(No Model.)

J. WAGNER.

GRATE BAR.

No. 561,929. Patented June 9, 1896.

Fig: 1.

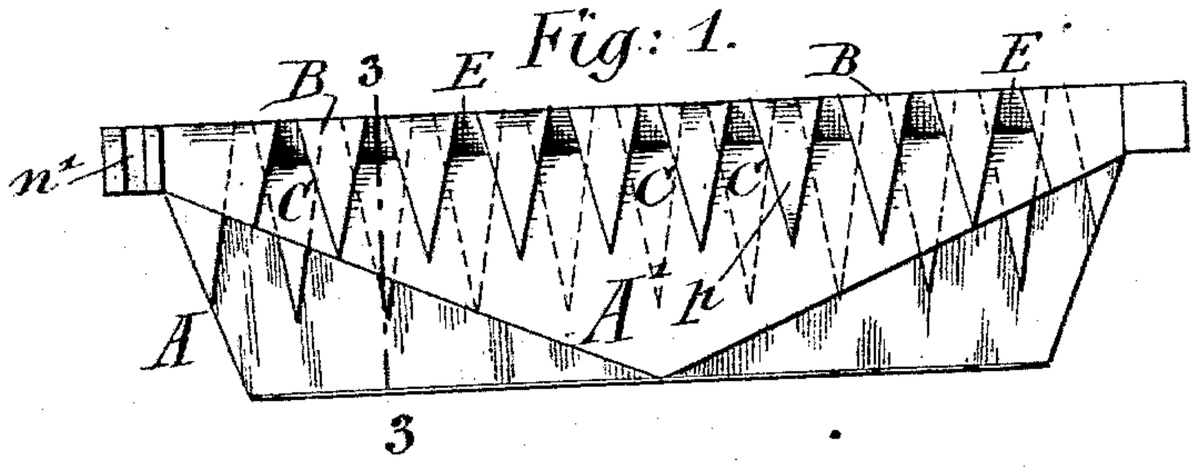


Fig: 3.

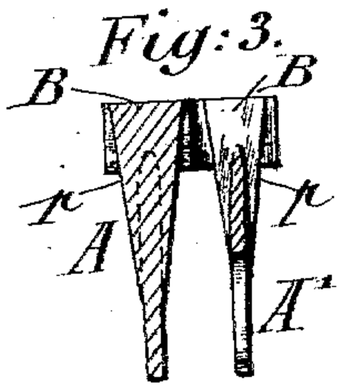


Fig: 2.

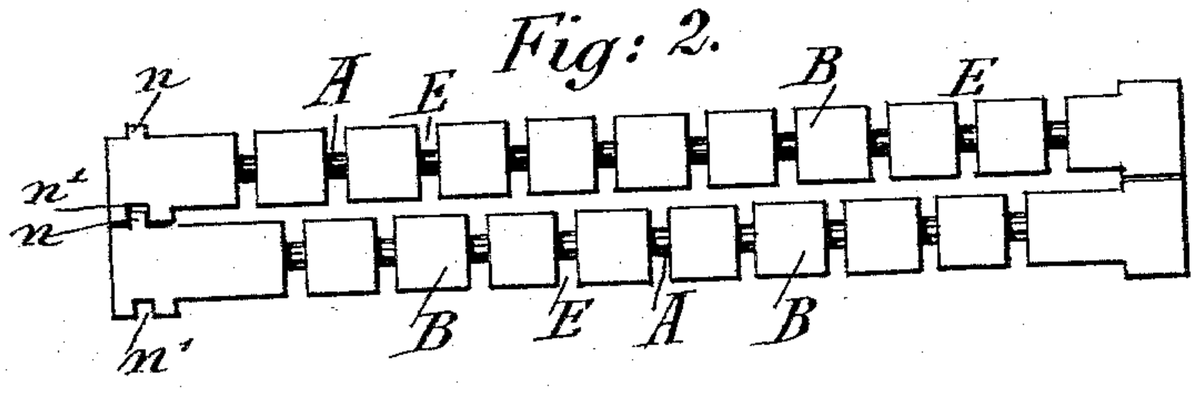


Fig: 4.

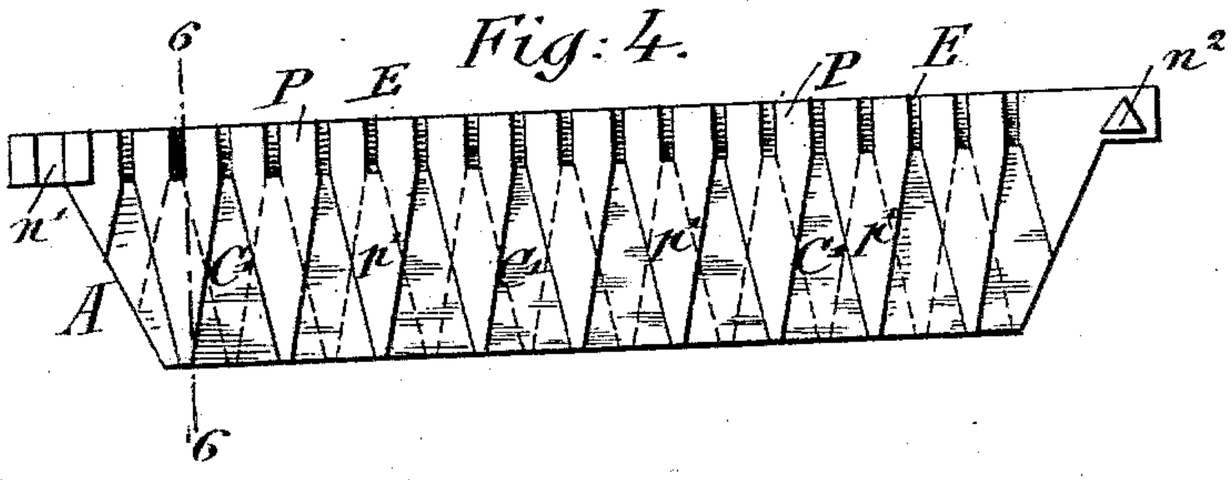


Fig: 6.

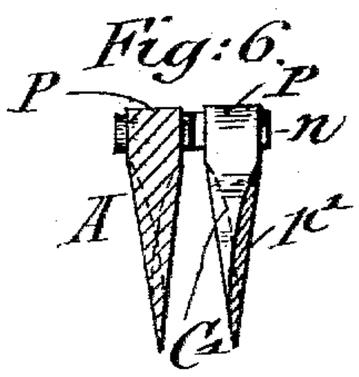
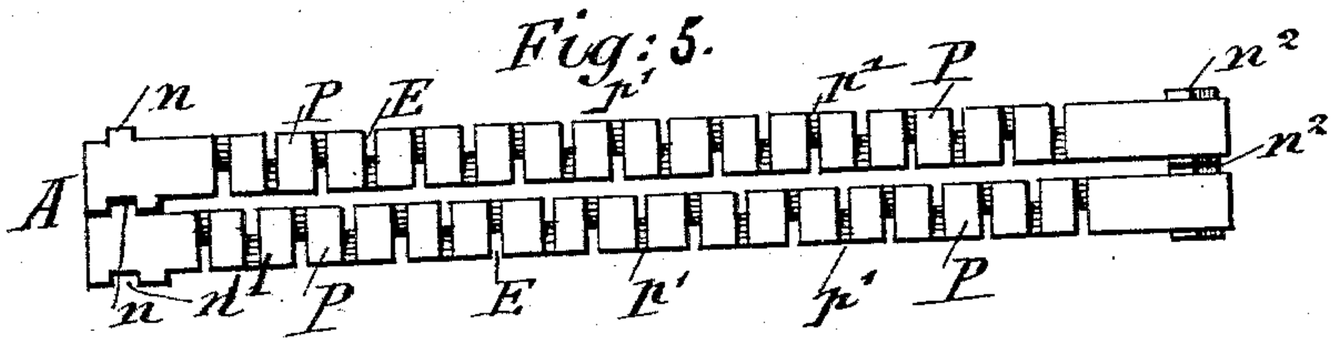


Fig: 5.



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UNITED STATES PATENT OFFICE.

JEAN WAGNER, OF PARIS, FRANCE.

GRATE-BAR.

SPECIFICATION forming part of Letters Patent No. 561,929, dated June 9, 1896.

Application filed March 26, 1895. Serial No. 543,188. (No model.) Patented in Germany April 11, 1893, No. 76,554; in England April 11, 1893, No. 7,406; in France April 19, 1893, No. 229,490; in Belgium April 20, 1893, No. 104,332; in Switzerland July 26, 1893, Nos. 7,219 and 7,439; in Austria-Hungary October 29, 1893, No. 80,941; in Italy November 14, 1893, No. 35,208, and in Spain January 19, 1894, No. 15,389.

To all whom it may concern:

Be it known that I, JEAN WAGNER, a citizen of the French Republic, residing in Paris, in the Republic of France, have invented certain new and useful Improvements in Grate-Bars, (for which I have obtained Letters Patent in the following countries: Germany, No. 76,554, dated April 11, 1893; Great Britain, No. 7,406, dated April 11, 1893; France, No. 229,490, dated April 19, 1893; Belgium, No. 104,332, dated April 20, 1893; Switzerland, Nos. 7,219 and 7,439, dated July 26, 1893; Austria-Hungary, No. 80,941, dated October 29, 1893; Italy, No. 35,208, dated November 14, 1893, and Spain, No. 15,389, dated January 19, 1894,) of which the following is a specification.

The objects of this invention are to secure a thorough distribution of the air throughout the mass of coals, a free escape of the ashes, facility of raking the coals, and an effectual cooling of the grate-bars, and to provide a simple, light, and inexpensive construction combining these properties.

The construction of my improved grate-bar is based on the principle that in place of thick bars with lateral channels or recesses thin bars or webs are used, the thickness of which is about equal to one-fifth of the cross-section of the teeth or blocks, and that these heads or blocks are arranged in the form of inverted pyramids which are placed astride of the web at right angles thereto and form one integral whole with the same, in such a manner that the sides of the pyramidal teeth or blocks form tapering ribs which extend partly or entirely over the web, so as to reinforce the same and protect it against warping when subjected to the heat of the fire. Between the tapering side ribs of the inverted pyramidal teeth are formed side channels of uniform tapering shape, through which the air passes in upward direction without being obstructed and is then distributed uniformly by means of transverse channels between the upper parts of the teeth or blocks, while the air at the same time exerts a cooling action on the projecting sides of the teeth. The improved construction therefore produces the proper and uniform cooling of all the parts of the grate-bar, and notwithstanding the small distance between the teeth an increased flow of air and a better combustion of the fuel are produced, so that the grate-bars can be used for furnaces of all kinds, even for such in which the constructions heretofore in use have failed.

In grates heretofore in use, even the best grate-bars, having a distance of five millimeters between the teeth, have about thirty per cent. of free grate-surface, while my improved construction, provided with like distances between the teeth, has a free grate-surface of forty-five per cent. and more. No existing system of grate-bars permits the reduction of the intervening space between the bars to such an extent as my system, which is important for the reason that my improved bars can be used with any suitable fuel without impairing the free dropping of ashes and slag, while the fire can be raked from above the grate as well as from below. Furthermore, the side channels pass in straight lines from the upper part of the web toward the lower part and furnish no projecting points in which ashes or slag can settle, while they furthermore permit the free introduction of the stoker from below for the proper cleaning of the spaces between the bars.

By carrying out the principles referred to in my improved grate-bar it can be made in various constructions, according to the purposes for which the same is designed; and the invention consists, therefore, of a grate-bar in which the web is provided with teeth or blocks formed of inverted pyramidal shape, which are arranged astride of the web at right angles thereto and the side portions of which form intermediate tapering air-channels of uniform tapering shape, which communicate with transverse channels between the upper parts of the teeth or blocks, as will be described hereinafter, and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side elevation of two cross-bars arranged side by side and connected with each other at the ends. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a vertical transverse sec-

tion on line 3 3, Fig. 1. Fig. 4 is a side view of a modified construction of grate-bar, which is specially adapted for the furnaces of locomotive and marine boilers. Fig. 5 is a plan view of Fig. 4; and Fig. 6 is a vertical transverse section on line 6 6, Fig. 4.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents the web of my improved grate-bar, which is made of comparatively thin cross-section.

B B are the teeth or blocks, which are formed on the upper part of the grate-bar A and which are made in the shape of inverted pyramids that are placed astride of the web, so that the downwardly-extending and tapering side portions *p* form vertical channels C on the sides of the web A, which side channels connect with transverse channels E between the upper parts of the teeth. The cross-channels form the continuation of the side channels and separate the upper parts of the heads or blocks from each other. The transverse channels E of one bar do not register with the transverse channels of the adjacent bar, as the teeth or blocks of the same are arranged so as to alternate with the teeth of the adjacent grate-bars, so that opposite to each transverse channel E a side portion *p* is placed, as shown clearly in Fig. 2. The bars can either be all of the same depth or they can be arranged in some cases with advantage so as to have different depths, as is shown, for instance, in Fig. 1, in which between two grate-bars A an intermediate bar A′ is arranged that is of less depth than the bars A and the lower edge of which is straight or inclined from the center toward the ends, as desired.

When it is desired to make grate-bars of lighter construction, which are specially adapted for fire-boxes of locomotive or marine boilers, two or more adjacent teeth or blocks are connected in groups, so that the grate-bar is composed alternately of inclined faces *p′* and of diagonal depressions C′, the raised side faces *p′* at one side corresponding to a diagonal depression C′ on the opposite side of the bar, and so on. These bars are not required to be made thicker than the flat smooth bars or webs of wrought or cast iron or even steel which have recently been in considerable demand and have the advantage that they permit of an increased and more uniformly-distributed flow of air through the channels C′ and E, while the lower part of the web extends to a considerable distance into the ash-pit. The diagonal depressions C on one side correspond to the tapering side faces *p′* on the other side, so that the bar is not weakened at any point thereof. One end of each bar is provided with a projecting lug *n* at one side and with a corresponding groove *n′* at the other side, which lug extends into the groove of the adjacent bar, while the opposite ends of the grate-bars are provided with abutments n^2, which, in connection with the lugs and grooves at the opposite ends, hold the grate-bars at the proper distance from each other, as shown clearly in Figs. 2 and 4. In very long bars every second bar is preferably provided at both sides with lugs by which the proper distance of the bars is retained intermediately between the ends and thereby the warping of the bars prevented. A grate composed of these bars having thin webs and pyramidal-shaped teeth disposed at right angles to the web permits the easy raking of the grate between the bars by means of a poker without difficulty, and the pyramidal teeth form channels flaring uniformly from their tops to the apexes of the pyramidal teeth on the sides of the web. These channels afford facility for the escape of ashes without clogging and constitute tapering passages through which air readily passes in continuous streams to the coals above the grate.

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

1. A grate-bar composed of a web having a thin upper edge and pyramidal teeth upon a side thereof, the bases of the pyramids which form said teeth constituting the fuel-supporting surfaces of the bar and lying with their adjacent edges at right angles to the web, the pyramids being spaced so as to leave between them flaring channels for the passage of ashes, the apices of the pyramids terminating in or between the planes of the two sides of the web.

2. A grate-bar composed of a web having a thin upper edge, and pyramidal teeth disposed on opposite sides thereof, the bases of the pyramids which form said teeth constituting the fuel-supporting surfaces of the bar and lying with their adjacent edges at right angles to the web, the pyramids being spaced so as to leave between them flaring channels for the passage of ashes, the apices of the pyramids terminating in or between the planes of the two sides of the web.

3. A grate-bar composed of a web having a thin upper edge, and pyramidal teeth disposed thereon, the bases of the pyramids which form said teeth constituting the fuel-supporting surfaces of the bar and lying with their adjacent edges at right angles to the web and the pyramids being disposed in groups and having flaring channels between the groups in alternation on opposite sides of the web, the apices of the pyramids terminating in or between the planes of the two sides of the web.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

J. WAGNER.

Witnesses:
W. MULLER,
CLYDE SHROPSHIRE.