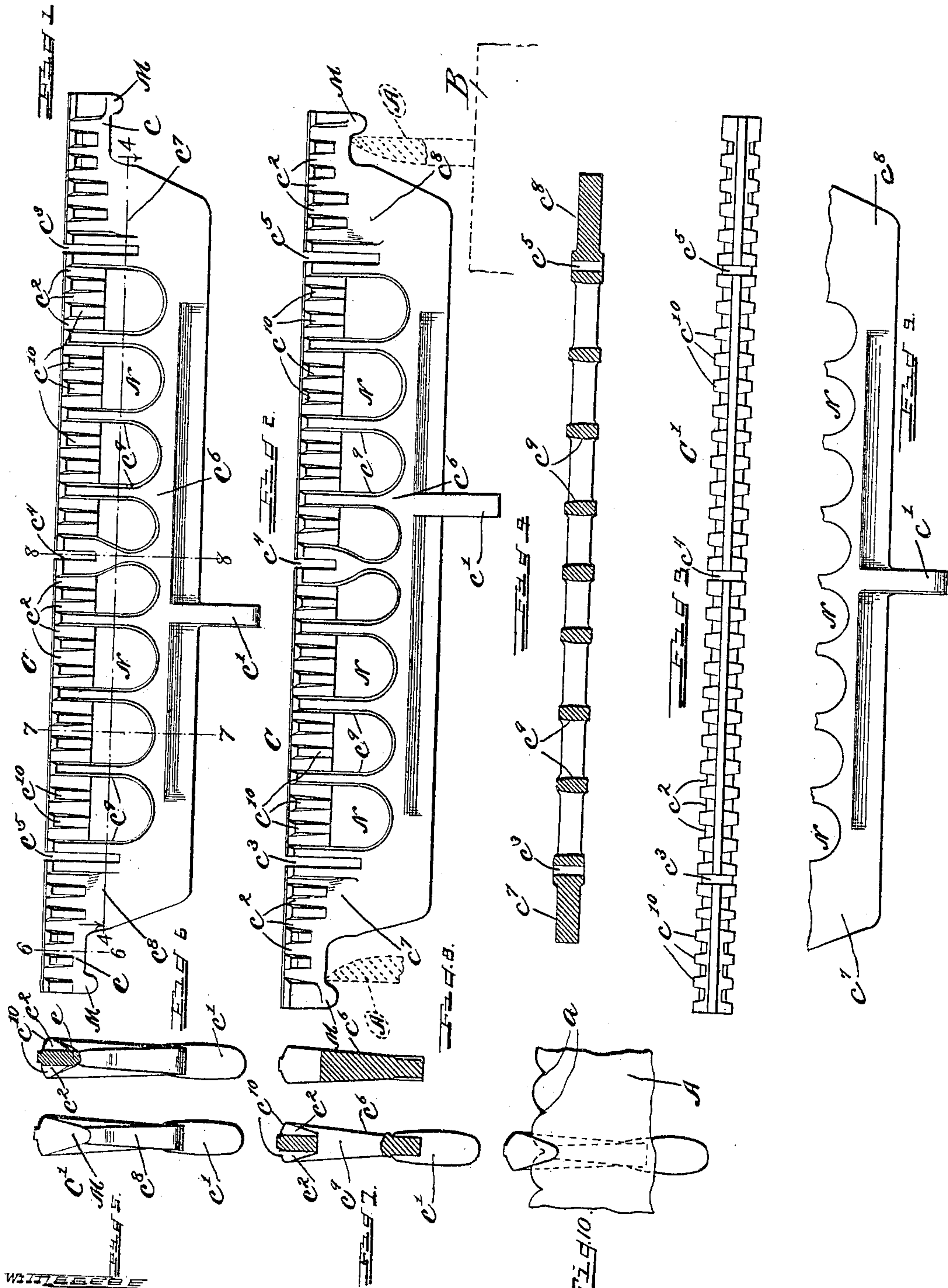


No. 819,019.

PATENTED APR. 24, 1906.

T. E. MARTIN.
FURNACE GRATE BAR.
APPLICATION FILED DEC. 26, 1901.



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FURNACE-GRATE BAR.

No. 819,019.

Specification of Letters Patent.

Patented April 24, 1906.

Application filed December 26, 1901. Serial No. 87,240.

To all whom it may concern:

Be it known that I, THOMAS E. MARTIN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Furnace-Grate Bars, of which the following is a specification.

Any features not claimed in this application are claimed in my divisional application, Serial No. 259,157, filed the 6th day of May, 1905—as, for example, the sectional character of the upper portion of the grate-bar—and the non-warping features thereof are claimed in this application, while in my said divisional application I have claimed various features and details of construction which relate more to the combinations and general construction of a furnace-grate.

My invention relates to furnace-grates in general, but more particularly to grates in which the grate-bars are readily removable from the grate structure, and especially to grates in which the bars are mounted and connected for rocking motion. Certain features of my invention are, however, applicable to all kinds of grates, and I do not, therefore, limit myself to any particular construction.

Generally stated, the object of my invention is to provide an improved and simple and inexpensive and thoroughly-efficient construction of grate-bar which may be readily employed in connection with different kinds of furnaces.

Certain special objects are to provide a grate-bar having the metal so distributed as to prevent warping and disintegration; to provide an improved bar in which the upper portion may contract or expand longitudinally without warping the bar; to provide an improved formation and construction of grate-bar which can be used in either a stationary or rocking grate, and to provide certain details and features of improvement tending to increase the general efficiency of a furnace and to render a grate-bar of this character more serviceable and satisfactory in use.

To the foregoing and other useful ends my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a side elevation of a grate-bar involving the principles of my invention. Fig. 2 is a view similar to Fig. 1, but showing the other side of the bar. Fig. 3 is a plan of the bar shown

in Fig. 1. Fig. 4 is a horizontal section on line 4 4 in Fig. 1. Fig. 5 is an end view of the bar shown in Fig. 1. Fig. 6 is a vertical section on line 6 6 in Fig. 1. Fig. 7 is a vertical section on line 7 7 in Fig. 1. Fig. 8 is a vertical section on line 8 8 in Fig. 1. Fig. 9 shows a grate-bar similar to the one shown in Fig. 2, with the exception that the stem or leg is located at the center of the bar. Fig. 10 is an end elevation of one of the rocking grate-bars, the view also showing a portion of the bearing-bar which supports the rocking bar.

The furnace can of course be of any suitable form and character, and the structure for supporting the grate-bars can also be of any suitable form or construction. For example, the grate structure may comprise a suitable number of bearing-bars A, arranged transversely and having their ends supported on beams or sills B. With this construction the grate-bars are arranged in any suitable manner within the furnace. With respect to the preferred formation of the end portions of the grate-bars the upper edges of the bearing-bars A are preferably provided with notches or seats *a*, which maintain the proper relative positions of the grate-bars. With the provision of the bearing-bars A, having the seats or notches *a*, the grate-bar C may be made readily removable from the grate. For example, each end of the grate-bar may be provided with a bearing portion *c*, the lower edge of which can be adapted to rest or fit within the seats formed in the upper edges of the said bearing-bars. If desired, the lower edges of these bearing portions *c* can be of a knife-edge character, so as to reduce friction and permit the bars to rock or oscillate freely upon their bearings. The lower portion of the bar has a leg *c'* adapted for attachment to the operating-rod. As a matter of further improvement the aforescribed grate-bars are of such character and formation as to effectually prevent the cracking, warping, or disintegration usually resulting from uneven expansion and contraction. For example, the bar C (shown in Fig. 1) may be substantially flat in character, it being observed that the bar is supported edgewise in the furnace. The upper portion *c²* of the grate-bar, which is the portion most subject to the harmful effects of expansion and contraction, is preferably of less weight and size than the lower portion, which latter is farther away from the bed of coals. With this relative formation of the top and bottom portions of

the bar the upper portion is not thick enough to permit the draft to superficially chill or cool the metal, allowing the center to remain at high temperature. In other words, the top of the bar is reduced in thickness and weight to an extent to insure practically an equal temperature for all parts of the metal while the bar is in use. In this way the cracking and disintegrating action observed in the bars having a relatively large amount of metal at their top is effectually prevented, and with the thickened lower portion of the bar this result is accomplished without weakening the bar as a whole. Furthermore and in order to prevent warping due to unequal expansion and contraction of the upper and lower portions of the bar, the said upper portion c^2 of the bar is preferably divided longitudinally into lengths or sections. For example and as shown in Fig. 1, the upper portion of the bar is cleft or divided at c^3 , c^4 , and c^5 , so as to divide the upper or supporting portion of the grate-bar into four sections. The outer or end sections, it will be observed, are connected with the base or bottom portion c^6 of the bar by the relatively thick portions c^7 and c^8 . The connecting medium between the two intermediate sections and the base c^6 is, however, of a different character and consists of the uprights c^9 . These uprights are, it will be observed, of such character as to be capable of flexing or bending slightly in the direction of the length of the bar, but are of such formation as to preclude all likelihood of their bending or flexing laterally. In other words, these uprights c^9 are thin when viewed from the side, as shown in Fig. 1, but are thick when viewed from the end of the bar, as shown in Figs. 5, 6, 7, and 8. The teeth c^{10} preferably project laterally from the top portion c^2 of the bar and are preferably of such formation as to leave a slight ridge or crest extending along the top of the bar. With the bar thus formed the weight and thickness of the top or supporting portion is reduced, so as to greatly reduce the liability of the toothed portion of the bar becoming superficially chilled or cooled while the center of the metal remains hot. The thickened base or bottom portion of the bar insures the requisite strength and rigidity of the bar as a whole, and as this base or thickened portion is farther away from the bed of coals it is therefore not subject to the injurious effects of intense heat and draft. It will also be seen that with the top portion of the grate-bar thus composed of sections the endwise expansion and contraction of this upper portion of the bar is practically taken up intermediate of its ends. When the upper portion of the bar expands lengthwise, the uprights c^9 yield in the direction of the length of the bar, and in this way the unequal expansion and contraction of the upper and lower portions of the bar does not cause any

warping or cracking. The base, however, of the bar is located farther away from the bed of coals, and for this reason it can be given the thickness requisite for insuring the proper strength and rigidity of the bar as a whole. My invention contemplates, therefore, an improved and scientific distribution of the metal in a grate-bar for the purpose of preventing cracking, warping, and disintegration. The stem or leg of my improved grate-bar is preferably arranged off center or nearer one end than the other; but it may be located substantially at the center, as shown in Fig. 9.

The grate-bars can be provided with depending lugs M, which overhang the bearing-bars and which prevent the grate-bars from being displaced therefrom. With the aforesaid formation and construction each bar is provided with transverse openings or apertures N, which are separated by the uprights provided for connecting the upper and lower portions of the grate-bar. These openings add to the efficiency and serviceability of the grate-bars, inasmuch as they permit a free circulation of air not only between the bars themselves, but also between the upper and lower portions of the bars. In other words, with these openings N the air is free to circulate both vertically and horizontally and in such manner as to prevent the lower portion of each grate-bar from becoming overheated. With this circulation of the air around the lower portion of each grate-bar, the amount of metal which is subjected to intense heat is reduced to a minimum.

With my improved construction and formation of the bar it does not warp or get out of shape—that is to say, the usual tendency in this respect is precluded or greatly reduced.

What I claim as my invention is—

1. In a furnace, a grate-bar having an upper portion composed of a plurality of sections arranged end to end, and having a continuous lower portion, the said upper and lower portions being connected by end uprights, and also by a number of slender intermediate uprights, the end uprights being split vertically for some distance below the lower edge of the said upper portion of the grate-bar, and the middle upright being split or divided vertically to a point substantially on a line with the lower edge of said upper portion of the grate-bar, whereby each intermediate section of the upper portion of the grate-bar is supported at its ends and also at intermediate points.

2. In a furnace, a grate-bar having a relatively light toothed upper portion composed of sections arranged end to end, and having a relatively heavy and continuous lower portion, the said upper and lower portions being connected by end and intermediate uprights, the end uprights being relatively thick or heavy, while the intermediate uprights are

relatively light or slender, the upper ends of said uprights being adapted to serve as teeth, and certain of said uprights being split or divided vertically for the purpose of giving the upper portion of the grate-bar the afore-
5 stated sectional character.

3. In a furnace, a rocking grate-bar having its ends provided with bearing portions, and having also a sectional upper portion and a
10 continuous lower portion, the upper portion containing considerably less metal than the lower portion, and the said bar having also a plurality of uprights connecting the said up-
15 per and lower portions, certain of said uprights being split or divided vertically in order to give the upper portion of the bar the aforestated sectional character, and the in-
20 termediate uprights being relatively light or slender and so disposed that each intermediate section of the upper portion of the grate-
bar is supported at its ends and also at inter-
mediate points.

4. A grate-bar for use in furnaces, having a relatively light upper portion composed of
25 sections arranged end to end, and having also a relatively heavy continuous lower portion, the said upper and lower portions being connected by uprights that are thicker than the upper portion and which extend to the crest
30 of the latter, so that the upper portions of said uprights may serve as teeth for the upper portion of said grate-bar, the end sections of the upper portion of the bar being provided with laterally-projecting teeth arranged out-
35 side of the said uprights, and the intermediate sections of the upper portions of the grate-bar being also provided with laterally-projecting teeth arranged between the upper end
portions of said uprights.

5. A grate-bar, provided with a relatively
40 light upper portion divided into a plurality of lengths arranged end to end, and having also a relatively heavy continuous lower portion, the end sections of the upper portion being
45 connected with the lower portion by means of thickened or relatively heavy uprights, and the intermediate sections of the upper portion being connected with the lower portion
by means of a plurality of slender or relatively
50 light uprights.

6. A grate-bar provided with a relatively
light upper portion and a relatively heavy
lower portion, the ends of said relatively
heavy and light portions being connected by
55 relatively thick or heavy uprights, and hav-
ing also a number of relatively light or slender uprights connecting the intermediate
parts of said upper and lower portions.

7. A grate-bar having a horizontal upper
60 portion consisting of a plurality of thin webs arranged end to end, a relatively heavy and continuous lower portion, teeth projecting laterally from the upper portion, uprights connecting the heavy and continuous lower por-
65 tion of the bar with the said webs which consti-

tute the relatively light portion, and bearing portions for the ends of the bar, certain of said uprights being split or divided verti-
cally for the purpose of giving the upper por-
70 tion of the bar the aforestated sectional char-
acter.

8. In a furnace, a grate-bar having a rela-
tively thin and laterally-toothed upper por-
tion composed of sections arranged end to
end, and having a relatively heavy and con-
75 tinuous lower portion, the said upper and lower portions being connected by uprights, the end and middle uprights being split ver-
tically for the purpose of giving the upper
portion of the grate-bar the aforestated sec-
80 tional character.

9. A grate-bar provided with a laterally-
toothed upper portion divided into sections
arranged end to end, and having a continuous
lower portion, the said upper and lower por-
85 tions being connected by a plurality of up-
rights, certain of said uprights being split or divided vertically in order to give the said
upper portion the aforestated sectional char-
acter.

10. In a furnace, a grate-bar having an up-
per portion composed of a plurality of thin
web-like sections arranged end to end, and
having a continuous lower portion, the said
upper and lower portions being connected by
95 inflexible end portions, and also by a number
of flexible intermediate uprights, the said
uprights being so disposed that an interme-
diate part of the upper portion of the grate-
bar is supported at its ends and also at inter-
100 mediate points.

11. In a furnace, a grate-bar having a rela-
tively light toothed upper portion composed
of sections arranged end to end, and having a
relatively heavy and continuous lower por-
105 tion, the said upper and lower portions being
connected by end and intermediate uprights,
the end uprights being relatively thick or
heavy, while the intermediate uprights are
relatively light or slender and of a character
110 to flex or bend when the upper portion of the
bar expands endwise, the upper ends of said
uprights being adapted to serve as teeth.

12. In a furnace, a rocking grate-bar hav-
ing its ends provided with bearing portions,
115 and having also a sectional upper portion and a continuous lower portion, the upper
portion containing considerably less metal
than the lower portion, and the said bar hav-
ing also a plurality of uprights connecting
120 the said upper and lower portions, certain of
said uprights being split or divided vertically
in order to give the upper portion of the bar
the aforestated sectional character, and the in-
termediate uprights being relatively light or
125 slender and so disposed that an intermediate
part of the upper portion of the grate-bar is
supported at its ends and also at intermediate
points.

13. A grate-bar for use in furnaces, having
130

a relatively light upper portion composed of sections arranged end to end, and having also a relatively heavy continuous lower portion, the said lower and upper portions being connected by uprights that are thicker than the upper portion and which extend to the crest of the latter, so that the upper portions of said uprights may serve as teeth for the upper portion of said grate-bar, the end sections of the upper portion of the bar being provided with laterally-projecting teeth arranged outside of the said uprights, and an intermediate part of the upper portion of the grate-bar being also provided with laterally-projecting teeth arranged between the upper end portions of said uprights.

14. A grate-bar, provided with a relatively light upper portion divided into a plurality of sections arranged end to end, and having also a relatively heavy continuous lower portion, the end sections of the upper portion being connected with the lower portion by

means of thickened or relatively heavy end portions, and an intermediate part of the upper portion being connected with the lower portion by means of a plurality of slender or relatively light uprights adapted to flex or bend with the endwise expansion of the upper portion of the bar.

15. A grate-bar provided with a relatively light upper portion and a relatively heavy lower portion, the ends of said relatively heavy and light portions being connected by relatively thick or heavy end portions, and having also a number of flexible uprights connecting the intermediate parts of said upper and lower portions.

Signed by me at Chicago, Cook county, Illinois, this 20th day of December, 1901.

THOMAS E. MARTIN.

Witnesses:

ARTHUR F. DURAND,
HARRY P. BAUMGARTNER.