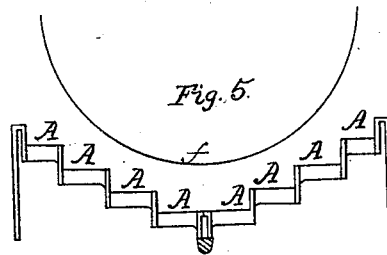
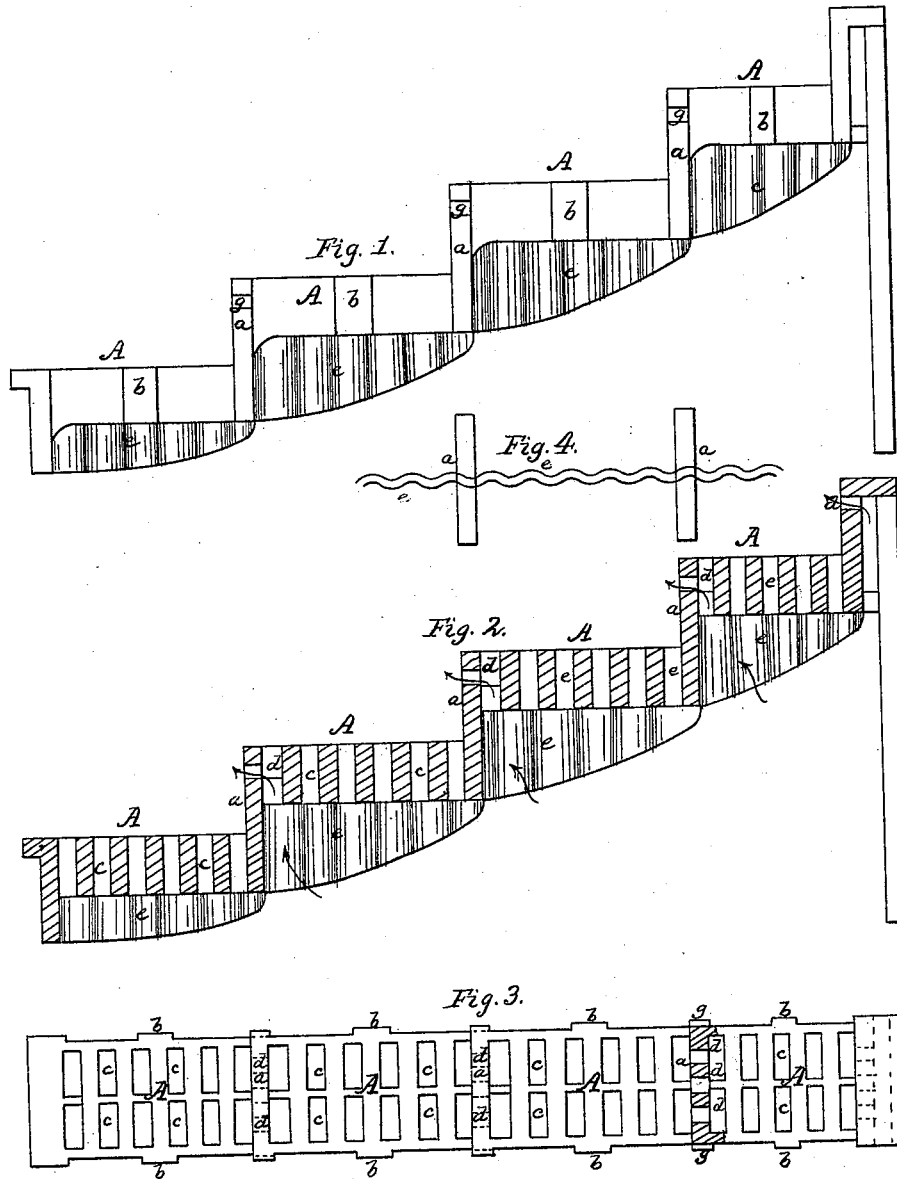


*A.C. Fletcher,*  
*Furnace-Grate Bar.*

*N<sup>o</sup> 53,966.*

*Patented Apr. 17, 1866.*



Witnesses.

*J. W. Cronby*  
*G. W. Reed.*

Inventor

*Adison L. Fletcher*

# UNITED STATES PATENT OFFICE.

ADDISON C. FLETCHER, OF NEW YORK, N. Y.

## GRATE-BAR.

Specification forming part of Letters Patent No. 53,966, dated April 17, 1866.

### *To all whom it may concern:*

Be it known that I, ADDISON C. FLETCHER, of the city, county, and State of New York, have invented a new and useful Improvement in Grate-Bars; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side view of a grate-bar constructed according to my invention. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a plan of the same, partly in section. Fig. 4 is a horizontal section of the longitudinal braces by which the bar is strengthened. Fig. 5 is a diagram, illustrating the application of my improved grate-bars to a boiler-furnace.

Similar letters of reference indicate corresponding parts in the several figures.

This invention consists in the construction of grate-bars with their faces in the form of a series of steps, one above another, and with a series of air-passages so arranged in the rising portions of said steps that air which is heated in its passage through them is delivered over the surface of the fuel on the steps below in such manner as to inflame the combustible gases eliminated from the fuel.

It also consists in the bracing of the steps of the bar by means of longitudinal vertical braces, as hereinafter described.

To enable others skilled in the art to make and use my invention, I will proceed to describe it with reference to the drawings.

The series of steps A A, the upper surfaces of which form the face of the grate-bar, are represented in Figs. 1 and 2. These steps are connected together by transversely-arranged vertical webs *a a*. On the sides of the bar there are lateral projections *b b*, as in other grate-bars, for the purpose of keeping the steps of the adjacent bars at the proper distance apart, making the horizontal profiles of the bars of substantially the same form as those of ordinary grate-bars, as shown in Fig. 3. In the steps there are parallel openings, *c c*, of any suitable form, through which, as well as through the spaces between the bars, air is admitted to the fuel on the steps. In the edges of the webs *a a* there are notches *g g*, so arranged that when the said webs of two bars meet each other in the grate the said notches

in the two bars will be opposite each other, and so combine to form an air-passage like *d d*. In the upper parts of the vertical webs *a a* are air-passages *d d*, of circular or other form—either horizontal or inclined—for the admission of air from below the grate-bar above the fuel on the steps.

*c c* are the longitudinal vertical braces for the strengthening of the bar, extending longitudinally from the transverse web *a* of each step to the corresponding web of the next one above or below, and connected in the casting with the upper parts of their respective steps. These braces may be straight, but I prefer to make them corrugated vertically, as shown in Fig. 4, that they may the more readily expand in a longitudinal direction as the upper portions of the steps are expanded by heat. The bars thus constructed may be arranged to form the grate, either side by side and parallel, or radiating from a common center, and in the latter case they may be arranged either with their highest steps at the center, but preferably with their lowest steps at the center, which would give the grate an amphitheatrical form.

The best arrangement for the furnace of a cylinder-boiler will be parallel and transverse to the boiler, using two bars for the width of the grate, with their lower ends abutting together under the center of the width of the boiler, as shown in Fig. 5, in which the line *f* represents the transverse sectional profile of the lower part of the boiler. By this arrangement the whole width of the grate and the bed of fuel upon it is kept at nearly uniform distance from the boiler, so as to subject nearly the whole of the lower semi-diameter of the boiler to a nearly uniform heating influence, which is one great advantage derived from the construction of the grate in step form.

The grate-bars thus constructed may be supported in the usual or any suitable manner, which will readily suggest itself to the engineer, according to their arrangement. They may be applied to all kinds of furnaces, stoves, and fire-places.

The coal or other fuel is spread upon the steps A A of the grate-bars up, or nearly up, to the passages *d* in the webs *a a*, so that while air is admitted from below through the fuel by means of the passages *c c* in the steps and the spaces between the bars, air is also admitted

above the fuel through the passages *d d*, as indicated by arrows in Fig. 2, and the air admitted through the latter passages is so heated before arriving above the steps that its oxygen combines readily with the carbonic oxide eliminated from the fuel, and so produces a very perfect and intense combustion.

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

1. A grate-bar with its face in the form of a series of steps, one above another, substantially as and for the purpose herein specified.

2. In a grate with its face in the form of a series of steps, passages *d d*, for the admission of air above the fuel on the steps, substantially as and for the purpose herein set forth.

3. The longitudinal vertical braces *e e*, connecting the transverse webs *a a* and the steps of a step-formed grate-bar, substantially as herein described.

ADDISON C. FLETCHER.

Witnesses:

HENRY T. BROWN,  
A. LECLERC.