A. E. BARTHEL.

GRATE-BAR.

No. 190,805. Patented May 15, 1877.

Fig. 1.

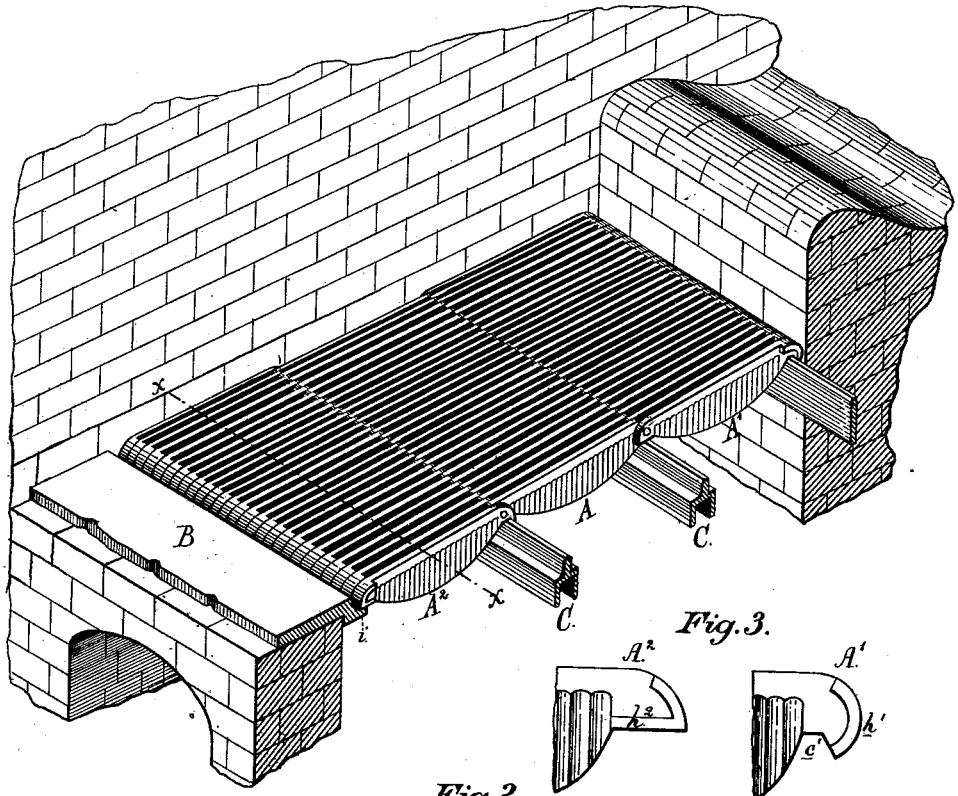


Fig. 3.

Fig. 2.

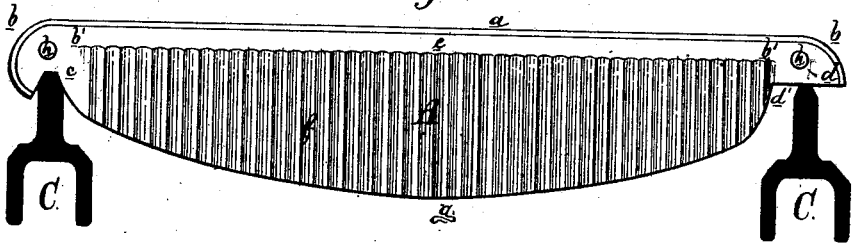
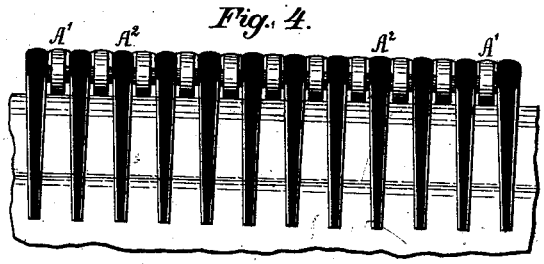


Fig. 4.



Attest:
R. T. Dyer.
S. N. Bully

Inventor:
Albrecht Edward Barthel
by Geo. W. Dyer & Co
Attys.

UNITED STATES PATENT OFFICE.

ALBRECHT E. BARTHEL, OF DETROIT, MICHIGAN.

IMPROVEMENT IN GRATE-BARS.

Specification forming part of Letters Patent No. **190,805**, dated May 15, 1877; application filed April 20, 1877.

To all whom it may concern:

Be it known that I, ALBRECHT E. BARTHEL, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Grate-Bars; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The object I have in view is such a construction and arrangement of furnace-bars as will best adapt furnaces to burn fine coal, sawdust, spent tan, or other finely-divided material in a perfect manner, insuring a complete combustion of the material; and my invention therein consists principally in a small removable grate-bar, and in the arrangement of such grate-bars relatively to each other, as more fully hereinafter explained.

In order to enable those skilled in the art to make and use my improvement, I proceed to describe the same, having reference to the drawings, in which—

Figure 1 is a view in perspective, with my grate-bars shown in position in a fire-bed, one side wall being removed; Fig. 2, a side view of one of the grate-bars in position upon the cross-bars; Fig. 3, separate views of the ends of such bars as are used at the ends of the fire-bed; and Fig. 4, a cross-section of the fire-bed with the grate-bars in position, taken upon the line *x x*, of Fig. 1.

In the drawings, A denotes one of my grate-bars, which is made of proper metal, and, preferably, about one foot in length, two and one-half inches in depth, one-fourth of an inch in its greatest thickness, and one-sixteenth of an inch in its least thickness, weighing usually about a pound. This bar has a straight smooth top surface, *a*, with ends rounded downward, as shown at *b*, having a hook, *c*, at one end and a projection, *d*, at the other end, with a straight under surface, *d'*, in parallel lines with the top *a*. The upper portion of each side of this bar (shown by the letter *e*) is smooth for a short distance. From this smooth portion *e* small corrugations *f* extend to the bottom *g* of the bar, which bottom is in outline of an arched form, as shown in Fig. 2. From the top *a* of the bar to the bottom of the bar the same diminishes regularly in thickness until, at the extreme bottom line, the bar is as thin in the webs between the corrugations (which coincide upon each side) as it can safely be cast. Upon one side the entire surface of the bar is upon the same plane, but upon the other side a portion, *b'*, near the ends, is made of less thickness, and on such portions a stud, *h*, projects to the line of the surface of the top *a*. The bars just described are those which occupy all the fire-bed, except at the ends, where modifications A^1 A^2 (shown particularly in Fig. 3) are used, which bars differ only from those already described in this particular, viz: At the hook end *c'* of the bar A^1, instead of the stud *h* is a flange, h^1, projecting to the thickness of the top of the grate-bar, and at the free end of the grate-bar A^2 is another flange, h^2, instead of the stud *h*, also projecting the thickness of the top *a*, both of which flanges, h^1 h^2, are shown particularly in Fig. 3. At the front of the fire-box is placed a covering-plate, B, having at its inner edge a lip or flange, *i*, which supports the outer end of the fire-bed, while the remainder of such fire-bed is supported at the ends of the grate-bars upon cross-bars C of the form in cross-section shown in Fig. 2, like the letter **U** reversed, with a central rib springing vertically upward, which bars are secured into the brick-work at the proper distance apart.

The bars A A^1 A^2 are placed upon these cross-bars in the following order or manner, viz: Beginning at the front end of the fire-bed, upon one side thereof, one of the grate-bars A^2 is placed with its free end resting on the lip or flange of the covering-plate and its hook end resting upon one of the cross-bars. Upon the same cross-bar, and lapping by the end of the grate-bar A^1, is placed a grate-bar, A, with its hook end resting upon the next cross-bar, and so on alternately, one grate-bar next to the side of the fire-box and another lapping by it at the ends until the back end of the fire-place is reached, when the hooked ends of the grate-bars A^1 must be placed over the cross-bar, or equivalent support, at the back end of the fire-box. And this manner of laying is pursued until the entire fire-bed is covered with the grate-bars, each bar being hooked at one end over a cross-bar or other

equivalent support, and the other end free to expand or contract upon the top of some cross-bar.

In each instance the flanges or studs upon the grate-bars, and the thickness of the intervening ends, will serve to separate the grate-bars their own thickness, or one-fourth of an inch, and the whole fire-bed will be composed of thin grate-bars and of narrow spaces, as shown in Fig. 1.

It will be observed that each of the grate-bars is hooked upon its cross-bar at that end of the grate-bar which is toward the back end of the fire-bed, so that the expansion of each grate-bar under the influence of heat is toward the front of the fire-box, or away from the point of greatest heat, by means of which arrangement the said bars expand uniformly upon the same plane, and do not warp or get out of shape. The use of the grate-bars A^1 A^2 at the front and back ends of the fire-place is essential, as it is desirable at these points to get a better lateral rigidity of the fire-bed, and preserve the spaces between the grate-bars.

By means of this construction and arrangement of the separate elements composing the fire-bed, fine coals or other finely-divided material is upheld upon the fire-bed without waste by sifting through, and at the same time there are numerous spaces throughout the fire-bed for the air to penetrate, to insure complete combustion of the fuel. At the same time, as the fuel is consumed, there are no places where the ashes can accumulate, as the points of support of the cross-bars are very small, and the ends of the grate-bars resting upon them are rounded off.

The principal advantages of my construction may be found largely in the cheapness of the fire-bed, in its durability, in the facility with which it may be laid, replaced, or repaired, and in the perfect combustion which it insures to fine coals or other cheap fuels of a finely-divided character.

I have found also, in use, that the grate-bars, when lapping each other at the ends, and touching uniformly upon their contiguous surfaces, were apt to melt and fuse together, so that they could not expand lengthwise under the heat, but would warp, and for this reason the stud *h*, interposing a small space between the contiguous surfaces, allows a passage of air between them, and consequently the lapping ends do not melt or fuse together, and the action of expansion lengthwise is not interrupted.

It may be mentioned also that when a grate-bar becomes in any way defective the same is removed, and another substituted without disturbance of the fire-bed, and therefore a new bar weighing a pound, and of small cost, is sufficient to supply all the needed repairs, which, in fire-beds of ordinary construction, would require the substitution of a long, large, and costly grate-bar.

Having thus described my improvement, its manner of use, and some of its advantages, what I claim as new therein, and my own invention, for which I desire Letters Patent, is—

1. The grate-bars A A^1 A^2, provided with small studs *h* at their free and interlapping ends, for the purpose of preventing such ends from fusing together while such bars are expanding longitudinally, substantially as described.

2. In combination, the grate-bars A A^1 A^2, with interlapping ends, provided with studs *h*, and the supporting-bars C, arranged under such interlapping ends, substantially as described.

This specification signed and witnessed this 20th day of April, 1877.

ALBRECHT EDWARD BARTHEL.

Witnesses:
R. N. DYER,
S. W. SEELY.