(No Model.) 3 Sheets—Sheet 1.

J. ASHCROFT.

GRATE BAR.

No. 347,548. Patented Aug. 17, 1886.

Fig. 1.

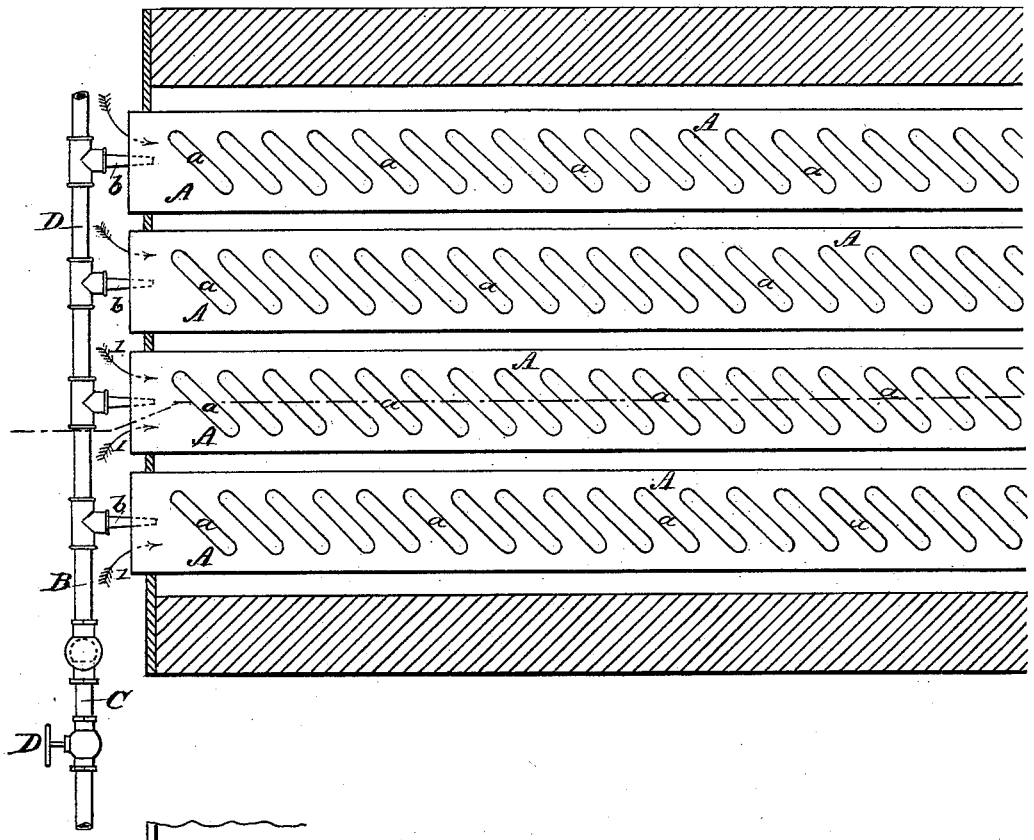
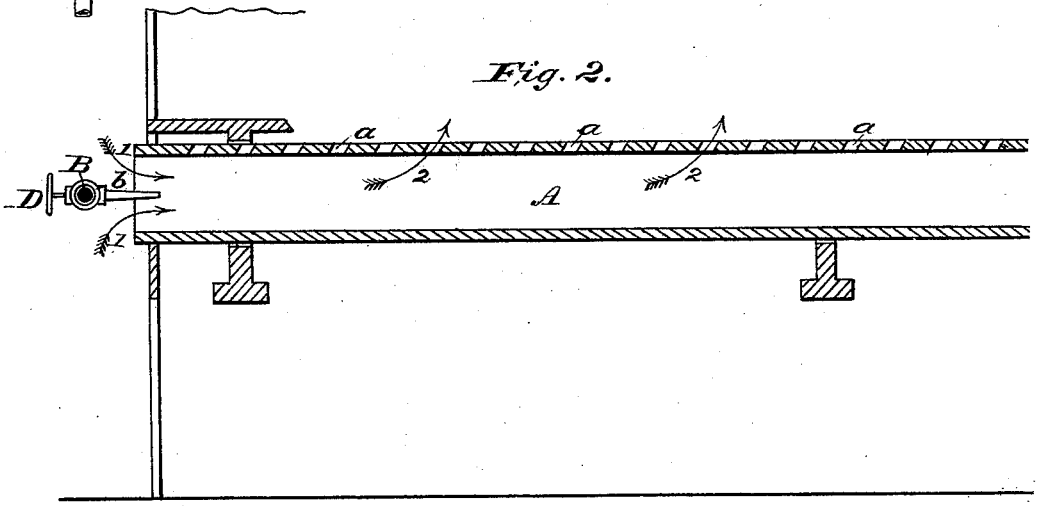


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

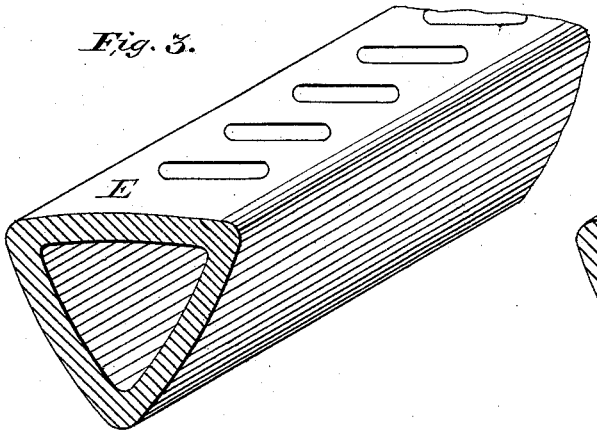


Fig. 4.

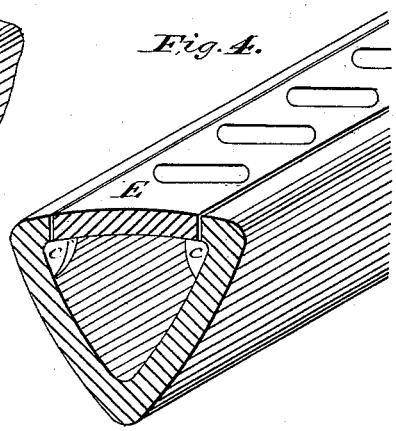
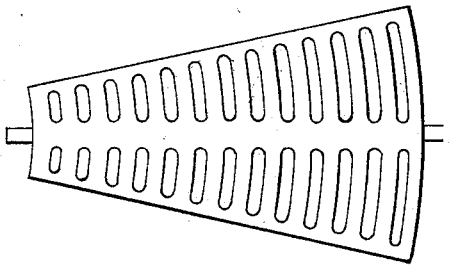


Fig. 5.



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3 Sheets—Sheet 3.

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GRATE BAR.

No. 347,548. Patented Aug. 17, 1886.

Fig. 6

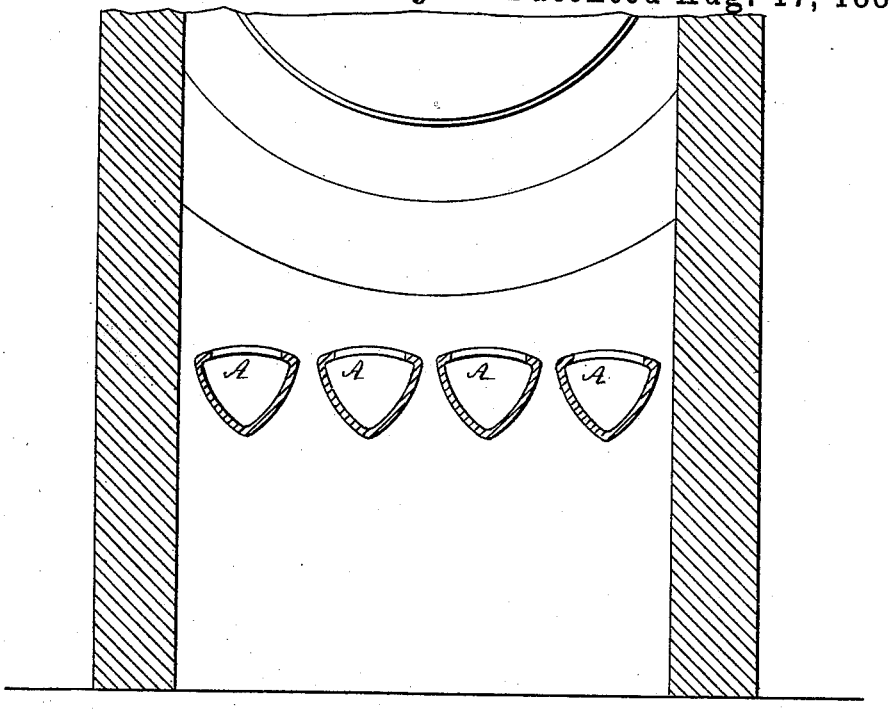
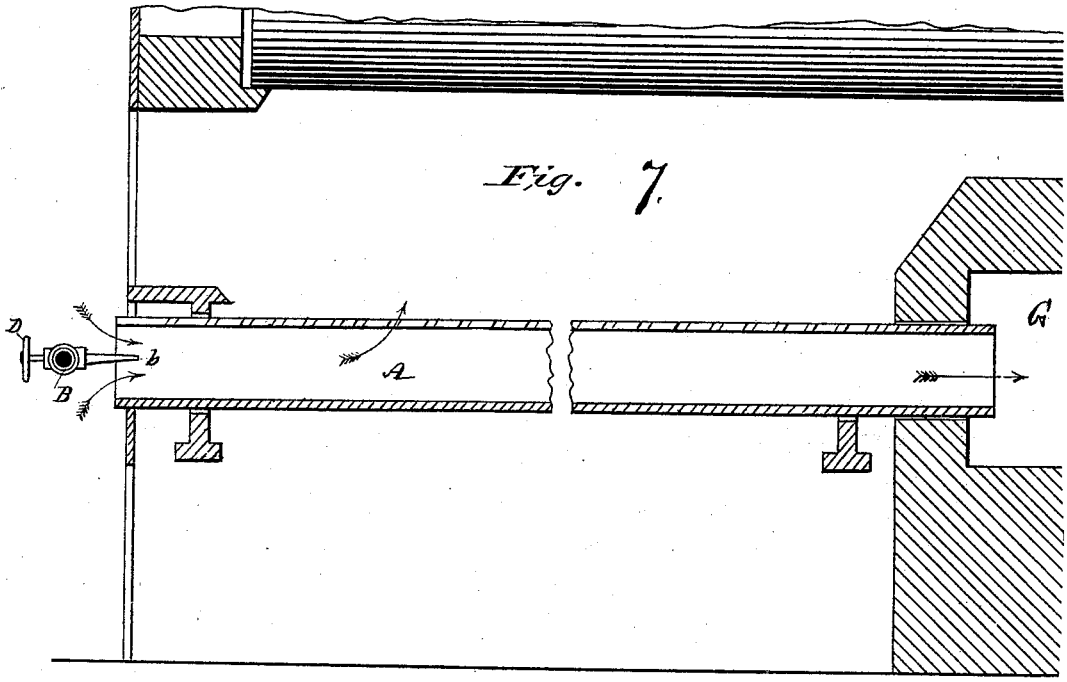


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOHN ASHCROFT, OF NEW YORK, N. Y.

GRATE-BAR.

SPECIFICATION forming part of Letters Patent No. 347,548, dated August 17, 1886.

Application filed October 4, 1884. Serial No. 144,742. (No model.)

To all whom it may concern:

Be it known that I, JOHN ASHCROFT, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Grate-Bars for Feeding Air to Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

My present invention relates to improvements in devices for feeding air or steam to furnaces to facilitate combustion.

The object of my invention is to produce a grate-bar through which air can be forced under pressure, to facilitate or complete the combustion of the gases arising from the coal, hydrocarbon, or other material used in the furnace.

My invention consists in providing the top of the grate-bar with a removable section, whereby when one section is worn or burned out a new one may be put in its place, as will more fully appear.

Referring to the drawings, Figure 1 is a top or plan view of a furnace having therein my improved grate-bar. Fig. 2 is a longitudinal sectional view on the line *x x* of Fig. 1. Fig. 3 is a view in perspective of my improved grate-bar having the solid or closed sides and open top. Fig. 4 is a view in perspective of a similar bar having a removable top. Fig. 5 is a top or plan view of a tapering or conical-shaped bar adapted to be used in a circular furnace. Fig. 6 is a view in cross-section of a furnace having my improved grate-bar therein. Fig. 7 is a longitudinal sectional view of a hollow grate-bar which extends through the rear end of the furnace-chamber and communicates with a chamber in the bridge-wall of the furnace.

A indicates my improved grate-bar, which is made hollow, and, by preference, of triangular shape in cross-section, but may be of any other suitable or desirable shape in cross-section without departing from the spirit of my invention. The sides of the bars A are made solid—*i. e.*, without perforations—while the tops of the bars are provided with numerous slits or other shaped perforations, *a*, so as to admit of the air or steam passing freely in and coming into immediate contact with the fuel placed thereon, thus producing rapid and complete combustion of the fuel.

B is a steam-pipe leading to any suitable source of supply, and is provided with a series of nozzles, *b*, which enter the open ends of the grate-bars A. The pipe B is connected to the stationary pipe C by means of a ball-and-socket joint, or by any other suitable connection, so that the section of the pipe B can be swung around to free the nozzles from the ends of the grate-bars, when it can be turned up out of the way, so as to admit of the grate-bars being turned and cleaned. The pipe C is provided with a suitable valve, D, by which the supply of steam is regulated or shut off entirely.

The pipes B and C may be connected with a reservoir of compressed air, so that air under pressure can be introduced directly to the bottom of the fuel on the grate-bars, the solid sides of the grate-bars serving to direct and confine the air-currents to the fuel which lies in immediate contact therewith. When steam is injected into the grate-bars, the vacuum produced thereby serves to draw the air rapidly in through the open end of the grate-bars, as indicated by the arrows 1 in Figs. 1 and 2, and force it up through the openings *a* in the top of the bar, and into immediate contact with the bottom of the fuel, as indicated by the arrows 2 in Fig. 2.

As shown in Fig. 4, the top E of the bar may be made of a separate piece and adapted to rest on the lugs *c* or on a ledge formed on the inner sides of the bar, so that the top E can be removed when worn out and replaced by a new top. A further advantage of this removable top is, that the bar can be turned and the top removed, thus freeing the bar of ashes and dust which may have accumulated there in a very short time.

The top or removable portion E of the bar may be made of metal, fire-clay, or any other suitable material, the essential feature being that the portion of the bar which is most liable to burn or wear out first can be replaced at a comparatively slight expense. This is an important feature of my invention, as it prolongs the life or usefulness of the main body of the grate-bar to an indefinite length of time.

In Fig. 6 I have shown a grate-bar adapted

for use in a circular furnace constructed on the same general plan—*i. e.*, with closed sides and open top—adapted to burn either solid, gaseous, or liquid fuel.

It will be observed that by employing the bars shown in Figs. 5 and 7 I am enabled to burn either solid or liquid fuel, or both may be used to advantage at the same time.

In Fig. 9 I have shown the grate-bar E as extending through the rear end of the furnace and communicating with an air-chamber, G, formed in the bridge-wall. By this construction I am enabled to heat the air in its passage through the grate-bars and chamber, and bring it in contact with the waste gases and smoke which have passed over the bridge-wall, where combustion takes place, and the smoke and gases, which would otherwise escape to the stack, are consumed, and the bar is made to perform a twofold function—viz., to supply air direct to the bed of fuel, and also to supply heated air to complete the combustion of the unconsumed gases and smoke which have passed from the fuel in the furnace.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In devices for feeding air to furnaces, a hollow grate-bar having its vertical sides solid or unperforated and its upper side or face composed of a removable perforated slab or plate, as set forth.

2. In devices for feeding air to furnaces, a hollow grate-bar provided with lugs or ledges *c*, in combination with a removable plate which forms the upper surface of the grate-bar, as set forth.

3. In devices for feeding air to furnaces, a hollow grate-bar having its sides solid or unperforated and its upper side provided with apertures or perforations, in combination with a swiveled or hinged pipe for supplying steam or air to the interior of the grate-bar, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN ASHCROFT.

Witnesses:

R. H. WHITTLESEY,

L. W. SINSABAUGH.