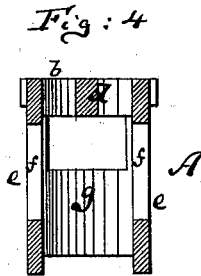
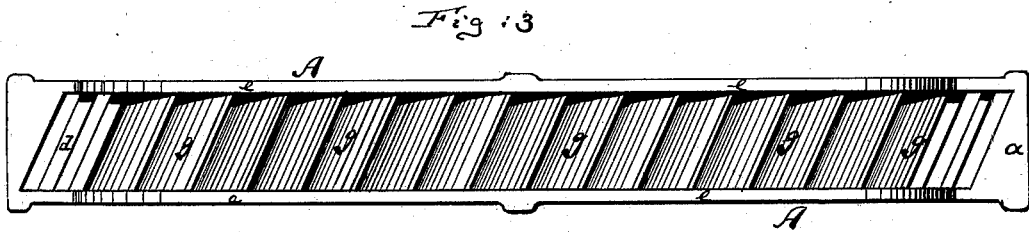
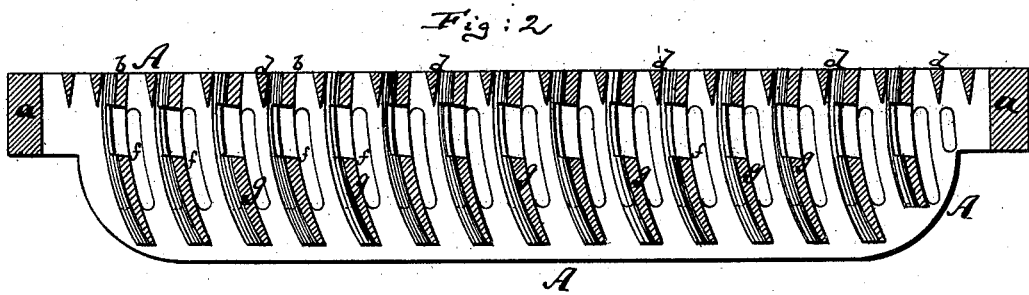
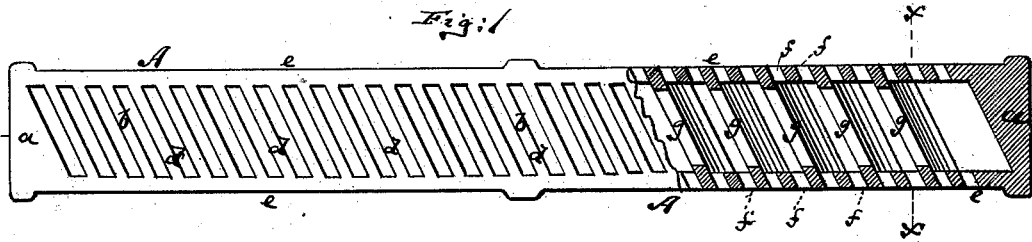


N. HENZEL & P. W. LIEBICH.  
Grate-Bar for Furnaces.

No. 199,707.

Patented Jan. 29, 1878.



**Witnesses:**  
John C. Sunbridge  
A. P. Briesen

**Inventors.**  
Nicolaus Henzel  
Paul Wilhelm Liebich  
by their attorney  
A. P. Briesen

# UNITED STATES PATENT OFFICE.

NICOLAUS HENZEL, OF PRAG, AND PAUL WILHELM LIEBICH, OF TEPLITZ,  
AUSTRIA.

## IMPROVEMENT IN GRATE-BARS FOR FURNACES.

Specification forming part of Letters Patent No. 199,707, dated January 29, 1878; application filed  
November 6, 1877.

*To all whom it may concern:*

Be it known that we, NICOLAUS HENZEL, of Prag, and PAUL WILHELM LIEBICH, of Teplitz, Austria, have invented a new and Improved Grate-Bar, of which the following is a specification:

This invention relates to an improved grate-bar for furnaces in which a high degree of heat is to be created, such as locomotive-furnaces, &c.

The invention has for its object, first, to so construct the grate-bars that the air may have full access to and proper draft be created in the combustion-chamber, and, secondly, that the grate-bars will not be as liable to be worn out or bent by the heat as those heretofore generally in use.

The invention consists of a new hollow grate-bar, having diagonal knife-edged ribs and diagonal perforated blades, combined with slotted sides, all as hereinafter more fully described.

In the accompanying drawing, Figure 1 is a top view, partly in section, of our improved grate-bar. Fig. 2 is a vertical longitudinal central section of the same; Fig. 3, a bottom view thereof, and Fig. 4 a vertical transverse section on the line *x x*, Fig. 1.

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

The letter A represents our improved grate-bar. The same is preferably cast in one piece of metal, and is made of the usual long and narrow form, as shown in the drawing, but it may also be made annular or of other form.

It is provided at its ends, and may also be provided at its sides, with suitable prongs or cross-pieces *a a*, by which it is hung in the furnace in the customary manner. A series of such grate-bars, thus hung side by side, constitute the entire grate.

The grate-bar A is made hollow and open at the bottom, as clearly shown in Fig. 4. Its upper plate *b*, to wit—that part on which the fuel is placed, is provided from end to end with transverse oblique slots, arranged at preferably equal intervals, which slots ex-

tend to within a short distance from the edges of the grate-bar.

In this manner the top or part *b* is composed of a longitudinal rib at each side, said two ribs being connected by transverse oblique knife-edged ribs, *d d*, alternating with oblique braces *g g*, that extend farther downward than the ribs *d*, as shown.

The vertical sides *e e*, Fig. 2, of the grate-bar A are also slotted similar to the upper side *b*, but the slots *f* in said sides are preferably slightly curved, as indicated in Fig. 2. The slots and the ribs in the top and sides should be in line with each other, as indicated in Fig. 2.

*g g* are a series of parallel blades or braces, placed obliquely within the hollow of the grate-bar A, and attached to the inner faces of the sides *e e*. We prefer to so space these blades that two slots, *f*, will be in each side *e* between every two pairs of said blades, as shown in the sectional part of Fig. 1; but a greater or less number of blades may be used. The blades *g* are parallel to the ribs *d*, and are perforated at their upper portions, so that an air-passage is created directly below the top of the grate-bar through all the blades.

It will be seen that a grate-bar of the above construction supplies to the fuel a constant current of air. The air enters from below, between the blades *g g*, and also through the slots *f* in the sides *e e*, then passes under the top, and through the slots in the top, where it reaches the fuel, supplying the same with the necessary oxygen, and embracing the ribs *d* so as to keep them comparatively cool.

As, by this construction, each grate-bar supplies within the dimensions of its body the necessary fresh air for combustion, the grate-bars constituting the entire grate may be placed close to each other, as the air needs not be supplied between the series of grate-bars, as was heretofore usually necessary. The fuel will, consequently, not be apt to drop and remain suspended between the grate-bars; at the same time the ribs *d d* are placed close enough together that the fuel cannot

fall between them or burn the sides of such ribs. Thus the fuel will only be in contact with the surface of the grate-bars, and the same will therefore be less liable to wear out or warp than those heretofore in use.

We claim as our invention—

The hollow grate-bar *A*, having diagonal knife-edged ribs *d*, and diagonal perforated blades *g*, combined with the slotted sides *e e*, substantially as herein shown and described.

This specification signed by us this the 7th day of September, 1877.

NIKOLAUS HENZL.  
PAUL WILHELM LIEBICH.

Witnesses:

V. O. GRIKRYLN,  
E. BRANDEIS.