June 24, 1941. E. L. TAROF 2,246,766

GRATING

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Fig. 1.

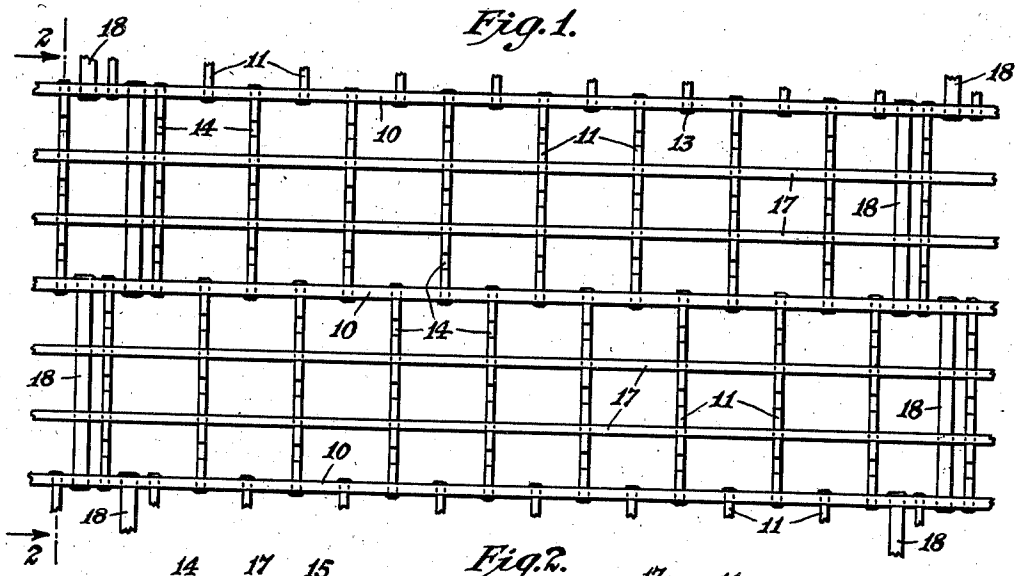


Fig. 2.

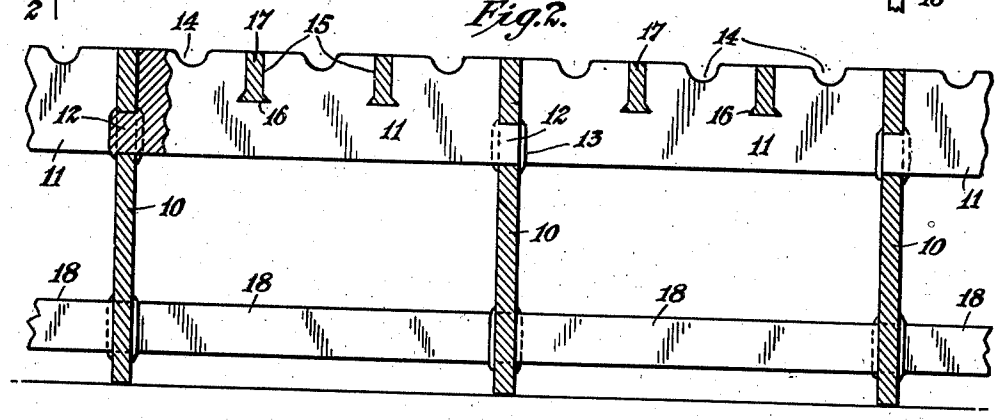


Fig. 5.

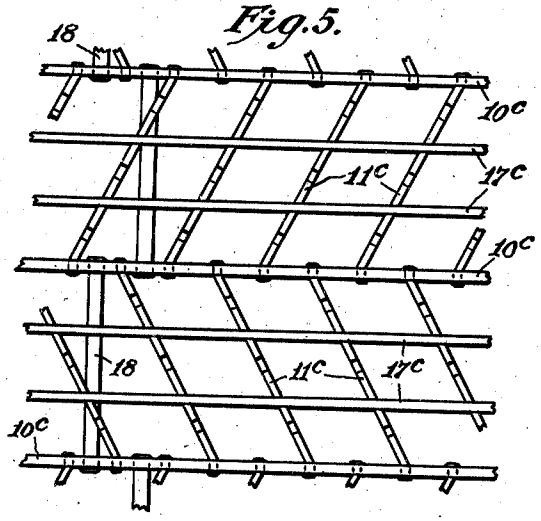


Fig. 3.

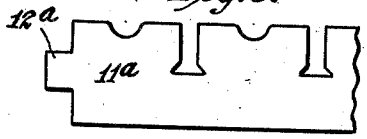
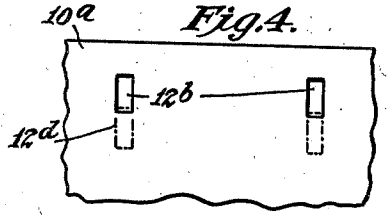


Fig. 4.



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Fig. 6.

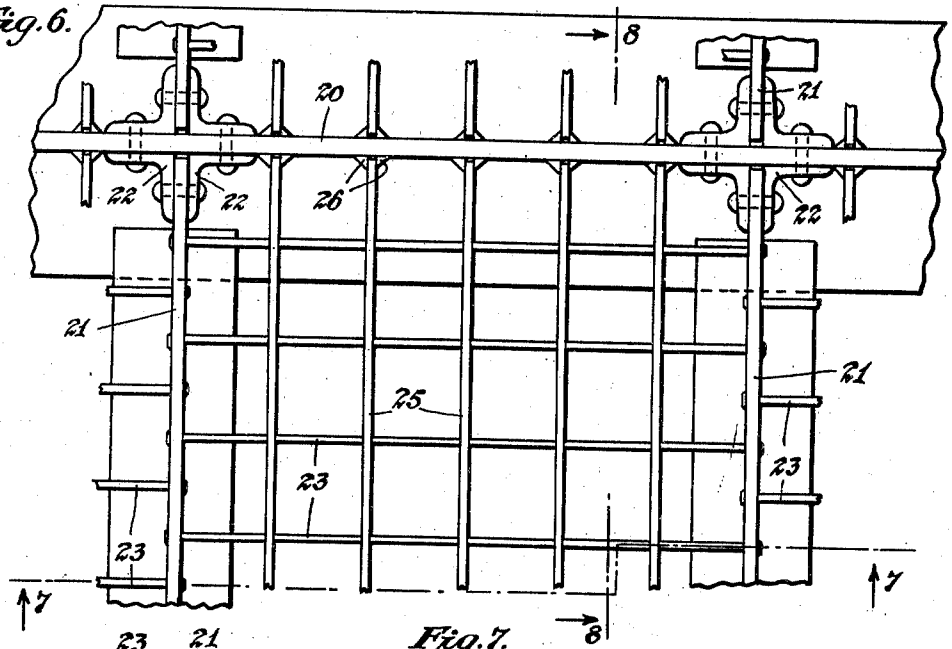


Fig. 7.

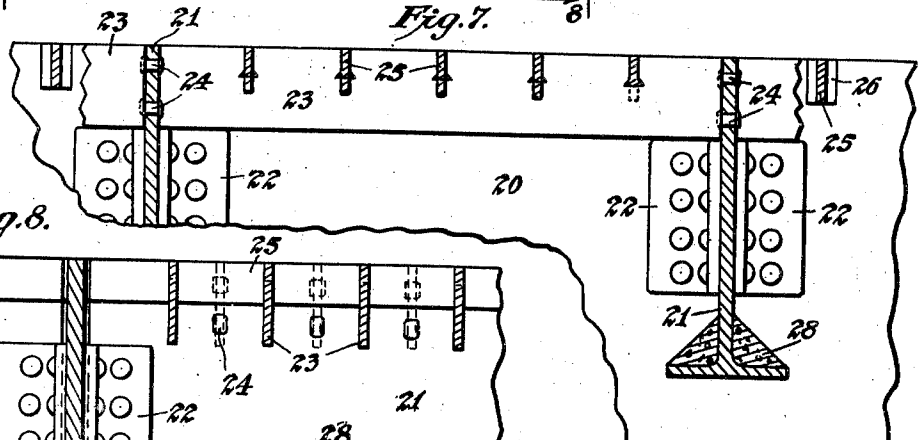
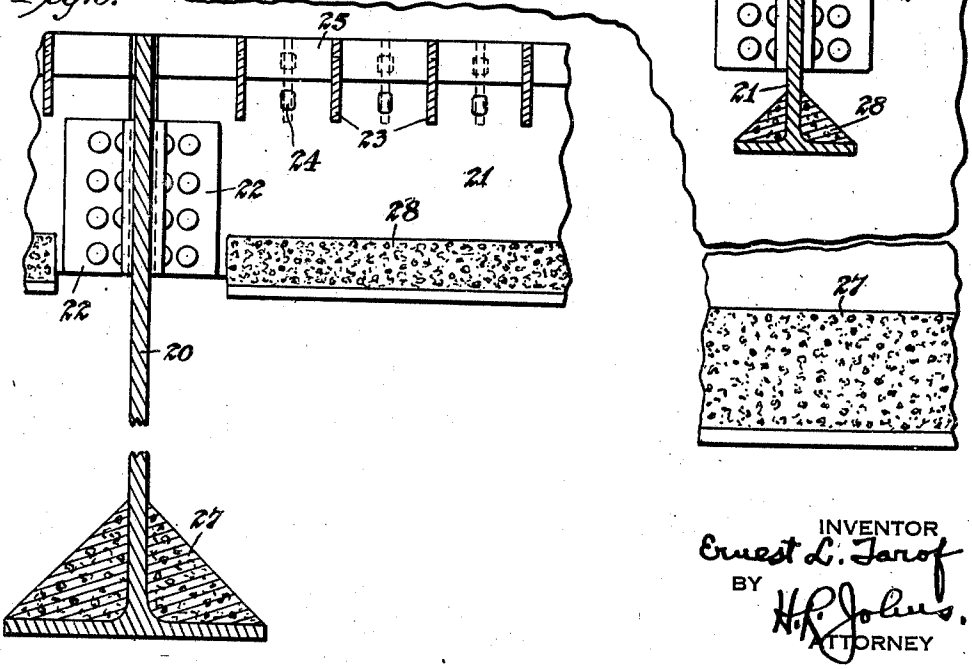


Fig. 8.



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UNITED STATES PATENT OFFICE

2,246,766

GRATING

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Application April 6, 1939, Serial No. 266,312

3 Claims. (Cl. 189—82)

This invention relates to gratings of the type used on roadways in elevated structures, and has for its object to provide an efficient and improved grating better adapted for the requirements of such roadways. Another object is to provide an improved grating for roadways on bridges in which the supporting girders have been arranged with their tops flush with the top of the grating and arranged so that the girders constitute a part of the grating and the grating functions to strengthen or reinforce the upper portion of the girder. Still another object is to provide short auxiliary spacing supports for some longitudinal bars that are not adapted to become loosened when such spacing supports are under a negative bending moment, i. e., when the fiber stress in the upper half of the support is in tension rather than compression. Yet a further object is to provide a combination grating and girder construction which requires minimum headroom, that is, is shallow and is also substantially free of openings, ledges and the like in which snow, ice or dirt may collect.

Heretofore gratings placed on bridges have been open to a number of objections. For one thing the grating sections have been placed on top of a number of transverse bridge girders. Under this invention the improved grating sections are formed so that the girders are a part of the grating sections each reinforcing the other. Fewer transverse girders are needed under this invention than has heretofore been required, resulting in lower cost of production and installation. Heretofore in connections between grating sections it has been customary to provide auxiliary members alongside of some of the bars and secured thereto by welding or riveting. Another suggestion has been to displace one section relative to the other at the connection, or to bend the bars of one section relative to those of the other section so that not the whole but only an end portion is displaced at the joint. In driving an automobile along a roadway of grating sections connected together the aforementioned lateral displacement may cause the front wheels to be noticeably swerved due to the offset or bend in the grating. Under this invention this objection has been eliminated and the roadway made uniform in appearance and driving character. In the accompanying drawings this invention has been shown embodied in a grating of a type having rectangular openings.

Fig. 1 shows a preferred manner of connecting grating sections together.

Fig. 2 is a section on the line of 2—2 of Fig. 1.

Fig. 3 illustrates a modified type of connecting bar.

Fig. 4 shows a bar at right angles to the connecting bars and to which the connecting bars of Fig. 3 may be secured.

Fig. 5 illustrates a modified construction in which the connecting bars are inclined with respect to the bars which they connect.

Fig. 6 is a top plan view of a combination transverse girder and grating embodying this invention.

Fig. 7 is a section on the line 7—7 of Fig. 6.

Fig. 8 is a section on the line 8—8 of Fig. 6.

In Fig. 1 is shown one embodiment of this invention in which the load supporting bars 10 are carried on two or more supports. Between each of the load bars 10 are a plurality of short spacing bars 11, each having at each end a lug 12 adapted to extend through a hole in the load bars and upset at 13. The top surface of these spacing bars 11 is provided with cut out portions having rounded edges, such cut out portions 14 enhancing the resistance of the tread surface to slipping by any vehicle that may otherwise have a tendency to do so. In the tops of the spacing bars 11 are also provided a number of recesses 15 having dovetailed shaped bottom portions into which are placed the bars 17 and their bottoms caused to spread laterally under compression, tending to fill up the bottom portion 16 of the holes 15. In addition to the spacing members 11, several more widely spaced bars 18 are located so as to be in the position shown in Fig. 2, whereby when the grating is placed under load these bars 18 transmit tension from one part of the grating to another.

The spacing members 11 are each so constructed as to be capable of serving the purpose of connecting members. Such members are capable of being headed over on the job.

A number of spacing bars 11 may be connected together through their bars 17 and then the units of bars 11 and 17 inserted into position between two grating sections each comprised of two adjacent bars 10 and what is between them. After this the ends of the spacing bars 11 projecting through the load bearing bars 10 are headed over by an appropriate tool familiar to those skilled in the art and capable of being sent out onto the job for doing just this work. If the grating sections are movable relatively to one another laterally of the bars 10 a slight amount the bars 11 may have their bars 17 inserted and permanently secured in place before

the spacing and connecting bars 11 have been put into place connected with the adjacent sections. Or the bars 17 may be inserted in the bars 11 after the bars 11 have been headed over and permanently connected to their adjacent grating sections.

A noteworthy feature is the tension bar 18 which is better adapted to assist in taking strains between the load bars 10 than is the case if such additional bars 18 were not used.

In Figs. 3 and 4 is shown a modified construction for the bars 11—*a* which may have their lugs 12—*a* located higher up than the case in Figs. 1 and 2. With the lugs of the type shown by 12—*a* the need for the tension members 18 is believed to be greater than if the lugs 12 were located lower on the spacing bars. Where lugs 12—*a* are used, holes 12—*b* of a sort suitable to receive the lugs 12—*a* are provided in the load bearing members 10—*a*. Where the supporting lugs 12, of the type shown in Figs. 1 and 2 are to be used, the dotted line opening 12—*d* in Fig. 4 is the type contemplated into which these lugs may extend.

In Fig. 5 is shown another embodiment of this invention provided with the same longitudinal bars 10—*c* of the grating section, which, in this case, may be connected by spacing bars 11—*c*, which have their end portions arranged at an angle as shown. In other respects than the angularity of the bars 11—*c*, Fig. 5 is believed to illustrate a construction similar in purpose to the construction of Figs. 1 to 4 inclusive herein, except that the spacing or connecting bars 11—*c* have their end portions angularly disposed. Instead of giving the bars an inclination of the shape illustrated, it may be desirable to substantially reduce the amount of angularity in these spacing bars by making them parallel but arranged at a larger angle with respect to the load bearing bars 10—*c*.

In Fig. 6 the invention previously described in connection with Figs. 1 to 5 inclusive is shown embodied in an elevated roadway grating in which the supporting girders and shapes form a part of the grating and the grating sections serve as a reinforcing means to strengthen the upper portions of the inverted T bars constituting the beams and girders, that is the grating sections to some extent take the place of the upper flanges which would be present if the beams and girders were I beams. Specifically the girders 20 are inverted T shape as shown in Fig. 8. Beams 21 (corresponding to members 10 of Fig. 1) are secured to the girders by the angles 22 shown in Figs. 6 to 8 as being riveted in place, with the rivets passing through the angles and the webs of the beams and girders. The connecting members 23 (corresponding to the members 11 of Fig. 1) are joined to the beams 21. As shown in Fig. 8 and also in Fig. 7 these connecting members are provided at each end with two lugs 24, instead of the single lug 13 used in Fig. 1. These lugs are integrally formed on the connecting members 23 and are adapted to be headed over after they have been put in place in recesses in the beams 21. The members 25 (corresponding to the members 17 of Fig. 1) are set into recesses in the connecting members 23 and at their ends are preferably secured to the girder 20 by welding as shown at 26. To prevent the collection of snow, ice or dirt on the flanges of the girders 20 and the beams 21 grouting is arranged as indicated at 27 and 28, the inclination of the top surface of this cementitious material being at least about 45 degrees as illustrated though of course other inclinations are permissible.

Among the advantages of this invention may be mentioned the ease and simplicity of connecting grating sections inexpensively and without any visible change in the design of the grating at the joint. In the attached drawings the bars have been drawn substantially to scale so that most of the bars are of the same thickness to provide a substantially uniform grip on the tires of motor cars, etc. So far as is known this invention is the first to provide a connection made in the same manner in which the corresponding parts are made in the rest of the grating. A connection has been provided without either bending or offsetting any of the spacing bars more or differently from what would be required if such connection were not present. Heretofore it has been customary to offset certain bars or else offset only the ends of the bars in forming a grating section. Under this invention it is not necessary to bend or offset any of the bars in one section with respect to those in another. The load supporting bars may if desired be arranged to extend longitudinally of the roadway in any of the illustrated embodiments of this invention. If the bars 11 and 23, which have recesses in their upper edges for the bars 17 and 25, were extended across more than two supporting bars 10 and 21 respectively, there might be a loading tendency to spread the sides of such recesses in sections adjacent but not between the supports for any such loading. This danger is said to be due to a negative bending moment, or in other words, a fiber stress in tension in the upper edge portion of one or more of the spacing bars 11 or 23. The bars 18 may be made much longer than has been illustrated. The spacing bars 11 may be placed more nearly in alignment rather than offset the half space shown. The bars 10 may have cross sections in the shape of an I, channel, angle or bulb beam. Wherever riveting has been mentioned it may be understood that welding might be used instead. The number of bars 17 may be more or less than the two shown in Fig. 1.

Having the beams and girders formed as a part of the grating structure and with their tops substantially flush with the top of the grating enables some of the transverse girders heretofore used to be eliminated. The ease of connecting the bars 23 and 11 is an important item especially since these connections entail no substantial change in the appearance of the grating or in the effect upon steering in driving a car over the grating. The load supporting bars have no L shaped or other recesses in which snow, ice and dirt may collect. The bars 23 and 25 may if desired be recessed on their top edge as has been done by the notches 14 shown in Fig. 2. Another advantage of the construction shown in Figs. 6–8 is that the total depth for both the grating and the girder or beam is less than would be the case if the grating rested on top of the girder or beam. The absence of any flanges on the top portions of the beams or girders makes it easier for the entire structure including both the grating and the beams or girders to be painted from the top of the roadway and without the necessity of any swung under support for a painter except perhaps in connection with the painting of the underside of the beams and girders 20 and 23.

In Fig. 1 the load bars 10 are preferably arranged laterally of the roadway, though they may extend longitudinally thereof. In Fig. 6

the girders may be arranged either longitudinally or transversely of the bridge and roadway, though preferably they are arranged transversely thereof.

I claim:

1. A grating section including load bars along each longitudinal edge of the section, spacing bars extending between the load bars and of substantially less depth, intermediate bars parallel to the load bars and of substantially less depth than the spacing bars but with their tops flush with the tops of the spacing and load bars, the spacing bars having their top edge recessed to receive said intermediate bars, the load bars having a recess below the top thereof closed on all sides, a lug on each end of said spacing bars below the top thereof for snug reception in the recess of said load bars, and headed over, another grating section similar to the first and spaced therefrom substantially the width of the section, and means for connecting said sections including a connected series of spacing and intermediate bars, the spacing bars having lugs for reception within recesses in the adjacent load bars spaced from the top and said lugs being headed over, the second mentioned grating section being connected with the first mentioned grating section by spacing bars substantially similar in length and shape with the spacing bars of said sections but being out of alignment with the spacing bars of each section, each spacing bar connecting no more than two of the adjacent longitudinal load bars.

2. A grating section including load bars, spacing bars rigidly connecting no more than each pair of adjacent load bars and of less depth than said load bars, at least one intermediate bar parallel to the load bars, carried in recesses in the upper edge of said spacing bars and of substantially less depth than such spacing bars with the tops of said load, spacing and intermediate bars substantially flush, another grating section similar to the first section and spaced therefrom substantially the width of the first section, spacing bars out of alignment with the spacing bars of said sections and rigidly connecting said sections, said last mentioned spacing bars also carrying at least one intermediate bar in recesses in the upper edge of the spacing bars, at least one end of the load bars being secured to and carried by a grating supporting beam of greater depth than said load bars, the upper edge portion of said beam being substantially flush with the tops of said load, spacing and intermediate bars and constituting a portion of said grating, a stiffening flange on the lower part of said beam spaced below the bottoms of said load bars.

3. A grating section including load bars, spacing bars rigidly connecting no more than each pair of adjacent load bars and of less depth than said load bars, at least one intermediate bar parallel to the load bars, carried in recesses in the upper edge of said spacing bars and of substantially less depth than such spacing bars, the tops of said load, spacing, and intermediate bars being substantially flush, another grating section similar to the first section and spaced therefrom about the width of said section, spacing bars out of alignment with the spacing bars of said sections and rigidly connecting said sections at their edges, said last mentioned spacing bars also carrying at least one intermediate bar in recesses in the upper edge thereof.

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