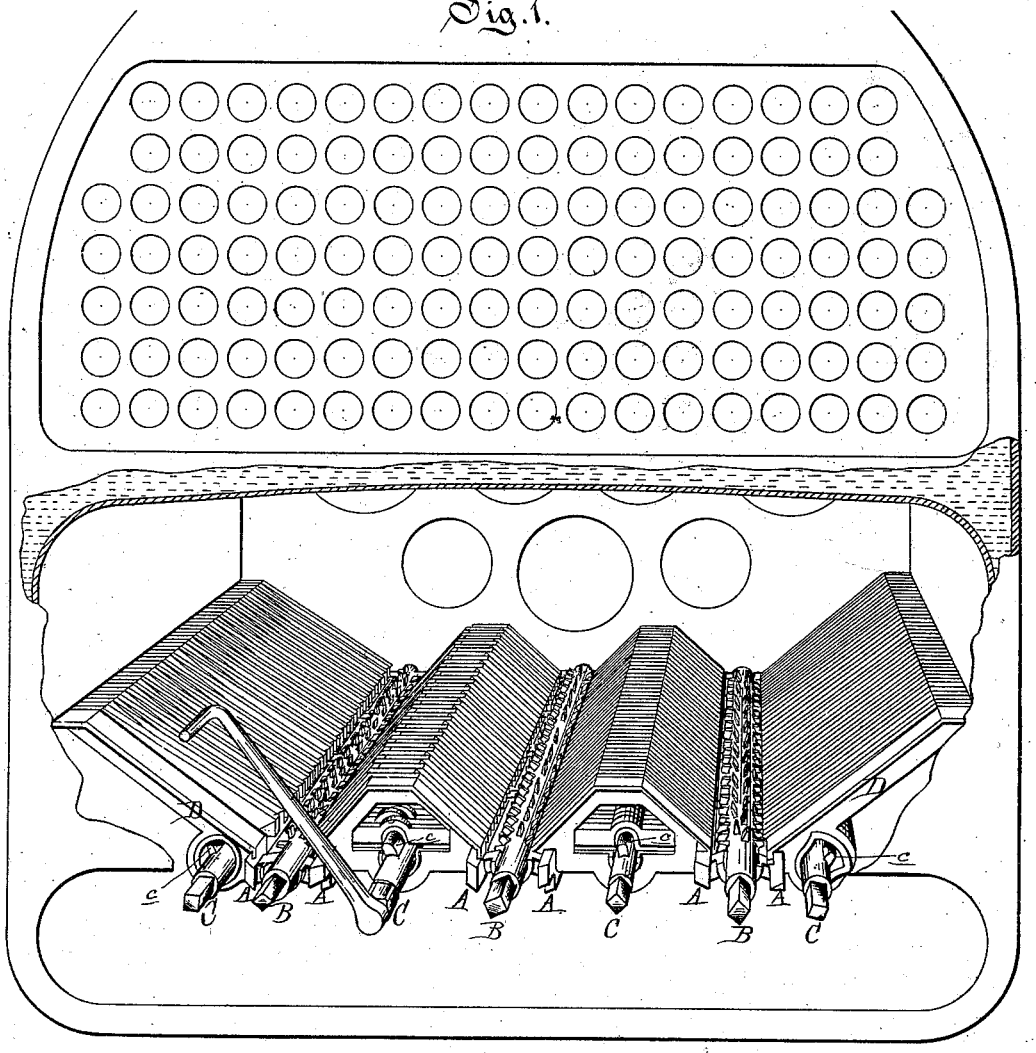
2 Sheets—Sheet 1.

T. MURPHY.

GRATE-BAR.

No. 169,655. Patented Nov. 9, 1875.

Fig. 1.



Attest:
Edward Barthel.
D. C. Lucas

Inventor:
Thos Murphy
Per Atty
Thos S. Sprague

2 Sheets—Sheet 2.

T. MURPHY.

GRATE-BAR.

No. 169,655. Patented Nov. 9, 1875.

Fig. 2.

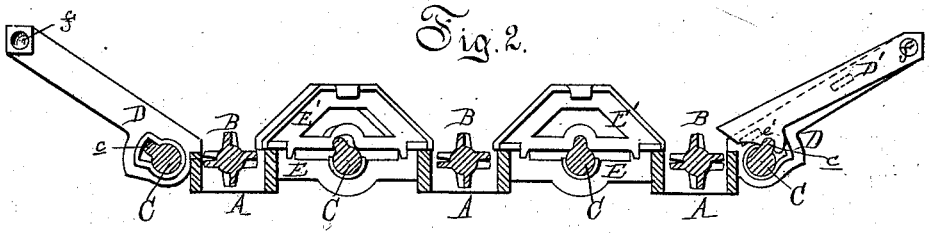


Fig. 3

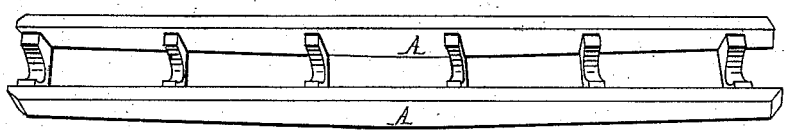


Fig. 4.

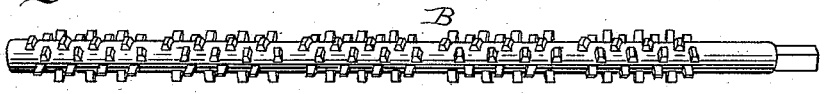


Fig. 5.

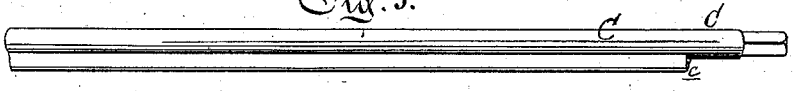


Fig. 6.

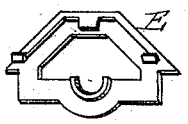


Fig. 8.

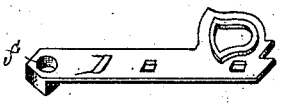


Fig. 7.

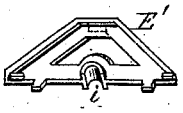
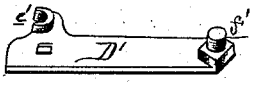


Fig. 9.



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UNITED STATES PATENT OFFICE.

THOMAS MURPHY, OF DETROIT, MICHIGAN.

IMPROVEMENT IN GRATE-BARS.

Specification forming part of Letters Patent No. **169,655**, dated November 9, 1875; application filed April 17, 1875.

To all whom it may concern:

Be it known that I, THOMAS MURPHY, of Detroit, in the county of Wayne and State of Michigan, have invented an Improvement in Furnace-Grates, of which the following is a specification:

My invention has for its object to provide the furnace of a steam-boiler-heating furnace or stove with a grate which will permit a greater volume of air to pass into and through the superimposed incandescent fuel, and thereby enable all kinds of coal, but more especially slake and refuse coals, to be successfully burned; also, to so arrange the grate-bars as that every second one may be vibrated to free the grate from ashes, and to collect the clinkers and refuse at certain points where they can be removed or ground up, and then removed by toothed cylinders rotated by cranks on the outside of the furnace.

Figure 1, Sheet 1, is a perspective view of the furnace of a marine boiler, nearly all the front of the same being broken away to show my improved grates applied thereto. Fig. 2, Sheet 2, is a cross-section of the grates, their supports, and the operative parts. (Seen in Fig. 1.) Fig. 3 is a perspective view of one of the grate-supporting frames. Fig. 4 is a similar view of a toothed cylinder used for grinding clinkers and removing ashes. Fig. 5 is a similar view of a feathered rock-shaft for vibrating the grate-bars. Fig. 6 is a detached perspective view of a triangular stationary grate-frame. Fig. 7 is a similar view of an intermediate triangular vibrating grate-frame. Fig. 8 is a similar view of one of the stationary inclined bars, such as are erected at the sides of the furnace. Fig. 9 is a similar view of an intermediate vibrating bar.

In the drawing, A represents a pair of parallel bars, cast with girths connecting them at the ends and intermediately, making a frame which can be supported longitudinally in a furnace by bars or brackets on the front and back walls thereof. In the furnace shown three of these frames are employed; but in a narrower one two, or but one alone, may be necessary. The girths of each frame are hollowed on the upper edge to receive and support a toothed cylinder, B, whose front end extends through a thimble in the front leg of the furnace, or beneath the front in the draft-opening, where it is squared to receive a crank by which it may be rotated. This cylinder has a series of studs projecting from its surface, as seen in Fig. 4. D is one of a series of bars set up at an angle of about forty-five degrees, as circumstances may require, against the furnace sides, supported at the lower ends by the outer edge of the frame A, the lower ends of the bars being notched to project over the edge of said frame. There is a pendent lug at the lower end of each bar D, with a pear-shaped opening in it. There is also an enlargement of the upper end on one side, to form a spacer, through which a hole, *f*, is cored in casting. D′ is a bar of nearly the same shape, having a pivot-lug, *f′*, on its upper end to insert in the hole *f* of the bar D. Between each pair of said bars it is intermediately placed. Instead of the open lug at the lower end, it has a segment-shaped lug with a notch, *e′*, in its upper side, in which the rib *c* of a rock-shaft, C, enters. The front end of the rock-shaft extends either through a thimble in the front leg of the furnace, or through the draft-opening; and, when oscillated by a crank, the feather *c* of the rock-shaft engages with the notches of all the bars D′, and vibrates them, freeing the grates of ashes, and carrying the partially-consumed coal and the clinkers to the lower ends of the grate-bars, and upon the toothed cylinders B. E is one of a series of triangular grate-frames, having a notch at each end to engage with the side bar of a frame, A, it being placed between two contiguous frames A, on which it rests. The bottom piece or girth of each frame E is hollowed out to form a bearing for the rock-shaft C, whose front end, like the others, projects through a thimble in the boiler-front, or into the draft-opening. E′ is a similar frame, but without the notches at the ends, and is intermediately placed between pairs of the frames E, its ends resting upon the frames A. Its girth has a socket, *i*, in the lower edge, which receives the rib of the rock-shaft, which, when oscillated on its axis, vibrates all the frames E′ in the series laterally to and fro, freeing that part of the fire-bed from ashes, and throwing the unconsumed coal down toward the foot, and the clinkers upon the cylinders B, which grind and remove them when rotated.

Fresh fuel is thrown on the tops of the grate-

frames and tops of the inclined bars at the sides of the furnace, and there remains until coked and partially consumed, until the time for firing the furnace the next time, when the incandescent coke may be pushed off by the fire-hoe, or by vibrating the grates. Fresh fuel being then introduced and thrown upon the incandescent mass, will have its gases ignited and consumed while coking, owing to the free admixture of large volumes of atmospheric air at a very high temperature.

In a furnace of less width than that shown one set of the triangular grates may be omitted; as also the intermediate toothed cylinder; and in a very narrow or contracted furnace the said triangular grates may be omitted altogether, using only the inclined grates at the sides, and an intermediate clinker-grinding cylinder.

It is evident that these grates may be modified in arrangement to suit the requirements of various forms of air-heating and other stoves and furnaces without departing from the spirit of my invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of two sets of alternating and inclined bars, D D′, with a supporting-frame, A, and a feathered rock-shaft, C, adapted to vibrate the bars D′ of each set, substantially as described.

2. The combination of the toothed cylinder B with the frame A and stationary and vibrating bars D D′, substantially as described and shown.

3. The combination, with the frames A, of the triangular grate-frames E E′, in an alternating series, the said frames E′ being susceptible of a lateral vibration from the rock-shaft C, hung in the frames E, substantially as and for the purpose set forth.

4. In a furnace or fire-box, the combination of two sets of transverse grate-bars, inclined from the sides of the fire-box toward each other, and revolving toothed cylinders, substantially as described.

THOS. MURPHY.

Witnesses:
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C. E. HUESTIS.